CTU
CZECH TECHNICAL
UNIVERSITY
IN PRAGUE

SCHOLA 2016

PROCEEDINGS OF 12th INTERNATIONAL SCIENTIFIC
CONFERENCE SCHOLA 2016, PEDAGOGY
AND DIDACTICS IN TECHNICAL EDUCATION

2
SCHOLA
1
6

EDITED BY PAVEL ANDRES, ROMAN HRMO ET AL.

MASARYK
INSTITUTE
OF ADVANCED
STUDIES
CTU IN PRAGUE

INFORMAČNÁ SPOLOČNOSŤ
PRE VÝCHOVU A VZDELÁVANIE

SCHOLA 2016

PROCEEDINGS OF 12th INTERNATIONAL CONFERENCE SCHOLA 2016, PEDAGOGY AND DIDACTICS IN TECHNICAL EDUCATION

EDITED BY PAVEL ANDRES, ROMAN HRMO ET AL.

SCHOLA 2016

PEDAGOGY AND DIDACTICS IN TECHNICAL EDUCATION

CONTENTS

INTRODUCTION

SCHOLA 2016, Pedagogy and Didactics in Technical Education, 12th International Conference on Engineering Pedagogy, was held from 6th to 7th December 2016, Masaryk Dormitory, Congress Centre, Czech Technical University in Prague, Czech Republic.

SCHOLA 2016 was organised in cooperation of Czech Technical University in Prague, MIAS, School of Business and Interdisciplinary Studies and DTI University in Dubnica nad Váhom, Slovakia, under the auspices of the International Society of Engineering Pedagogy – IGIP and other partners.

This international conference was aimed to focus on the exchange of relevant trends and research results as well as the presentation of practical experiences in Engineering Pedagogy.

TOPICS OF INTEREST

- Engineering Pedagogy Education
- New Trends in Branch Didactics
- Accreditation, Curriculum Development, Quality in Education
- Technical Teacher Education, Key Competencies
- Networks of Social Sciences in Engineering Education
- Information and Communication Technologies in Education
- Talent Education
- Lifelong Learning

PATRONAGE OVER THE CONFERENCE

prof. Ing. Petr Konvalinka, CSc., Rector, Czech Technical University in Prague

doc. Mgr. Gabriela Gabrhelová, PhD., MBA, Director, DTI University, Dubnica nad Váhom, Slovakia

Ing. Přemysl Malý, CSc., Chairman, Czech Mechanical Engineering Society in Prague, Czech Republic

SUPERVISORS

doc. PhDr. Dana Dobrovská, CSc., Czech Technical University in Prague, Masaryk Institute of Advanced Studies, Department of Pedagogical and Psychological Studies, Czech Republic

doc. Ing. Lenka Švecová, Ph.D., Czech Technical University in Prague, Director, Masaryk Institute of Advanced Studies, Czech Republic

doc. Ing. Roman Hrmo, PhD., ING.PAED.IGIP, MBA, Executive Committee Member of International Society of Engineering Pedagogy – IGIP, Vice Rector for Quality and Development, DTI University, Slovakia

prof. Dr. Dr. Michael E. Auer, President of International Society of Engineering Pedagogy – IGIP, Carinthia University of Applied Sciences, Austria

SCIENTIFIC BOARD

Ing. Pavel Andres, Ph.D., ING.PAED.IGIP, Czech Republic

prof. Jenő Bárdos, DSc., Hungary

prof. PhDr. Martin Bílek, Ph.D., Czech Republic

prof. Ing. Pavel Cyrus, CSc., Czech Republic

doc. PhDr. Dana Dobrovská, CSc., Czech Republic

doc. Mgr. Gabriela Gabrhelová, PhD., MBA, Slovakia

prof. PaedDr. Alena Hašková, CSc., Slovakia

Ing. Peter Jakúbek, PhD., MBA, Slovakia

doc. Ing. Ján Kmec, CSc., Czech Republic

prof. Dr. Elena Kovalenko, Ukraine

prof. Mag. Dr. Norbert Kraker, Austria

Ing. Lucia Krištofiaková, PhD., ING.PAED.IGIP, Slovakia

Ing. Daniel Kučerka, PhD., ING.PAED.IGIP, Czech Republic

doc. Ing. Daniel Lajčin, PhD., MBA, Slovakia

doc. PaedDr. Tomáš Lengyelfalusy, PhD., Slovakia

Mgr. Juraj Miština, PhD., Slovakia

dr hab. prof. nadzw. Henryk Noga, Poland

prof. PhDr. Gabriela Petrová, CSc., Slovakia

doc. Ing. Čestmír Serafín, Ph.D., Czech Republic

prof. Ing. Milan Slavík, CSc., Czech Republic

doc. PhDr. František Stellner, Ph.D., Czech Republic

Ing. Petr Svoboda, Ph.D., ING.PAED.IGIP, Czech Republic

Dr. habil. Ing. István Szőköl, PhD., Slovakia

JUDr. Anatolij Jevgenijovič Ševčenko, Ukraine

doc. PaedDr. Jana Škrabánková, PhD., Czech Republic

prof. Ing. Rudolf Šlosár, PhD., Slovakia

Assoc. Prof. Kevin Taylor, USA

prof. PhDr. Alena Vališová, CSc., Czech Republic

Philosophy and Basic Principles of International Society for Engineering Pedagogy

Tiia Rüütmann

Tallinn University of Technology
Estonian Centre for Engineering Pedagogy
Tallinn, Estonia
tiia.ruutmann@ttu.ee

Abstract—**Engineering Pedagogy is an interdisciplinary scientific subject and an essential element of the system of engineering education. The article is dedicated to the work of Adolf Melezinek, the founder of Engineering Pedagogy and the main principles of Klagenfurt School of Engineering Pedagogy. Curriculum design and technical teacher education in International Society for Engineering Pedagogy (IGIP) are based on Melezinek's work.**

Keywords—*engineering pedagogy science, teaching engineering, curriculum design, technical teacher training.*

I. INTRODUCTION

„Scientists dream about doing great things. Engineers do them." – James A. Michner.

The present article is dedicated to the work of Adolf Melezinek – the main principles of Klagenfurt School of Engineering Pedagogy, curriculum design and technical teacher education in International Society for Engineering Pedagogy (IGIP) are based on his work.

Professor Adolf Melezinek (1932 – 2015) was the founder of IGIP, long-time president of IGIP, IGIP honorary life president and one of the founding professors of the University of Klagenfurt.

Adolf Melezinek had numerous international honors and activities – among others Advisor to the Government of the Czech Republic for higher education, Honorary Doctor of Tallinn University of Technology, Honorary Senator of the University of Budapest, Honorary Doctor of Technical University of Liberec, Moscow NE TU Bauman, University of Hradec Králové, Technical University in Moscow (MADI), etc.

II. DEVELOPMENT OF ENGINEERING PEDAGOGY

Adolf Melezinek was the founder of the Klagenfurt School of Engineering Pedagogy. The fundamental principles of Engineering Pedagogy Science have been elaborated, and formulated in general sense by Adolf Melezinek [1]. Engineering Pedagogy is an interdisciplinary scientific subject and an essential element of the system of engineering education.

While scientific pedagogy comprises various schools and streams, two major streams can be identified based upon simplified and generalized assumptions. The first one includes the more or less traditional philosophical-spiritual scientific beginning during which methods based upon phenomenological understanding were applied in order to get insight into the components of the instruction process. The other stream is represented by scientists who basically created the cybernetic beginning during which calculation methods dominated. Although both streams comprise a wide range of schools, they share certain key ideas which, at the same time, distinguish them from each other [3].

The traditional, classical pedagogy did not meet specific needs when used for education of engineers striving for the teaching profession. This was proved by experiences of different countries. The discrepancy was solved by setting up of special engineering-pedagogical institutes at some technical universities. The term "Ingenieurpädagogik – Engineering Pedagogy" has become a technical term for a young scientific discipline which deals with the problems of teaching technology and engineering.

The term "Engineering Pedagogy" signifies the characteristic of discipline – the interaction of engineering and technical sciences with pedagogy and the education system. As it is presented in Figure 1 (in Melezinek [2]), the necessary technical knowledge is offered to Engineering Pedagogy by different technical sciences. Pedagogical knowledge (didactics) is generally used in the development of corresponding knowledge systems for instruction, as well as for the method of instruction, whereby the cognitions of other sciences are also being used, such as psychology, sociology, information theory, etc.

Melezinek [3] proposed the aims of Engineering Pedagogy – to implement integral thinking in terms of Science as Art, trying to combine the science of teaching with the art of the teacher, i.e.

with the teacher's personality. The teaching process should be inspired in a scientific manner applying as many calculation methods as possible and making teaching activities meaningfully algorithmic. However, human beings and art, which inspires teaching and adds creativity, should maintain their roles in the instruction process. The teacher's art should be applied in accordance with the science, exploring the effectiveness of teaching processes. The subject of Engineering Pedagogy Science is everything, which improvement of technical disciplines is aimed at, all kinds of teaching activities, concerned with aims, content and forms of education.

The methodology of Engineering Pedagogy as the science of the most common laws, principles and methods of scientific and technical knowledge, search for new ideas and theories and their realization, the contents and structure of engineering activities has been considered. The object of Engineering Pedagogy is the pedagogical system of training engineers; the subject is described as designing and realizing of professional training contents, organization forms, methods, and the process of specialist's personality formation.
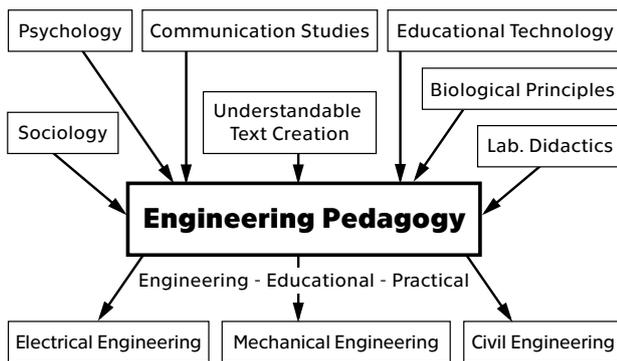
Fig. 1. Engineering Pedagogy Model for Technical Teacher Training [2]

The basic notions and categories are the same as in general pedagogy: aims, principles, organization form, etc., enriched with new contents taking into account the objectives of engineering education. The categories specific for Engineering Pedagogy are scientific and technical knowledge, engineering activity, specialist's personality and communication in the process of professional activity.

III. DEVELOPMENT OF ENGINEERING PEDAGOGY SCIENCE

According to Heinze [4] developments in Engineering Pedagogy in Europe in 1950s are exemplified by three "schools of Engineering Pedagogy":

- the "Dresden School of Engineering Pedagogy";
- the "Prague School of Engineering Pedagogy";

- the "Klagenfurt School of Engineering Pedagogy".

The "Dresden School of Engineering Pedagogy" goes back to the founding of the Institute of Engineering Pedagogy at the Technical University in Dresden in November 1951 [2]. The first director of the institute was Prof. Dipl.-Ing. Hans Lohmann, succeeded by Prof. Dr. Lichtenecker in 1963 and Prof. Dr. G. Lehmann in 1986 [3].

The "Prague School of Engineering Pedagogy" developed in Czechoslovakia in the 1960s based on activities at the universities in Prague, Liberec, Brno, Olomouc, Bratislava and Kosice. An Institute of Vocational Training was set up at the Technical University in Prague in 1961, which became the Institute of Studies at Technical Universities in 1965. The director of the institute was Prof. Dipl.-Ing. S. Novák, CSc [3]. Thus the origins of the "Prague School of Engineering Pedagogy" can be clearly dated back to 1961. The origin of this institute existed in different forms till 1991, when its educational activities were taken over by the founded Masaryk Institute of Advanced Studies of Czech Technical University in Prague. The work of Prof. S. Novák was continued by Dr. Dipl.-Ing. J. Měřička and PhDr. Dana Dobrovcká Csc [3]. Development and production of new educational means in the institute were closely connected with research.

The "Klagenfurt School of Engineering Pedagogy" was established in 1971. Dipl.Ing.,Dr.phil.,Dr. hc. Adolf Melezinek was appointed to the 'chair of the didactics of scientific/technical subjects with particular reference to teaching technology' and University of Educational Sciences (now the University of Klagenfurt) saw the continual and systematic scientific development of Engineering Pedagogy in Austria [2]. The term "Klagenfurt School of Engineering Pedagogy" is used for a scientific approach founded by Adolf Melezinek.

According to A. Haug [5], Melezinek built up the Institute of Teaching Technology with an emphasis on engineering education. Melezinek had previously been based in Prague where he taught courses for technology lectures at university level at TU. Thanks to these activities and IGIP, the work of the "Klagenfurt School of Engineering Education" was and is still very effective.

According to Victor K. Schutz [6] the "Klagenfurt School of Engineering Pedagogy" and IGIP are well established. They should be able to contribute significantly along with the Bologna Declaration, the ABET CRITERIA and other programs to an eventual accreditation agreement for engineering and technology programs and faculty members.

The current situation of Engineering Pedagogy has evolved more or less continuously from activities at the three schools of Engineering Pedagogy mentioned above. This is where the basic approaches of all three schools of Engineering Pedagogy meet: the prerequisite for scientific

Philosophy and Basic Principles of International Society for Engineering Pedagogy

studies on Engineering Pedagogy is mastery of the fundamentals of a technical science subject. The path to teaching a science irreversibly leads from mastery of the subject matter to the actual teaching process. This is where specific research on Engineering Pedagogy can start. Naturally, it also reflects findings from pedagogy and other sciences and takes account of a whole series of important influences [2]. This is formulated in a general sense by Melezinek [1] in the initial approach of the "Klagenfurt School of Engineering Pedagogy" when he defines the subject of Engineering Pedagogy as the scientific investigation and practical realization of the aims and contents of technical subjects as well as of the process in which their contents are transformed by specific media as influenced by a specific socio-cultural environment with the help of specific teaching methods with the knowledge of specific recipients.

According to Melezinek [5] the Klagenfurt approach to Engineering Pedagogy may be based on the thoughts of traditional philosophic-humanistic pedagogy, but it does emphasize the approach of cybernetic pedagogy, which is based on the concept of information with its quantitative measurements and feedback control system – in line with the special situation of technical sciences and technicians.

As Melezinek has pointed out [5], the educational process should be scientific – a sensible algorithm should be created for the activity of teaching – but we should not lose sight of the person and their art which inspire teaching and give it creative impulses. The art of teaching should be brought to bear on the foundations of a science on the effects of learning processes.

The "Klagenfurt School of Engineering Pedagogy" defines the subject of Engineering Pedagogy as the scientific investigation and practical realization of the objectives and contents of technical subjects as well as the process in which the subject matter is transformed into knowledge for the addressees with the help of certain media and instructional methods within a socio-cultural environment [1].

The Engineering Pedagogical concept of teaching according to Klagenfurt approach may be described as follows: education is a subject to certain regularities. It has two poles – the teaching system and the learning system – between which information is transferred.

According to Frank and Heimann the course of the whole process is influenced by a number of variables [1]:

- Instructional objectives (Z);
- Subject matter (L);
- Psychostructure (P);
- Media (M);

- Sociostructure (S);
- Teaching method (TM).

Teaching can be changed significally when the variables are altered. The teacher's main didactic task is to find an optimal teaching method (TM – how?) which can achieve a given instructional objective (Z – why?) for a given subject matter (L – what?) with the available media (M – with what?) for the addressees present (P – who?) under the influence of a certain socio-cultural environment (S – where?). This described Engineering Pedagogical model of the teaching process is presented in Figure 2 [1].

The teaching method is thus a function of different influential factors and can be expressed mathematically as follows [1]:

$$TM = f\,(Z, L, M, P, S)$$

This functional equation describes very complicated relations as all factors act together. Individual factors can act with or against others. The educational process as a whole, taking account of teaching and learning and the mutual interplay of all pedagogical variables, represents an extraordinary complex construction.

In the process of teaching the forming of knowledge of students is always carried out by a certain plan, according to the accurately specified instructional objective. Taxonomy of instructional objectives was developed by B. S. Bloom, D.R. Krathwohl and other authors (cited in [1]). According to the formulation of R. F. Mager it is possible to understand the instructional objectives of the teacher set as univocal, clear-cut, excluding most of alternatives (cited by [1]). According to Melezinek [1] it is important to set general instructional objective first and then detailed instructional objectives of a lecture.

Clear conception of the goal before learning study materials provides the learners with the opportunity to explain the reference points of joint activity and to make clear the tasks challenging them. This takes off the stress during the process of teaching, promotes motives formation and finally increases teaching effectiveness.
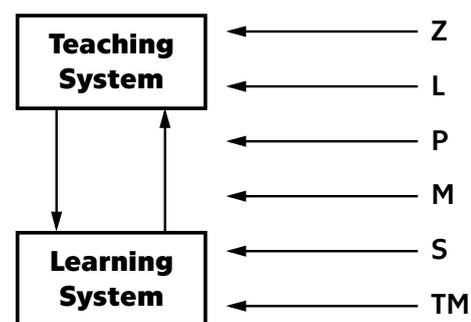
Fig. 2. Engineering Pedagogical Model of the Teaching Process [1]

Pedagogical variable "subject matter" (L) indicates what should be taught to students. H. Frank and B. Meder (cited in [1]) have proposed the change of the amount of scientific information in years. At the end of 18th century the amount of scientific knowledge overcame the possibility of seize of a single person. The structural-theoretical approach of Jerome Seymour Bruner (cited in [1]) proposes that the old image of a science as a quantum of exactly described facts has expired, and contemporary science is more than collected and generalized facts. Today new facts have been searched along with phenomena in order to find the conjunction between them for the purpose to finding the structure and systematic effects. By including separate facts and phenomena into the substantial inner structure of the subject matter, it is easier for students to remember these facts and phenomena with the help of remembered general impression. According to Melezinek [1], a lecturer has to select subject matter according to the aimed instructional objective and point out the main phenomena, laws and conceptions and to structure the chosen subject matter, use main principles of the conception of understandability.

The invariable "psycho-structure" (P) has also a great importance in Engineering Pedagogy. This is formulated by Melezinek [1]. G. Gagne [1] has defined the process of teaching – teaching is a goal-directed process of transmission of knowledge, the result of which residual changes in human reserves or abilities have occurred, and which have not occurred due to the natural development. The main condition for the learning process is receiving information from surrounding. Information is received by optical, acoustical, tactile, thermal, and sensorial channels. The intensity of the appropriate channel refers to the maximum of information that these channels transfer in unit of time to sensorial memory.

According to H. Frank (cited in [1]) maximal intensity of optical channel is 107 bit/s, that of acoustical channel is about 1,5.106 bit/s, and tactile channel (only by hand) – 0,2.106 bit/s. Intensity of other channels is much lower and stay in the interval from 10 to 100 bit/s. The speed of apperception is defined by H. Frank 16 bit/s. H. Riedel proved that the speed of apperception depends on the age of people. H. Frank noted the value 16 bit/s, which is maximal for people in age of 18 – 21. H. Frank stated that information in short-term memory the delay is 10 seconds, at the same time according to the data of H. Riedel it is 6 seconds. The flow speed into permanent memory according to H. Frank and F.V. Cube is 0.7 bit/s [1]. According to Melezinek [1] a lecturer must not be in haste, it is important to use short sentences, repeat subject matter, especially the most important parts, ask students to make written remarks and answer the questions, use active learning, PBL and problem-solving, make pauses,

consider the time of a lecture (from 2 pm to 4 pm) and avoid mono-directional activities.

Important variable is socio-structure (S), characterizing socio-cultural environment of origin of the students, and socio-cultural environment where the process of instruction is carried out. Important are the age, gender, sphere of activities, and peculiarity of place of living, financial conditions of students [1]. It is also advisable to know the foregoing study experience (prerequisites) of the students which are important in setting basic requirements.

Teaching assumes presenting of different information. Under the term "Media" (M) all technical devices, equipment and systems, which facilitate the process of teaching are considered, including learning environments and e-learning. Methodology of using media is dealing with soft media (using methodology) and hard media (devices, apparatus). Media could be divided into adaptive (for bidirectional communication – separate lessons, lessons with groups or parallel groups) and unadaptive (for mono-directional communication – visual, audio and audiovisual information). Basic and important data concerning requirements for a lecture hall and visual and audiovisual media have been calculated and presented by Melezinek [1]. According to Melezinek, a lecturer has to choose appropriate media adequate to instructional objectives, check how devices work already before the beginning of a lecture, check over that all the students can see images on the display, guarantee readability of fonts used in projection, use colors functionally, present information in essential moment, check illumination of a lecture hall, guarantee audibility of a speech [1].

Correctly chosen teaching methods (TM) facilitate the optimal way which helps students to reach aimed instructional objectives. Teaching process is based on a communication processes. Very important in teaching process are oral and visual communication. But of especial importance is easily understood (clear) communication. Conception of understandability has been presented by Langer and Schulz, Thun and Tausch [1] suitable also for technical information. Langer and Schulz, Thun and Tausch define four features of understandability (clarity): simplicity, regularity, orderly-structured (divided into parts), and concision of presentation and additional stimulation. According to K. Geiger (cited in [1]) teaching methods could be divided into inductive methods and deductive methods, and direct and indirect methods.

In the process of teaching methods' choice the teacher should combine the form, contents and methods of carrying out the teaching process on the base of information available. It is recommended to represent them as a table on the initial stage after main teaching methods' choice; the table should combine the activity on every

stage of mastering and the teaching methods. As a result the teacher's final product of methodical activity on the choice of teaching methods represents a table of chosen teaching methods, plan of lessons and themes. Lesson's structure and also different descriptions of teacher's activity and means for carrying out students' activity on should be analyzed on every stage.

According to Melezinek, [1] a lector should choose teaching methods accordingly to the general system of communication: formulate instructional objectives, choose appropriate subject matter, assess psycho-structure and socio-structure of students, choose adequate media and teaching methods. For proving essential laws inductive methods should be used, for proving special laws (if students are unaware of general laws) inductive method is recommended to use. For proving solitary laws if general laws are known for students, both methods – inductive and deductive may be used, but it is recommended to prefer deductive method, as it shows interdependency with other laws [2].

The teaching of Engineering Pedagogy is very closely linked with the development of theories on Engineering Pedagogy. The Institute of Engineering Education at the TU in Dresden has put on various courses over the years. For example, starting in 1958, a course on Engineering Pedagogy for teachers at technical colleges was offered as an additional qualification. The admission requirements for this course included a university degree (Dipl.-Ing) and at least two years full-time teaching experience at a school of engineering. Graduates of this course received a certificate for this "additional pedagogical examination". From 1976 onwards it ran as a "postgraduate course on technical college pedagogy".

IV. IGIP BASIC CURRICULUM FOR ENGINEERING PEDAGOGY AND ITS CONCEPT

Melezinek [2] has defined very precisely contemporary requirements to technical teachers: "A technical teacher must possess a variety of qualities needed for performing his/her professional functions. A technical teacher must have a high scientific potential, deep fundamental and special engineering knowledge, methodological, pedagogical and organising skills. Besides, possessing the skills of rhetoric, communication, psychological influence, educating is extremely desirable. The content of educational engineering programmes is so complicated and advanced educational technologies are so intensive that a technical teacher may have a success only in case of being able to explain dearly and briefly topics difficult for understanding. He/she must also possess un-verbal means of communication: mimetic movements, expressive gestures and fluent speech. In addition to all mentioned above, a technical teacher must possess freely at least one widely spread foreign language, as well as modern technical educational means and practical skills of engineering work." According to this technical teacher training at universities is of essential importance.

In times of increasing European integration and academic mobility it has been necessary to formulate a common minimum standard or well-balanced competence profile for technical teachers. The International Society for Engineering Education has created a register of "International Engineering Educator ING-PAED IGIP".

The qualification profile of ING-PAED IGIP is based on three fundamental premises [3]:

- A solid foundation in engineering disciplines is and essential requirement;

- A good knowledge of the pedagogy of engineering education is just as important. The content of appropriate training course should be based on the model of "Engineering Pedagogy" and curriculum can only be taken at institutions accredited by IGIP;

- A further requirement for inclusion on the register is a minimum of one year's practical work in the field of engineering education (e.g. technology lecturer, in-service trainer, etc.).

International Society of Engineering Education IGIP was founded in 1972 in Klagenfurt, Austria. Over the years the society has developed into an important and well-known international association, being also a member of International Federation of Engineering Education Societies (IFEES). Today, IGIP has members in more than 75 countries, it is recognized as a consultative body by UNESCO and UNIDO and its publications on engineering education appear regularly.

In May 1972 the first international Engineering Pedagogy symposium took place in Klagenfurt. On the occasion of this conference, the International Society for Engineering Pedagogy (IGIP) was founded. Since then, international engineering pedagogy symposiums have been held every year.

One of the most urgent problems which IGIP faced in its work was the issue of technical teacher training. IGIP has created ING-PAED IGIP Register (see IGIP www.igip.org) based on a minimum qualifications profile for teachers and trainers in engineering education. At the major "Second European Conference on the Assessment and Accreditation of Engineering Training and Qualifications" in December 1994 in Paris, the register of ING-PAED IGIP was officially recognized as a basic qualifications profile for lecturers in technical subjects. On the suggestion of UNESCO Paris, the register was presented in May 1995 in Sao Paulo and Rio de Janeiro and met with and enthusiastic response [4].

After many years of experience in industry or research, engineers who are appointed as teachers at a technical school or university are influenced mainly by their professional careers. Their way of thinking is determined by the precision of the technology by their work with quantifiable, measurable events and objects. The influence of their discipline, the "language" of engineers, must be taken into account in their engineering pedagogy training; it must penetrate the engineering pedagogy curriculum [7].

The target group should acquire the necessary professional competences of an engineering teacher. These general, professional competences consist of two main groups: technical expertise and typical engineering pedagogy science competences in the narrower sense of the term [8], [9], [10].

The engineering pedagogy program is generally an independent course of studies after an engineering program. But it can also be an integral part of an engineering degree program [7], [8].

The aim of the curriculum is to strengthen the quality of engineering education for the 21st century targeting on effective and contemporary teaching of engineering, and engineering & STEM leadership (Strategic Planning, Accreditation, Integrating the Research Function, using contemporary methodology, implement principles of STEM didactics, etc.) [7], [8].

General aims of IGIP curriculum are:

- To give contemporary, scientifically based, consistent education of an engineering educator to technical teachers already possessing university degree in engineering (or respondent education), to enable them to teach engineering competently, effectively, innovatively and creatively;

- To design an idiosyncratic system of teaching for engineering educators, taking into consideration the basics of Educational Psychology and Engineering Pedagogy Science in the learner-centered study process.

- General outcomes of IGIP curriculum are that having passed the curriculum a graduate has to be able to:

- Master science-based, systematic and internationally recognized competences in Engineering Pedagogy Science;

- Teach STEM subjects and engineering competently, effectively, innovatively and creatively taking into consideration the basics of Educational Psychology and Engineering Pedagogy Science in the learner-centered study process.

- The purposes of IGIP accreditation are [7], [8]:

- To assure that graduates of the accredited engineering pedagogical programs are well prepared to perform their teaching duties in engineering subjects and meet the criteria for IGIP registration as an International Engineering Educator, ING.PAED IGIP;

- To promote the quality assurance, quality improvement and modernization of the engineering pedagogy programs;

- To create public awareness of the high quality of the programs for engineering pedagogues;

- Qualification of ING.PAED IGIP guarantees relevant competencies for academic mobility.

Depending on the structural requirements of the national education system, the engineering pedagogy program can be organized as an independent course of studies which follows a completed engineering program, or integration of the engineering pedagogy program into an engineering degree program.

IGIP curriculum is built on the knowledge from traditional education in philosophy and the liberal arts but respects the particular character of the technician and the analytical-methodological approach in the fields of engineering science.

The engineering pedagogical competences are to be summarized as follows:

- Pedagogical, social, psychological and normative-ethical competences;

- Didactic skills and subject expertise;

- Evaluative competences;

- Organizational (Management-) competences;

- Communication and social competences;

- Self-reflexive and development competences.

The IGIP curriculum permits engineering educators to acquire professional competences.

The following guiding ideas were formulated for the IGIP Curriculum: The IGIP Curriculum:

- Communicates engineering teaching competences as education in the sense of a triad consisting of knowledge, a repertoire of teaching methods, and value orientations;

- Enables teachers in engineering programs to realize a future-oriented training program for engineering and prepares them to take responsibility for a sustainable, humane and socially and environmentally compatible contribution to shaping society, the world of work and technology;

- Communicates for this educational task - the necessary knowledge and the neces-

sary insights; a repertoire of teaching methods which connects aspects of teaching the subject with general social science aspects; educational and subject-related vital value orientations;

- Makes statements regarding: the disciplines and modules of the curriculum; the individual contents and goals/competences; practical phases, which must relate to the theoretical context, and permit reflection on teaching practice against a theoretical background; testing modalities.

V. CONTENTS OF THE SUBJECTS

The contents of the subjects are briefly outlined. Altogether the curriculum contains minimum 20 ECTS credits. Compulsory subjects are in the total amount of 17 ECTS credits additionally there are elective subjects in the minimal amount of 3 ECTS credits.

In the proven IGIP curriculum there are the following compulsory subjects:

Engineering Pedagogy in Theory (2 ECTS credits): the core module is the backbone of the curriculum – the base and integrating part of the engineering pedagogy science "Technical Teacher Training." The starting point is practically oriented technical teaching. This is understood as a process which, like any other, is subject to specific regularities and is determined by a series of components throughout its course – teaching goals (G), teaching materials (T), teaching media (M), psychological structure (P), social structure (S) and teaching methods (TM) have a complex interdependent relationship [1]. The subject is dealing with the definition of the overall and precise objectives of a lecture, the selection and structuring of information, the different influences of technical subject matters on teaching methods – definition of terms, derivation of laws, inductive and deductive methods, programmed instruction, etc.

Engineering Pedagogy in Practice (3 ECTS credits): The participants are supposed to practice the design and performance of instructional units using concrete technical subject matters. Their actual performance is recorded on videotape and discussed by the group. Due to their shared experience the transfer of the learnt into real situations is achieved.

ICT in Engineering Education (1 ECTS credit): Technical devices, equipment and systems used to support instruction. The operation of these media and e-learning, their sensible use and integration into the instructional process are the main problems dealt with in this unit.

Laboratory didactics (2 ECTS credits): Concentrates on psycho-motor aspects of technical classes, namely experimental technical work in labs and research. Amongst others, the structure of controlled experiments should be brought across, i.e. "stating the problem, setting up hypotheses, carrying out the actual experiment, results and conclusions", as well as the various possibilities for teaching work in the laboratory, i.e. "strictly predefined experiments – selecting one experiment from many – individual topics selected by students – semester work in the laboratory", etc.

Scientific writing (1 ECTS credit): students should fulfill the requirements of research work. Scientific work at the Bachelor level is usually the first research work of the author, the topic is therefore generally rather narrow which facilitates achieving the desired insight.

Presentation and communication skills (2 ECTS credits): students will acquire basic historical and theoretical-pragmatic knowledge and skills from the field of history of rhetoric, speech technique, and vocal hygiene; by practicing they will develop aesthetic criteria for assessing verbal communication.

Engineering Ethics (1 ECTS credit) as a study course, Engineering Ethics is closely related to Philosophy. The goal is to offer general information on European thinking advancement in the cultural-historical framework from the beginning of continental philosophy to the present. Theories of the human and problems of morality are considered.

Working with projects (1 ECTS credit) - one of the objectives of the teacher project is to have a clear relationship to a teaching experience. If a student chooses to process a textbook, it must include a didactic analysis of existing textbooks (rationale for creating a new text) and pedagogical-psychological parameters required from the textbook. If the author decided on research survey on selected issue, it is usually on a small scale investigation. Its implementation and interpretation, however, must meet all the requirements for such surveys.

Intercultural competencies (1 ECTS credit): the goal of the course is provides students with knowledge of socio-pedagogical issues, focusing on the so-called multicultural education, whose mission is to eliminate barriers, prejudice and xenophobia resulting from ignorance of foreign cultures, nations and ethnic groups.

Psychology (2 ECTS credits): Conditions of human learning, the process of learning, results of memory research, motivation, talent and educability (technical knowledge, comprehension and intelligence), etc.

Sociology (1 ECTS credit): Functioning and dependence of social groups (classroom community as a social group, groups within school classes), the role concept of the teacher in his professional situation, teacher behavior, student behavior, etc.

Additionally the following elective subjects are taught: Portfolio Assessment; Coaching and Mentoring in Engineering Education; Creative Thinking; Collaborative Work; Evaluation of Student Performance, Quality Management (1 ECTS each).

VI. EDUCATIONAL PROCESS AND METHODOLOGY

In the traditional approach to teaching, the professor lectures to the room full of students. The students listen, take notes, and solve problems individually. You might see a few bored-looking students jotting down notes, some dozing, and most just being busy with their iPods.

In engineering education, improving lecturing is the critical problem; and the first focus on improving engineering education at all schools should be on improving lecturing.

Every educational program − including programs in engineering pedagogy − is a multilayered process. The quality of the final results is measured by the success enjoyed by graduates in their professional careers. It depends largely on the commitment of all those involved, both inside and outside the educational institution. Therefore the graduates should be included into the planning; controlling and implementation of this process.

At the beginning of the engineering educational process, the first-year student has already a certain profile and level of entrance qualifications. These entrance qualifications have been acquired in previous phases of education and career experience. The institution of engineering pedagogy must clearly define the entrance qualifications for students studying engineering pedagogy, i.e. specify in detail what knowledge and skills are expected of first-year students.

The result of the process of training teachers in Engineering Pedagogy is to graduate educators with certified degrees and specific competencies which certify them as qualified teachers in technical subjects based on their training as teachers of engineering. The level of qualifications and profile should correspond to market requirements. Hence, the desired final qualification should be defined as a series of competencies/skills necessary to pursue a career in the profession. A mere list of the knowledge acquired in the framework of the educational process is insufficient to describe the degree qualification.

The heart of the qualification process is an educational program with a clearly defined curriculum designed to overcome the difference between entrance level and graduation qualification. Ideally, a curriculum should be strictly results-oriented, i.e. the entrance level of students is raised to a clearly defined graduate level.

The curriculum defines the teaching process (the coordinated sequence of lectures and seminars), the testing process (the evaluation of the students' achievements) and the process of practice transfer (the practical implementation of those competencies and the development of skills).

The actors on the inside of these processes are students, lecturers, professors and other academic and administrative personnel. They use the institutional resources (facilities, equipment and financial resources of the educational program, etc.). On the other side there are the employers, who play a major role when the students write their thesis with the help of those outside the university. The quality of this process depends heavily on coordination between individual process components and between the participants and the existing feedback loops on all levels.

Moreover, the universities should initiate a process of quality control and document the results. The information collected in this way should be used for the continuous improvement of the program. In the framework of such a process, the students should be asked whether their program of studies satisfied the desired objectives and whether, in their opinion, it brought to them the knowledge and skills needed. As part of quality control, feedback from the employers' side should also be sought after in which both expertise and behavioral competence of the newly hired graduates are judged on the job. This could be done, for example, by sending a questionnaire to students immediately after graduation, and to their employers several years later, requesting their feedback.

IGIP defines minimum criteria which must be met for the accreditation of an engineering pedagogy program for the following areas [7], [8]:

- Entrance qualifications for first-year students;
- Competencies/skills of the graduates;
- Engineering pedagogy curriculum;
- Lecturers and professors;
- Institutional resources;
- Quality control and feedback.

According to the Klagenfurt School of Engineering Pedagogy [4] teaching of engineering is a process which like any others, is a subject to specific regularities and determined by a series of components throughout its course. These 6 components − teaching goals, teaching materials, psychological structure, social structure, teaching media and teaching methods have a complex interdependent relationship [4]. Taking account of the named components a technical teacher can build up an effective model of engineering pedagogy for teaching engineering. Some hints introduced below in order to teach engineering more effectively.

Write comprehensive instructional objectives that list what the students should be able to do (identify, explain, calculate, model, design, critique etc.) to demonstrate that they have satisfactorily mastered the knowledge and skills the instructor wants them to master, including high-level thinking and problem-solving skills [4], [5], [6].

Make the objectives available to the students. Design in-class activities and homework to provide practice in the desired skills, and make the tests specific instances of a subset of the instructional objectives [4], [5], [6], [7].

Find out at the beginning of a course what most of the students know and don't know and what misconceptions they have about the subject – start teaching from that point [4].

Recognize that good students vary considerably in motivation, cultural background, interests, and learning style, and teach accordingly. Motivate learning – relate the material being presented to what has come before and what will to come in the same course, to material in other courses, and particularly to the students' personal experience [4], [5].

Provide a balance of concrete information (facts, data, real or hypothetical experiments and their results) and abstract concepts (principles, theories, mathematical models). Balance material that emphasizes practical problem-solving methods with material that emphasizes fundamental understanding [3], [4], [5].

Follow the scientific method in completing, structuring and presenting theoretical material. Provide concrete examples of the phenomena the theory describes or predicts then develop the theory or formulate the mod and show how the theory or mod can be validated, deduce its consequences and present applications [3], [4], [5].

Use pictures, schematics, graphs, and simple sketches liberally before, during, and after the presentation of verbal material. Show video films. Provide demonstrations, simulations, hands-on, if possible. Use suitable modern teaching media [2], [3], [15].

Do not fill every minute of class time lecturing and writing on the board. Provide intervals – however brief – for students to think about what they have been told [15].

Provide opportunities for students to do something active besides transcribing notes, hold interactive lectures. Small-group activities that take no more than five minutes are extremely effective for this purpose. Active learning is one first step towards problem-based learning [15].

Problem-based learning (PBL) is suited to real-world open-ended problems with multiple respectable solutions, some being better than others and shares qualities with experiential learning activities. PBL is based on learning by doing and even the simplest projects teach to lead, facilitate, record, compromise, cooperate, schedule, discuss, prioritize, organize, plan, research, apply, integrate, evaluate, make decisions. Beyond these basics, we can decide and determine what our students will learn to do and what additional knowledge they will acquire by their research in our choice or design of PBL problems. The research indicates [15] that PBL develops the following skills of students:

- Teamwork;
- Project management and leadership;
- Oral and written communication;
- Emotional intelligence;
- Tolerance for uncertainty;
- Critical thinking and analysis;
- Application of content knowledge;
- Research;
- Decision making;
- Problem solving across disciplines.

In addition to interactive lecturing, have students work individually and in small groups on brief course-related activities, such as answering questions, setting up problem solutions, completing steps in derivations, interpreting observations or experimental data, estimating, predicting, brainstorming, troubleshooting. Call on several students for responses at the conclusion of each activity then invite volunteers to provide more responses to open-ended questions, and proceed with the lesson when the desired points have been made. This is active learning [14], [15], [16].

Recognize that students learn best when they perceive a need to know the material being taught. Start with realistic complex problems, let students establish what they know and what they need to find out, and then guide them in finding it out by providing a combination of resources (which may include interactive mini-lectures and integrated hands-on or simulated experiments) and guidance on performing library and Internet research. This is inductive teaching and has a number of variations, including problem-based learning, project-based learning, guided inquiry, discovery learning, and just-in-time teaching [15], [17].

Supplement the traditional content with training in critical and creative thinking, methods of solving open-ended multidisciplinary problems (which tend to be what practicing engineers spend most of their time dealing with) [18].

Talk to students about different learning styles, both in advising and in classes. Students are reassured to find their academic difficulties may not all be due to personal inadequacies [17].

Assign a combination of individual work and teamwork, structuring the latter to provide assurances of individual accountability for all the work done and following other procedures known to promote good teamwork skills (including communication, leadership, project management, time management, and conflict resolution skills). This is cooperative learning [15], [16], [17].

Contemporary and different teaching methods should be used: interactive lectures with active breaks (with interaction, answering to questions and discussions) seminars, exercises, active learning including problem-based and project-based learning, team-based learning, integrative learning, multidisciplinary learning, interdisciplinary learning etc.

Contemporary and different learning environments should be used, including e-learning, blended learning, virtual group work, remote and virtual labs, learning games, flipped and hybrid classroom, online conferences and workshops etc.

Different assessment methods should be used: peer-assessment, self-assessment, teaching portfolio, written and oral examinations, presentations, group examinations. For outcome-based teaching higher order learning skills and critical thinking should be supported. Workshops with integrated hands on experiences are recommended.

All required modules should have allotted time for reflection on learnings as well as planning for implementation of strategies. Interaction between instructors and students, as well as collaboration among students is emphasized.'

Teaching methods fostering active and long-term engagement with learning tasks emphasizing conceptual understanding are recommended to use in teaching engineering. Cooperative and collaborative learning are instructional approaches in which students work in teams on a learning task structured to have the following features [12]:

- Positive independence – there must be a clearly defined group goal (complete the problem set, write the lab report, design the process) that requires involvement of every team member to achieve. If anyone fails to do his/her part, everyone is penalized in some manner.

- Individual accountability – each student in the team is held responsible for doing his/her share of the work and for understanding everyone else's contribution.

- Face-to-face promotive interaction. Although some of the group work may be parceled out and done individually, some must be done interactively, with team mem-

bers providing one another with questions, feedback, and instruction.

- Appropriate use of interpersonal and teamwork skills. Students should be helped to develop leadership, communication, conflict resolution, and time management skills.

- Regular self-assessment and peer-assessment of team functioning. Teams should periodically be required to examine what they are doing well together and what areas need improvement.

VII. TEACHING PORTFOLIO AND FINAL EXAMINATION

Participants of the engineering pedagogy training should document on a continuous basis the learning processes and work results module by module in a portfolio that contains the confirmation of the teachers of the individual modules [7], [8].

Furthermore, corresponding to the "IGIP Criteria" the complete planning, performance and analysis of a course including video recording as well as the solution of a didactic case study and innovation team project are presented for the final exam to the "Engineering Pedagogy Colloquium" - both documented in the portfolio [7], [8] .

Pedagogical qualifications and competence are recommended to be confirmed in a teaching portfolio. The portfolio should be both qualitative and quantitative so that engineering pedagogical competencies could be assessed.

The following principles are recommended to consider in compilation of a teaching portfolio:

- Background and brief presentation. Short introductory presentation of work and research background should be presented, including pedagogical duties and experience, to help to get an overview of qualifications.

- Education. Education in the specific engineering subject area should be described. Completed courses in pedagogy should be described.

- Experience of teaching and supervision. A summary of teaching and supervision experience should be presented, the extent and variation of experience stated.

- Pedagogical activities: approach, reflection and development. This section is one of the most important parts of the pedagogical portfolio. Basic pedagogical outlook should be described: approach to teaching, supervision and student learning that. By describing and reflecting on pedagogical activities and conditions for learning, ap-

Philosophy and Basic Principles of International Society for Engineering Pedagogy

proach to current and future pedagogical assignments should be clarified.

- 1-2 courses should be selected from pedagogical activities and shown how the applicants work as a teacher. Course examples might include how the applicants have planned, implemented, evaluated and developed a course, course element, laboratory experiment or exam.

- 1-2 supervision assignments should be selected to demonstrate how the applicants work as a supervisor. Materials such as course descriptions, lecture plans, exam tasks, laboratory experiments, reports on pedagogical development work or other materials that you have developed should be attached as appendices.

- Compilation of study materials. Efforts to produce study materials, compendiums, lab tutorials, etc. are described. The target group is indicated. Pedagogical considerations are clearly described, for example on the basis of the didactic questions of what, how and why. Described is to what extent others use the study materials produced.

- Management in the field of education, the leadership duties, work as a supervisor, study advisor, pedagogical development, etc.

- Scholarship of Teaching and Learning (SoTL) – entails developing a research approach to one's teaching. The concept includes continuously working to improve the conditions for student learning, as well as sharing experiences of teaching and learning with colleagues. Sharing can take place within a specific subject area or on a more general basis, as well as locally or internationally.

- Pedagogical activities and knowledge sharing outside the university world, community work, science festivals, popular science publications, staff training etc.

- Other pedagogical qualifications - pedagogy awards, study trips with a pedagogical purpose, pedagogical mentoring, and cooperation on issues related to education and participation in pedagogy networks.

The education is completed by the final exam held by a commission of at least 3 members (who should have ING.PAED IGIP qualification). During the exam the candidates must show that they have acquired the skills of an engineering pedagogue. Final examination consists of 2 parts: individual and group examination. The exam is marked as "passed" or "failed".

- The final individual exam consists of the presentation and discussion of the candidate's portfolio and teaching philosophy statement, and an examination interview,

in particular about the portfolio's components.

- The final Group Examination. A final innovation project or problem according to students' choice to be solved, designed and implemented during a course they are teaching with the opportunity to learn from each other by forming a community of reflection and analysis of best practices. The results of implementation, evaluation and analysis are presented in the group examination.

- The final project is carried out during the studies on IGIP curriculum. Developing, the innovation plan and time schedule, selecting assessment tools for evaluation of the process, recourses needed, etc. are carried out during the core modules. Teams are expected to implement the innovation project in their classrooms/departments/universities, attend mentoring sessions with instructors etc. After implementing the innovation project, the results are analyzed and a scientific paper is complied. The results are presented on the Final group examination. Feedback is given by fellow students and professors.

VIII. CONCLUSIONS

With his characteristic cleverness, George Bernhard Shaw armed several generations of cynics with his statement: "Those who can, do; those who can't, teach." But in today's world, technical teachers have to be able to **do** engineering and to **teach** engineering. We expect engineers to undergo rigorous training to become proficient. It is logical to require similar rigorous training in the art teaching of technical teachers. As Professor Adolf Melezinek said, "Professional-level engineering teaching is both an art and a science".

REFERENCES

[1] Melezinek Adolf (1999). Ingenieurpädagogik – Praxis der Vermittlung technischen Wissens, Springer-Verlag, Wien New York, 4th edition.

[2] Melezinek Adolf (2001). Engineering pedagogy – ingenieurpädagogik: theory and practice of technical teacher training. International Conference on Engineering Education, August 6.-10, 2001, Oslo, Norway.

[3] Melezinek Adolf (1996). On the Didactic Quality of Instruction. The IGIP Qualifications Profile – the European Engineering Educator – ING-PAED IGIP, AECEF Newsletter 3/1996. Available from website http://webold.fsv.cvut.cz/aecef/news/96-3/melezinek.html (14.12.2006).

[4] Heinze C.D. (1995). „Ingenieurpädagogische Schulen in Europa" In: Melezinek, A. (ed.) „Interdisziplinarität und Internationalität der Universität Klagenfurt – Die Klagenfurter Ingenieurpädagogische Schule", Leuchtturm Verlag (LTV), Alsbach/Bergstraße.

[5] Haug Albert, 30 Years of IGIP – In the Service of Technology Teaching, in Melezinek, A. (Hrsg.) International

Society for Engineering Education, Who is Who, Leuchtturm-Verlag, 2001

[6]   Schutz Victor K., IGIP 30 Years of Dedicated Work in Teaching Technology, in Litvinenko, V, Melezinek A., Prikhodko V. (Hrsg.), Ingenieur des 21. Jahrhunderts, Referate des 31. Internationalen Symposiums IGIP, Sankt-Petersburg, 2002

[7]   IGIP Recommendations for Studies in Engineering Education Sciences, Decided by IGIP International Monitoring Committee on September 11th 2006, Approved by IGIP Executive Committee on September 11th 2006, 37 p., Available on www.igip.org

[8]   IGIP Criteria for Accreditation of Engineering Education Studies, Decided by the IGIP International Monitoring Committee on September 11th 2006, Approved by IGIP Executive Committee on September 11th 2006, 16 p.

[9]   Melezinek Adolf, Ingenieurpädagogische Theorieentwicklung − Bestandaufnahme Ingenieurpädagogischer Entwicklungslinien, in Dana Dobrovská (Ed.) New Trends in Engineering Pedagogy, pp. 109 − 126, Prague, 2006

[10]   Melezinek Adolf, A Contribution to the Quality of Technology Teaching: IGIP's Qualifications Profile and Professional Register "Der Europäische Ingenieurpädagoge"- "The European Engineering Educator" 'ING-PAED IGIP', in Melezinek, A. (Hrsg.) International Society for Engineering Education, Who is Who, Leuchtturm-Verlag, 2001

[11]   Läänemets, U. (2012). Hilda Taba's Heritage: Curriculum Development in Estonia. Proceedings of International Conference on Curriculum Theory and Practice, Ed Kalamees-Ruubel, December 7-8, 2012, Tallinn, Estonia.

[12]   Ruutmann, Tiia (2009) . Contemporary teaching methods as the basis of the curriculum for technical teacher training at tallinn university of technology, proceedings of IGIP conference 2009.

[13]   Nilson, L. B, "Teaching at its Best − a Research-Based Resource for College Instructors", 2003.

[14]   Grayson, L, P, "The Design of Engineering Curricula", UNESCO Studies in Engineering, United Nations, Paris, 1977.

[15]   Felder, R. M., "Teaching Engineering in the 21st Century with a 12th-Century Model: How Bright is that?". Chemical Engineering Education, 40(2), 110-113, 2006.

[16]   Lang H., Evans D. N., "Models, Strategies and Methods for Effective Teaching", 2006.

[17]   Felder, R. M., "Inductive Teaching and Learning Methods: Definitions, Comparisons and Research Bases", Journal of Engineering Education. 95 (2), pp 123-138, 2006.

[18]   Orlich D.C., Harder R.J., Callahan R.C. et al., "Teaching Strategies. A Guide to Effective Instruction", 2007.

Integration of Theory and Practice in Teacher Training

Gabriela Petrová

Constantine the Philosopher University in Nitra
Faculty of Education
Department of Pedagogy
Nitra, Slovakia
gpetrova@ukf.sk

Jana Duchovičová

Constantine the Philosopher University in Nitra
Faculty of Education
Department of Pedagogy
Nitra, Slovakia
jduchovicova@ukf.sk

Abstract— **The paper analyses practical problems of teacher training in Slovakia at the background of current school legislation. It points to the function of practical education of teachers as a means of developing the required skills. It is focused on the possibility of improving and updating teachers' readiness for their professional activity in the changed conditions not only in Slovakia but also in the EU. The paper is a partial output of the APVV (Slovak Research and Development Agency) project called "Practice in the area of special didactics, special didactics in the Centre of practical training" APVV C-15-0368.**

Keywords—Teachers' undergraduate education, special didactics, practice

I. INTRODUCTION

Transformation changes in our country have also been directly projected to the school system. However, the existing reforms are not related only to the organization and management of schools, but, with regard to them, there emerges a need of complex approach to the questions of aims, content and process of education as well as the teacher's personality and his/her training. The modification of future teacher training is not possible without the awareness of the complexity of current problems. Therefore the proposal of new conceptions of teacher training attempts, drawing either on our traditions as well as on the experience from abroad, to use more coordination in teacher training as well as a more proportionate representation of pedagogical-psychological and subject training, the coordination of theory with practice. Our experience from recent years shows that efforts have been taken to innovate the organization and content of the training of future teachers, but, unfortunately, what is missing is more coordination. The problems facing teacher training are not only frequently discussed, but are global in their nature. The strategic changes in education at primary and secondary schools in Slovakia, codified in the Law on Education and the Law on Pedagogical Staff, create certain framework conditions for their implementation. However, the carriers of the changes are, first of all, the teachers who should be able to create and follow new educational programs and permanently innovate the educational process. The increasing demands and changing social requirements with regard to education have provoked consequent requirements for the change of the structure of teacher training. From a practically and methodologically based training to an academic one – also under the influence of the changing of colleges into universities. However, this academic training proves to be insufficient, since it does not reflect the needs of regional education. If schools do not want to lose one of their basic functions – the educational one – they have to significantly innovate and change their didactic procedures as well as conditions of instruction in the widest possible contexts. New demands on teachers, necessitated by a changing educational paradigm, call for innovated approaches towards teacher training emphasizing the development of psycho-didactic competences, ability to perform the cognitively based teaching and to implement adaptive teaching strategies for the development of the learners' critical and creative thinking. Regarding the above-mentioned facts, there emerges a need for a systematic approach towards the education at Slovak HEIs. The aim of this paper is not to analyse all subjects from the teacher training curriculum, since its extent does not make it possible anyway. What we would like to achieve instead, however, is to draw attention to the relation of subject didactics to pedagogical practice as a basis for the application of cognitively based approach to teaching, focused on the development of learners' critical thinking, and the reflection of their individual mental structure via the new teaching conception's subject and didactic anchoring and its reflection in practical training.

II. ANALYSIS OF CURRENT STATE

A quality teacher training is not a problem only in Slovakia. In many OECD countries there are also serious worries concerning adequate number of new, sufficiently qualified teachers. The content of pre-graduate teacher training has been constantly extending because of the requirements laid on teachers by society as well as the changes

in regional education defined in the teacher profession standards.

As a consequence of transformation changes in regional education there are significant changes in teachers' competences as well. Teachers can no longer be just experts in their subjects, but also the educators able to respect in their teaching the needs, individuality, and cognitive specificities of their learners, including special educational needs. Therefore, it is necessary to strengthen the teachers' specific competences. This trend is evident throughout Europe.

The study field of teaching is directly connected with the training of future, academically educated experts for education in various educational institutions. This fact stimulates attempts to learn about relationships in the process of study at a HEI in order not just to obtain a necessary qualification, but a positive attitude to the profession as well as a social status of the teachers' work. The quality of an educational expert lies in the quality of his/her developed knowledge and skills not only to mediate that knowledge from individual fields of science, didactically transformed into individual teaching subjects in concrete grades at primary and secondary schools, but to work with children, youth, and their parents towards the creation of values, social orientation and behaviour. Since the transformation of academic teacher training is determined by the transformation of regional schools, we have carried out a content analysis of the following educational documents:

- National Educational Programme
- Descriptions of teacher study fields
- Teacher study fields of individual faculties
- Teachers' professional standards

Based on the analysis and a consequent comparison, we were trying to find out which professional competences are included in the core of the descriptions and consequently saturated by the contents of study plans, and which ones are missing. As regards the comparison of the national educational programme ISCED 2 and ISCED 3 with the descriptions of teacher study fields, it is possible to say that most educational areas are covered in the descriptions' core. There are reserves in some transversal themes though. As inevitable seems to be the requirement to strengthen the future teacher training by the courses devoted to the problems of SEN learners.

Drawing on the comparative analysis of study programmes aimed at individual teacher study fields, one may say that all of them refer to and focus on the need of preserving the educational continuity of teacher education. The following may be observed in teacher study programmes:

- terminological and professional differences,

- conceptional differences – various models,
- diversification in the supervision of study programmes as well as diversification of research portfolio of the supervising institution at Slovakia's HEIs,
- lack of proportionality between individual elements of teacher education at individual HEIs,
- diffusion, mainly in the subjects of social-scientific and pedagogical-psychological base,
- various criteria for prospective applicants for study, as well as various criteria for study completion,
- various extent and content of pedagogical practice.

The descriptions of the teacher training study field were then compared with the teachers' professional standards defining inevitable professional competences which are currently being prepared. Professional standard is a norm for those entering a profession, therefore the description of a study field and the definition of its core must ensure that the teacher study programs, respecting certain specificities and the autonomy of individual faculties, can guarantee standard performance of the teacher upon his/her entering the profession. Our comparison brought the following findings:

- In a study field's core there are defined basic areas of the field of science, theory, methodology and epistemology of subjects specialisation, in harmony with the educational needs, in terms of national educational programs, of subject didactics, pedagogical practice, biological, psychological and sociological aspects of the development of children and youth, general theories of education, theory and practice of education, models of cognitive, personal and social development of children and youth.
- There is a lack of disciplines aimed at the teacher's self-development (ability of professional growth and self-development, identification with the professional role of school, and so on).
- Pedagogical practice is a problem in itself. Practical training for the conditions of regional schools is insufficient especially because of a decreased amount of time allotted to practice (3-4 semesters). In current model of pedagogical practice in teacher education students are just informed, "told" about the possibilities of doing teaching activities at a concrete type of school, often without any contact with concrete learners, without searching of, reflecting on, or discussing their job possibilities. It follows then that it is inevitable to pay more atten-

tion to the development of pedagogical skills of future teachers through the creation of a system of pedagogical practice drawing on a level-based creation of teachers' professionality.

Based on the above facts, it is necessary to firmly ground teacher education on the concept of teaching profession. From the very beginning of the study there should be a systematic interacting of courses making up a base of subject specialisation, pedagogy, psychology, and subject didactics. Teachers cannot be trained as "hybrids", but within the framework of a unified coherent profession.

- There are different ways of training the future teachers, many of them not respecting the descriptions of study fields (teacher training is done only in the second cycle, in a restricted version, which shortens the time of the professional preparation aimed at the development of teachers' competencies).

- The supervision (guaranteeing) of teacher training is often very formal, without a deeper understanding of the study field and its specialisations (the guarantor does not know the specificities of the workplace training the future teachers, or he/she is from abroad and is not familiar with the specific features of our regional school system).

- Pedagogical practice is insufficient – non-reflected upon, there is a lack of interconnection to the theoretical and methodological base. What is needed here is the dynamization of mentor schools and creation of conditions for helpful cooperation of HEIs with primary and secondary schools.

- The existing descriptions of study fields do not sufficiently reflect the educational areas contained in the national educational programme and school educational programmes (multicultural education, ICT in education, education towards citizenships and human rights, financial literacy, business, ability to face aggressiveness, cross curricular topics, etc.).

- The existing study fields do not sufficiently reflect the importance of the development of critical thinking and creativeness of future teachers.

Gradual development from the teacher towards the student goes through, as it is claimed [1] in agreement with the conclusions of pedeutological research studies, the phases which should be a conjunction of the three component parts of his/her professional preparation: selected scientific theories, general and field didactics, and pedagogical practice. The concept of the realistic education of teachers [2] points towards the

inevitability of a functional interconnection of all the three aspects of pre-gradual training and motivation of students for reflective learning. One of other ways – drawing on the Korthagen learning – is drawing the attention of the trainers of future teachers to the processes developing metacognitive skills of teacher trainees.

III. SUBJECT DIDACTICS

Individual subject didactics, often referred to as special didactics, and recently also as methodology, are understood, from the aspect of the differentiation of pedagogical theory, as pedagogical scientific disciplines. They are focused on the exploration into the process of the creation of educational content related to individual teaching subjects as well as into the processual aspect of teaching these subjects.

Currently one can witness the development and new tasks assumed by subject didactics. These disciplines clearly have an integrating function and interdisciplinary character, since they connect the pedagogical-psychological preparation of teachers with the subject-specific training, as well as the theoretical knowledge with a gradual acquisition of professional competences.

The tendencies in the development of subject didactics emphasise, on the one side, the need for a specialisation into individual partial areas (didactics of botany, didactics of geology, didactics of zoology, etc.), while, on the other side, in harmony with integration tendencies, conditions are created for their synthesis (for example the didactics of natural science subjects).

As far as the profiling of teacher training study is concerned, it must be clearly stated that individual subject didactics are significant disciplines addressing the process of the transformation of science into a didactic system as well as to the projects and programmes of teaching, the application of these programmes in educational process through interactive relations, and analyse student performance as outputs into social reality. All this leads to the functional integration of study and to the development of pedagogical competences of future teachers.

IV. PRACTICAL TRAINING OF TEACHERS

Pedagogical practice is a significant part of professional-pedagogical and methodological training of future teachers. Therefore the importance of its position in curriculum is undeniable. Its aim is to gradually change the attitude of the student to the one of the teacher. Pedagogical practice draws on pedagogical theory, being developed by it, but, on the other side, it also confronts the information taken from theoretical knowledge, allowing its concretisation and synthesising, and provides students with basic pedagogical skills inevitable for doing his/her

future teaching job. Its practical implementation can be inspired by several models: "the teacher as a reflecting intuitive practitioner (Great Britain Atkinson – Claxton, 2001), model of the changes of teacher roles (Holland Vermunt – Verloop, 1999), turbine model of professional development (Australia Ling – Mackenzie, 2001), model of teacher knowledge (Holandsko Verloop – Driel – Meier, 2001), model of professional reflexive supervision (USA Weiss – Weiss, 2001), KIVAS – interaction and reflection model (Holandsko Meulenkamp, 2002), social-personal model (ČR – Spilková, 1999), ability-reflection model (ČR – Švec, 1999) or pedagogical-reflection model (ČR – Lukášová – Kantorková, 2003)." [3]

The main tasks of all kinds of pedagogical practice is to allow students to gradually acquire experience, through various pedagogical activities, through addressing various pedagogical problems and creative activity at school, which would help them develop their knowledge and skills. In the system of individual kinds of pedagogical practice there is a gradual increase in the requirements for student activities, in a close relation to the theoretical preparation. Therefore, in order to achieve the objectives included in the profile of a teacher training graduate, it is inevitable that all factors participate in this process, mainly the teachers of pedagogy, psychology, subject didactics, and mentor school teachers (practice), integrating their efforts and intentions.

V. PSYCHODIDACTICS

Psychodidactics is an interdisciplinary search for the answers about the mutual relationship between the processes of learning occurring in the learning subjects and the processes of teaching, mediating, which influence, orientate them, make them easier or more complicated, emphasising the formation of cognitive functions and building of an individual's knowledge. The key psychodidactic themes have become a paradigm of cognitive education, being a basic source of the innovations of didactic strategies in the whole spectrum of subject didactics throughout the world. The most frequent issues include the areas of meaningful teaching mediating, motivation, abilities, cognition and metacognition, critical thinking and rationality, creative thinking, teaching styles and strategies, learners' self-respect, or the meaning of pre-conceptions, early learning and the extent of its content. Psychodidactics explains educational processes under the conditions of teaching, considering not only didactic activities, but also psychical determinants operating in these activities. We claim that the psychodidactic context of teaching covers correlations between the elements of curriculum understood in the widest possible sense. Cognitive education moving in the direction of the development of critical thinking is understood as the application of such strategies that eliminate the deficits of cognitive functions.

The argument for the inclusion of metacognition support to the teacher education is the fact that the teacher should be able to prepare for his/her students the activities supporting the development of their metacognition, or a plan of metacognitive training (depending on the type of school and individual needs of the learner). Metacognitive skills are declared as part of the competence for teaching primary school learners.

VI. APVV PROJECT: "PRACTICE IN THE CENTRE OF SUBJECT DIDACTICS, SUBJECT DIDACTICS IN THE CENTRE OF PRACTICAL TRAINING"

Drawing on the above mentioned facts, but above all on international efforts to support the development of critical and creative thinking of learners in educational process, we applied for and consequently were awarded the APVV project in which we formulated our research intentions, focusing on pedagogical practice (reflected by the mentor teacher, psychologist, teacher, and subject didactician) as the main instrument of the development of psychodidactic competence of the teacher.

The theoretical starting point for the project's applied research is represented, for example, by the works [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], and so on. The sources, as well as partial results of the research in subject didactics from abroad, point to the inevitability of further research in this area and call for the research application of psychodidactic themes in individual subject didactics as well as of innovations in the system of practical teacher training.

The extent of the project's originality is indicated by the fact that it is aimed at the application of cognitive approach to teaching, focusing on the development of learners' critical thinking and the reflection of their individual mental structure through subject-didactic anchoring of the new teaching conception and its reflection in practical training. A significant measure of originality lies in the ambition of the project team to create an interactive Centre of Practical Training, in order to coordinate the activities at a mutual research and applicatory platform, with an intention of training future teachers in real model situations allowing for immediate feedback and reflection.

VII. APVV PROJECT AIMS

The project's aim is to identify key adaptive teaching strategies applying cognitive approach to the development of critical and creative thinking of learners in individual subject didactics, i.e. in the didactics of teaching mathematics, chemistry, physics, biology, informatics, geography, Slovak language and literature, English language and literature, French language and literature, ethical education, civics, pedagogy, physical education,

visual, musical, musical-dramatic arts, technology, and to apply them in pre-gradual practical training of teachers of secondary education through a reflected, structured, gradated teacher practice.

The aim is to create a methodological material in a form of didactic situations and strategies of teaching a particular subject, applying psychodidactic knowledge in particular subject didactics, complemented by expert subject-didactical and psychological-pedagogical analysis, and push them through a pilot verification in a model of reflected pedagogical practice. Based on the results, to define standards of practical training with the emphasis on professional psychodidactic abilities of students and graduates in all the subjects which have been absent in subject didactics so far, and to create the instruments of the evaluation of the quality of acquired professional skills at the level of individual elements of practical training, which would make the results the universally usable instruments to detect the quality of teacher training in our provenance, as well as an instrument of international comparison.

The aim of the project is also to directly implement the principles of the interconnection of theoretical preparation with practical training, to increase the quality and increase the time allotted to practical teacher training by establishing the excellent Centre of Practical Training, which would:

- form space for the presentation of conceptual strategies of teaching the individual subjects and their coordination by subject didactics, which is characterised as a new concept of quality teaching requiring the simulation of corresponding skills of a teacher training student,

- form space for the observance, analysis of pedagogical situations and didactic strategies (implementing the knowledge in modern subject didactics, also using digital educational means),

- form space for the proposal and testing of solutions and their expert, subject-didactical and psychological-pedagogical analysis with consequent student reflection confronted with psychodidactic theory,

- create space for close cooperation with mentor teachers (trained through continual education programmes), and through them directly with labour market, which is a significant criterion of the quality of education as defined in ESG (Standards and Guidelines for Quality Assurance in the European Higher Education Area),

- create space for the analysis of assistant pedagogical activities in educational area,

- create space for the identification of research problems in subject didactics and their basic methodological anchoring to carry out the action as well as applied research via the diploma works of the students of teacher training based on the presented teaching process environment,

- create space for international comparison and confrontation of subject-didactic as well as psychodidactic strategies and their methodological analysis by students, guided by subject didactics teacher and the teacher-experts (teachers with attestation),

- create space for improving the quality of pedagogical practice of teacher training students through the analysis of best practices in national as well as international context,

- create space to support practical training abroad and its evaluation by foreign and domestic experts and self-evaluative reflection,

- create digital base for the presentation of demonstrative studies of subject-didactic applications for the detected key psychodidactic constructs and the analysis of the observed practical didactic schemes,

- interconnect practical training of students within the pre-gradual teacher training with the environment of further education and post-gradual training of teachers and mentor teachers.

VIII. APVV PROJECT METHODOLOGY

The research into the strategies of subject didactics in the teaching of individual subjects, emphasising the detection of psychodidactic problems and strategies and the implementation of the elements of cognitive education, will be carried out primarily at the mentor schools of Faculty of Education, Constantine the Philosopher University in Nitra as well as at other schools representing potential environment in which graduates could work. Behavioural methods will be used, especially direct and indirect observation, exploration methods (questionnaires, structured interview), analysis of written record, literary method in the analysis of textual and electronic foreign information sources, and further methods allowing to identify the research object. We also expect to use comparative research methods, comparing the strategies used in education in our country and abroad.

The creation of the content of didactic situations (in all subject didactics) and defining the didactic strategy complying with the specificities of the proposed didactic situation will be carried out through the methods of "educational design re-

search" (Research in education based on the creation, proposal of education/research connected with the proposal of the conception of education – according to [21]) .

The created didactic situations implementing effective psychodidactic strategies (research results) and their visual formation in practice, with the methodological outline of the situation and the identified best practices of individual subject didactics, with a consequent professional didactic and pedagogical-psychological analysis and setting of the tasks for the reflexion of practical situation for students, will become a basis for the creation of the database of the Centre of Practical Training. The project expects to include into the research the students of 2nd and 3rd grades of Bachelor Study and 1st and 2nd grade of Master Study, in order to verify the proposed strategies within practical training, since these are the years in which pedagogical practice is carried out, and in the 2nd grade of Bachelor Study a new type of demonstrational pedagogical practice, extending the current practical training model, will be experimentally included. The project team includes more than 50 subject didacticians, didacticians, psychologists and UKF doctoral students.

In addition to them, we expect the participation of at least 500 teacher training students and 60 mentor teachers.

The increased intensity of work with students, especially in pedagogical practice, and increased number of hours of practice and of the analysis of teaching during practice, also open space for the fulfilment of project objectives. The methodological procedure will include case studies, methods of evaluative research, questionnaires, the analysis of written records – reflected portfolios of students' pedagogical practice. The results of the verification of proposed methodologies in practical training will become a starting point for the creation of a conceptional material defining the outcomes (knowledge, skills, competences) of practical training and individual types of pedagogical practice in the wide spectrum of teacher training study programmes within the frameworks of particular subject didactics. We expect the application of the methodology of the anchored theory with a close participation of subject didacticians, mentor teachers, pedagogues and psychologists.

The standard of pedagogical practice in the field of subject didactics will then be applied in the instruments evaluating the quality of the acquired professional skills at the level of individual elements of practical training, which will make the results the universally applicable instruments of detection for the quality of teacher training in our provenance, as well as instruments of international comparison.

CONCLUSION

The project has an ambition to increase the quality of teacher training graduates' readiness to enter their profession through the understanding and practical training of key psychodidactic strategies, aimed at the development of cognitive functions of learners as basic conditions of their successful social inclusion. Conceiving a knowledge base of teacher training as a starting point for the change of teacher education curriculum is an important task not only for pedagogical theory, but for the subject didactics and pedagogical practice as well. Emphasis must be put on the integration-based content of teacher education.

REFERENCES

[1]   B. Kosová, "Vysokoškolské vzdelávanie učiteľov. Vývoj, analýza, perspektívy,"Banská Bystrica: PF UMB. 143 s, 2012.

[2]   F. Korthagen et al., "Jak spojit praxi s teorií: Didaktika realistického vzdělávání učitelů," Brno: Paido. 293 s, 2011.

[3]   B. Kosová, "Vysokoškolské vzdelávanie učiteľov. Vývoj, analýza, perspektívy," Banská Bystrica: PF UMB, s.39,2012.

[4]   R. J. Sternebrg,"Kognitivní psychologie," Praha: Portál. 636 s,2002.

[5]   R. J. Sternberg," Kognitivní psychologie,"Praha: Portál. 640 s, 2009.

[6]   H. Gardner,"Dimenze myšlení. Teorie rozmanitých inteligencií," Praha: Portál, 1999.

[7]   M. H. Taylor,"Dynamic Assessment With Pre-scool Children: Implementation Integrity and Perceptions by Various Stakeholders of Relative Usefulness," Dundee : University of Dundee, 2000.

[8]   P. R. J. Simons, "Metacognition. In International encyclopedia of education," Oxford, Elsevier Science, s. 3784-3788. [on-line] [2010/19/12] Dostupné na internete: http://igitur-archive.library.uu.nl/ivlos/2005-0622-90116/5831.pdf, 1994.

[9]   J. Livingston," Metacognition : An Overview [on-line] [2010-20-2] Dostupné na internete: http://gse.buffalo.edu/fas/shuell/cep564/Metacog.htm., 1997.

[10]   R. Fisher," Učíme děti myslet a učit se: praktický průvodce strategiemi vyučování,"Praha: Portál. 172 s, 2004.

[11]   I. Ruisel,"Inteligencia v prežívaní subjektu. In Úvahy o inteligencii a osobnosti," Bratislava : Slovak Academic Press, s. 39-59, 2006.

[12]   Z. Kolláriková a kol.," Výchova ku kritickému mysleniu," Bratislava : ŠPÚ, 1995.

[13]   H. Krykorková,"Kognitivní svébytnost, teoretická východiska a okolnosti jejího rozvíjen," Pedagogika, 58(2), s. 140-155,2008.

[14]   J. Duchovičová,"Neurodidaktický a psychodidaktický kontext edukácie," Nitra : UKF, 94 s., 2010.

[15]   E. Sollárová,"Kognitívne a učebné štýly v kontexte veku a výkonu žiaka," Nitra: FSVZ, 135 s. 2004.

[16]   J. Mareš, M. Ouhrabka," Dětské interpretace světa a žákovo pojetí učiva," in: Čáp, J.; Mareš, J.: Psychologie pro učitele. Praha: Portál, 655 s.2001.

[17]   B. Pupala," Epistemologické východiská vyučovania. Teórie učenia a koncepcie vyučovania," In: Kolláriková,

Z. − Pupala, B.(eds.): Predškolská a elementárna peda-gogika. Praha: Portál, s. 161 − 217, 2001.

[18]   B. Pupala, Ľ. Held,"Epistemologické aspekty súčasných pohybov v pedagogickej kultúre,"in Pedagogika, roč. 45, 1995, č. 1, s. 339 349,1995.

[19]   P. Gavora," Kritické myslenie v škole alebo koľko rokov má kapitán lode?" in Pedagogická revue, roč. 47, č. 1-2, s. 17-25, 1995.

[20]   J. Škoda, P. Doulík,"Psychodidaktika. Metody efek-tivního a smysluplného učení a vyučování," Praha: Grada, 2011.

[21]   A. Kelly,"Quality criteria for design research: Evidence and commitments," in J. van den Akker, K. gravemeijer, S. McKenney & N. Nieveen (Eds.), Education design research. (p. 107-118). London: Routledge,2006.

Metacognitive Development of Students

Gabriela Petrová

Constantine the Philosopher University in Nitra
Faculty of Education
Department of Pedagogy
Nitra, Slovakia
gpetrova@ukf.sk

Nina Kozárová

Constantine the Philosopher University in Nitra
Faculty of Education
Department of Pedagogy
Nitra, Slovakia
nina.kozarova@ukf.sk

Abstract— **In this paper, the authors deals with the issue of modification of individual teaching strategies applied in the educational process. In dealing with this topic, the authors focused on the development not only of students' cognitive abilities but also their metacognitive abilities through the educational process. A special emphasis was put on strategies that work with handling errors during the process of learning and teaching. Knowing how to deal with errors may crucially contribute to the development and modification of students' metacognitive thinking.**

Keywords— *metacognition, self-regulation, errors, teaching strategies.*

I. INTRODUCTION

Every person goes through a learning process on a daily basis because we live in a modern society where change cannot be halted. Just the same, the knowledge acquired by students several years ago is becoming out-of-date. Technological progress brings ongoing transformation to our world and people have to be adaptable in order to adjust to the changing environment. For that reason education should be directed at preparing every individual to successfully cope with and manage the modern world and accept societal priorities. The subject area of metacognitive development of students has been gradually spreading in awareness among the professional as well as lay public; but the information acquired and presented so far is not yet sufficient.

II. COGNITION AND METACOGNITION

Cognitive science examines cognition, memory, perception, information processing, the ways of problem-solving, evaluation, planning, and mental processes. Currently cognitive science is perceived as a stream of the most dynamically-developing areas of science. The key role of cognitive science is considered to include de-mystifying functions, reflection and the nature of the human mind. This includes primarily psychological states such as attention, emotions, memory, perception, thinking and also the most recent knowledge of cognitive research related to language, the brain, consciousness, behavior, and the mind. Neverthe-less, cognition still is the key subject examined by cognitive science. Thinking can be viewed as the representation of respective structures that are present in the human mind. Cognitive scientists keep finding answers to questions such as: How do we learn? How does our brain acquire information? How do we remember? How can we evaluate information?

Reference [1] describes cognition as follows: "Cognition (Lat. cognitio), cognitive functions, present all mental faculties related to thinking and cognition and we dare say that they determine not only the successfulness of an individual at school but also throughout her/his life. Cognitive functions are present in all areas of human life, in thinking and other mental activities. They, inter alia, also influence how a student handles the presented information, what ideas s/he creates, what and how things are stored in memory, what means a student uses in recalling and so forth."

With regard to metacognition, realizing one's own faculties is the beginning of metacognitive information-processing. Metacognition, as a multi-dimensional construct, is a factor influencing also other cognitive dimensions. Teaching procedures and strategies used by individual teachers in the teaching and educational process are the key elements in contemporary education that must be emphasized throughout education. We believe it is very important to increase the effectiveness of the education process through innovation, modification and application of relevant learning strategies in the teaching process.

Defining metacognition is a rather challenging process even if there are myriad definitions of the concept. The concept has been interpreted by numerous authors as a supra-structure of human thinking that includes thought procedures and cognition processes in an individual who is capable of controlling, knowingly using and evaluating her/his mental processes, meaning her/his own thinking.

Reference [2] considers metacognition as "the most important aspect of human intelligence be-

cause it is related to applying all other forms of intelligence".

Reference [3] defines metacognition as "the ability to plan, monitor and evaluate procedures one uses in learning and recognizing these. It is a conscious activity that brings one to cognition through progressing when getting to know the world".

Analyzing the definitions indicates that metacognition serves for regulation of cognitive processes in humans who can use it to control and analyze the processing steps at their mental level. Metacognition also plays a role in developing one's own learning process and evaluating the effectiveness of that process. Metacognition was well presented in reference [4], stating that "teaching students to know their own cognition processes is the stage preceding their ability to control them". It is the ability to acquire, sort and use the knowledge of one's own cognition processes.

The knowledge concerning metacognition can be put in several umbrella categories. Specifically, it includes cognition of oneself (this is needed for students to know how to optimize and control their own learning), cognition of the learning assignments (selection of a relevant strategy that will bring the student to the set goal) and cognition of strategies (the student is capable of modifying particular learned strategies to accomplish the set goals).

III. METACOGNITIVE-DESIGNED EDUCATION

Contemporary education can be criticized for focusing predominantly on results (performance) of students rather than on the entire process that accompanies acquisition of knowledge. Students are not brought to systematically learn from lesson to lesson. There is not enough space for reviewing the material and as for errors, the teachers focus primarily on identifying them but then they do not make use of the errors in the subsequent teaching process.

A well-organized educational process should keep students' brains systematically stimulated. Regardless of education development and application of numerous modern didactic concepts of education in the recent decades, there still are many students who have difficulties in picking relevant metacognitive strategies for their learning. As stated in [5], metacognition and respective metacognitive strategies allow a person to compensate for deficits in the area of general intelligence. For that reason it is very important to gradually improve students' own cognition.

As mentioned in [6], students master respective strategies for working with text depending on how their reading is guided by teachers or parents. One of the ways to teach students to work effectively and have meaningful orientation in the text is through metacognitive strategies and procedures.

Metacognitive thinking that people use in the process of learning any kind of text results in its lasting remembrance and full comprehension of the text. Reference [7] presents a description of the principles of metacognitive training that include the affective principle of effectiveness (learning motivation); the principle of self-regulation (intervening in the cognition processes); the principle of regulation (regulating the cognition processes); the principle of generativeness (active effort by the student to sort, ask questions and give answers); the principle of reflectiveness (cognition of one's own cognition); and the principle of processivity (focusing on the entire process rather than just on the result).

Metacognitive modification is extremely important in an individual's life. It helps the person to adapt to ordinary life by using knowledge in specific situations. Reference [8] identified the so-called cognitive clues the use of which can help create metacognition.

The effectiveness of the teaching process is manifested through two main dimensions, namely the dimension of educational methods, aims, outcomes, concepts and strategies. The other is a dimension that is manifested through purpose-oriented work by the teacher with the students. The effectiveness of the teaching process is determined by numerous factors such as the material, students, teachers, goals, material conditions, outcomes, methodology, and motivation.

Above all active engagement of students in the classes promotes creation and development of neural networks. For that reason teachers need to be encouraged to use not only the activity of the students but also change in the organization of students' activities. The issue is using creative teaching methods, team teaching, problem-based teaching and comprehensive teaching that will improve respective functions of the human brain. The important thing is to gradually remove transmissive teaching, memorizing, passive listening and mechanical learning from our schools because all of these keep students passive and do not allow creation of neural networks.

In contemporary schools we ever more often see preference given to a ready-made information process that is time-intensive. The process means that students independently search and process information. There are innumerable possibilities and strategies through which students can acquire information and then transform it into knowledge. The teaching conditions still present in our education system by far do not match the present needs and certainly not the needs of our school system in the near future. We lag behind European countries not only in international measurements but also in teaching practices that use innovative trends.

IV. METACOGNITIVE STRATEGIES

We dare claim that many students still have not sufficiently developed and mastered various learning strategies. Subsequently students do not learn effectively, are unable to solve the set problems/assignments in educational practice, do not finish their assignments and have poor learning planning. But there also are students who have mastered a broad array of learning strategies that help them learn effectively and to successfully plan particular educational activities.

We have to constantly bear in mind that relevant learning strategies are always influenced not only by attitudes of the students but also by their individual metacognitive pre-dispositions. And this is exactly where teachers can actively intervene. It is up to them to use as many effective teaching strategies as they can in classes. This will allow the students to choose, from among the large choice of the presented teaching and learning strategies, those that are most relevant for the specific subject or teaching topic.

Reference [9] outlines and describes four categories of learning strategies. They include the cognitive strategies (such as making maps, structuring the material, organizing the material, practicing strategies), metacognitive strategies (such as monitoring, planning, regulation strategies, regulating the attention in learning, modifying the learning environment), motivating strategies (such as supporting internal and external motivation, causal attributions, understanding the value of the material), and self-cognition strategies (such as perception of one's own strong and weak points within the learning process, knowing one's own learning style, delineating the preferred teaching subjects).

The role of a modern teacher-facilitator should be developing metacognitive thinking in students who often are unaware of their thinking within the learning process. In that way learning to them gradually becomes a kind of a universal and automated sequence of activities and they then fail to seek to comprehend respective relational levels and find inter-relations. That kind of learning is called a mechanical learning style that is certainly undesirable. Teachers who can use and have embraced several metacognitive teaching and learning strategies are also capable of sharing them with their students and allowing the students to adopt those strategies and apply them to various model situations.

The most frequently used metacognitive strategies in the teaching-learning process include: SQ4R, think–along strategy, PQRST, MURDER, T. E. Scruggs procedures, and the method of cognitive activity pattern. We would like to give more details for certain of these strategies.

PQRST is a comprehensive method used in teaching extensive instructional material. It includes five steps that cover the instructional material as a whole as well as the instructional material split into units.

SQ4R is a metacognitive strategy. The letters in its name stand for the procedures for working with instructional material [10]. The steps are: S (survey) – orientation in the fundamental structure of the material; Q (question) – asking questions and orientation about thus far unknown information; R (read) – reading the material and annotation; R (reflect) – reflecting on the material, finding the key concepts, analyzing and handling discrepancies between pieces of information; R (recite) – remembering the information and recalling the material through notes; and R (review) – summing up.

THINK-ALONG is a strategy authored by [11]. The strategy makes the thinking process visible through reading the material. This is a process where the teacher reads aloud and students visually follow along with the text. Once the text has been read, the teacher analyzes the text through a thought process. Subsequently, the students verbalize their own ideas that have been evoked by the text.

Other metacognition strategies include the increasingly popular reading strategies such as PLAN (Predict, Locate, Add, and Note), KWL (what you Know – what you Want to know – what you Learned), RAP (Read, Ask, Paraphrase), REAP (Read, Encode, Annotate, Ponder).

Designing an effective learning strategy cannot be viewed as a simple process. Students can gradually internalize certain teaching strategies that the teacher applies in the process of instruction. Reference [12] presents the requirements in its metacognition teaching scheme that need to be fulfilled in the process of developing the student's metacognition. The student is in the centre of development and the other components (transformation of learning responsibility to the student, fostering conscious deliberate learning, promoting metacognition, drawing from the student's experiences and helping find interrelations and supporting interaction with other students) are handled by the teacher. The teacher is considered to be the more competent person within this strategic teaching and is considered as the fundamental resource and model for the strategically-designed educational process.

We are of the same opinion as [13] and associate the choice and use of any learning strategy with associative processes and gradual development of metacognition. This author claims that metacognition should be developed in students only through problems and assignments matching their actual cognitive capacity. From this it results that the development of metacognition is always determined also by the context of the learning environment.

V. USING ERROR IN THE EDUCATIONAL PROCESS

Over the years many people have maintained the idea that only a correct answer can lead to good marks, success and right decisions. On the other hand, doubt and errors are an integral part of people's lives since errors motivate people to do things differently, better and more successfully. It is important that not only the students but also the teachers engaging in the educational process understand the vast difference between the goal of learning something and the goal of performance.

Often students perceive error as a threat to their self-image. For that reason they usually focus on the activities they are comfortable with and can be assured of not committing mistakes, where they will not have to work hard or even think in the process. An error is interpreted by numerous students, teachers and parents as admitting lesser skills or capabilities. In every educational reality there is too much focus on evaluating a student's performance and not enough attention is paid to further development of the student's knowledge and competencies. Students are often forced to cover up their errors instead of coping with them, admitting them and understanding why the errors occurred and then using them effectively for further improvement.

Using errors to teach and learn is inseparable from education. The elementary process of evaluation and self-evaluation should include identification of an error and its interpretation. Using errors in our educational setting is, unfortunately, still perceived as a negative experience. According to [14] error is a natural phenomenon at the beginning of every learning process and teachers should finally stop perceiving error-committing by students as proof of their incompetency, inability, poor personal characteristic faculties and poor motivation. Teachers should know how to use errors for the purposes of the teaching/learning process and turn errors to the benefit of themselves and their students.

In that regard the recommendation presented in [15] should be considered and the orientation toward negative evaluation should be eliminated from the education system. This author suggests that only pointing out the errors made by students can result in their lower self-evaluation.

Identifying an error in subjects such as mathematics, physics, biology and languages is quite easy but identifying, analyzing and interpreting erroneous thinking and judgement is a rather demanding process. Moreover, it may be the teacher alone who has committed an error in, for example, evaluating a student when s/he did not comply with the educational standards or not being quite sure whether the student's performance was correct. This is the situation that presents space for so-called *creative errors*. And this is where the teacher may offer the students space to explain their thinking and procedure. Next, the teacher should discuss the unclear issues with the students and interpret them and allow more questions and in-depth analysis of the covered material.

More errors mean a worse mark for students under the traditional educational system. This only reinforces the stereotype in students that error = failure (and the following punishment). Traditional teaching actually rejects accepting and using errors. They are always identified as an undesired phenomenon followed by punishment, meaning a lower score in tests that may also result in ridicule and the teacher also getting angry over errors committed by students because s/he perceives this as a teaching failure. The students involuntarily end up in situations where they are reluctant to do something and prefer to do nothing just to avoid making mistakes. Even worse are situations in which errors re-occur or the teacher alone is afraid of potentially making an error in front of the students.

An error is a far more complex attribute that activates and develops independent thinking in students. An error always brings new and different views of handling problems and assignments and presents an opportunity to learn new experiences that may be used by the teacher as well as the students to plan the next action. Errors should primarily serve as indicators pointing out gaps in the student's learning. Students should never be punished for errors, including in their evaluations and oral assessment. Punishment only results in fear from potential prosecution. If students find and correct their errors, they gain knowledge useful for their future learning. Errors should be welcomed within the teaching/learning process because they can tell a lot about the actual cognition of a particular student. There is much truth in the idiom "learn from your errors". Moreover, teaching that draws from this fosters trust, cooperation and joy of the work done by students and their teachers.

VI. METACOGNITIVE DEVELOPMENT AND USING ERROR

The author of [16] suggests that the didactic perception oriented at goals and their accomplishment always includes also specific requirements for the student's performance and then it is easy to identify errors. In contrast, where the didactic perception is oriented at the student's activities, requirements for the student's performance are usually absent and the process of identifying and analyzing errors is much more challenging.

The most important aspect in metacognitive development of students where errors are used is the specificities related to the age of the students. In this regard we can draw from the theory [17] of the development of children's thinking. The author claims that every individual's reason-

ing capabilities modify in the course of childhood and adolescence. The respective cognitive stages an individual goes through are exceptional with their unique structure.

For that reason every error should be identified and corrected right at the beginning of learning. If the student embraces an erroneous meaning and goes on using it, unlearning that reinforced error may be a long process with no guaranteed success. That is why the teacher needs to remember to give feedback all the time and to check the students in the course of their learning process. Information about the error and its correction are accepted by individual students differently in the beginning of the learning process than at its end. The beginning involves gradual development of the student's knowledge structure and for that reason various concepts have not yet acquired a stabilized position and the relationships between these concepts are just being sought and explained. That is why an error, if it occurs, does not yet have deep roots that could make eliminating it difficult. Reference [18] differentiates a normative error from a creative error. The former is a certain deviation from standardized performance that is considered to be correct. A creative error represents a rigid view of every student's idea that is in conflict with the required performance. In humanities the analysis and correction and evaluation of erroneous performance by students is an instrument that allows a comprehensive assessment of the knowledge system of individual students. Below we specify certain concepts that use error as one of the key components in metacognitive development of students.

VII. POKA-YOKE SYSTEM

The poka-yoke system offers an effective way of using errors that is based on finding and presenting the key causes of a problem under all circumstances. This is a concept of immediate error detection and correction. The key goal and the way of working is the so-called *zero error rate*. The poka-yoke concept is used predominantly in technological areas but its philosophy can be applied also to modern education since the particular concept can be used for all people (different genders, ages, experience, education), it is easy to use during classes and does not require any special attention from the teacher, does not require much time and allows immediate feedback and correction of possible errors and works as prevention against future errors.

There are numerous techniques for error prevention and elimination, yet many concepts are rather ineffective. Errors generally occur when the assignment has been carried out incorrectly or when the student does not have enough information needed to perform the required action.

The poka-yoke concept suggests that we can prevent all errors once we have found out when, where, why and under what circumstances they have occurred. The most frequent causes of error-committing by students include absence of norms (standards), shortage of relevant guidance and instructions, poor discipline during classes, miscomprehension, not enough information, forgetting, not concentrating, not paying attention, clumsiness, misunderstanding/failing to understand inter-relations between concepts, poor internal and external motivation, shortage of experience, absent supervision, slow or clumsy/cumbersome work, assignments that are not matched to the student's actual cognitive level.

VIII. COGNITIVE EDUCATION

Cognitive education is based in systematic education with the goal to develop the student's cognitive functions that are bound to thinking processes. Reference [19] designed a model of cognitive functions that includes these functional units: input system (receiving information, storing information, analyzing information); output (regulating and performing activities, programming activities); and systematic consciousness activation (making sure the course of the entire process is conscious, information evaluation).

It should be remembered that particular cognitive functions develop throughout an individual's entire life since all mental capacities are modified in the learning and maturing process.

Reference [20] explains that cognitive activation takes two ways, an active mechanism or a passive one, determined by its intensity. Given the theory, cognitive education operates through several dimensions of grasping the material. The students are guided to independently uncover problems and find solutions, they are guided to use training and to learn strategies to develop their cognitive functions; they are guided to independently handle and use information and they get assignments/problems with specific or general meaning.

We agree with the author (ibidem) that modern times have an ever more relevant requirement, namely to lead students to be able to independently set their goals, to be curious, responsible, cooperative, to develop their cognitive learning strategies and develop their metacognitive processes. Interaction between the new instructional content and the learning individual is in the focus of cognitive comprehension of the material. This means decoding the presented information and a perfect organization of instruction that leads not only to a knowledge base but also to analyzing the crucial points that the learners can lean on and interlink with more information through particular metacognition strategies.

IX. INSTRUMENTAL ENRICHMENT

The instrumental enrichment method [21] is founded on increasing the effectiveness of teaching, acceleration of thinking and using errors to learn. Reuven Feuerstein, world-acclaimed psychologist and educationist, developed a system of worksheets to gradually develop cognitive functions in students. The worksheets help students to gain experience and self-confidence that they can master problems and learn inter-relations. They are not afraid to commit errors, are able to respect opinions of other people and it is easier for them to find orientation in their lives. According to the author, those students who are unable to learn under the traditional education system suffer from certain deficits in the cognitive area. But they do not suffer from lack of intelligence. These students are unable to structure their knowledge, they do not plan their learning, they are unable to think along inter-relations and they have impulsive thinking and do not think over their learning strategy before actually starting to work on the assignment. They receive information in isolated form and are unable to learn from errors.

The instrumental enrichment program seeks to modify cognition structures through worksheets with special assignments along the strategy of mediated teaching. The goal of the respective instruments is increasing the level of difficulty and developing the learning potential as much as possible in every student.

CONCLUSION

The paper has focused on issues of metacognitive development of students through the use of errors for teaching/learning. In the practical educational setting we should focus not only on students' performance but also on their personal and social development. With regard to metacognition the need is for teachers to know how teaching/learning mechanisms work and how they can improve their effectiveness in teaching students.

Preparing students for the modern world by requiring them to memorize and accept transmissive teaching is not a satisfactory solution. The modern world is flooded with information and if we want our students to be successful we need to support their critical thinking and appropriate responses to any situation that may arise.

REFERENCES

[1]   J. Duchovičová, "Kognitívna edukácia a sprostredkované učenia," in Kolektív autorov: Vybrané kapitoly z didaktiky pedagogiky a sociálnej pedagogiky. Nitra: PF UKF, 2011.

[2]   R. Fisher, "Učíme děti myslet a učit se," Praha : Portál, 172 s., 2004.

[3]   J. Průcha, E. Walterová, J. Mareš, " Pedagogický slovník," Praha : Portál, 322 s, 2003.

[4]   J. Mareš, "Styly učení žáků a studentů," Praha: Portál, s.173, 1998.

[5]   G. Schraw, "Promoting general metacognitive awareness" in Instructional Science, 26 (1-2), pp. 113-125, 1998.

[6]   D. Gunišová, "Metakognícia, jej podoby vo vyučovacom procese" in: MMK 2015: sborník příspěvků z mezinárodní vědecké konference MMK2015 – Mezinárodní Masarykova konference pro doktorandy a mladé vědecké pracovníky. Ročník VI., Magnanimitas, s.1200-1207, 2015.

[7]   H. Krykorková, " Psychodidaktická aplikace metakognitivní teorie," in Vališová, A. a kol.: Historie a perspektivy didaktického myšlení. Praha: UK, Karolinum, s.174-186, 2004.

[8]   J. Duchovičová, E. Žovinec, "Rozvoj kognitívnych funkcií a sprostredkované učenie v edukačnom procese (u detí v MŠ a na 1.stupni ZŠ)," Glivice, 2009.

[9]   J. Čáp, J. Mareš,"Psychologie pro učitele," Praha: Portál, 2001.

[10]   Z. Helus, I. Pavelková, "Vedení žáků ke vzdělávací autoregulaci a humanizaci školy," in Pedagogika, roč. XLII, č. 2, s. 197-207, 1992.

[11]   D. C. Anchin, "Learning Strategies – Resource Guide," Georgia: ETS, 89 pages., 1979.

[12]   L. Portelance, "Intégrer la métacognition : Dans l'ensemble de ses interventions pédagogiques," in Vie pédagogique, roč. février/marec, č.122, s. 20-23, 2002.

[13]   K. Crowley, J. Shrager, R. Siegler, "Strategy discovery as a competitive negotiation between metacognitive and associative mechanisms," in Developmental Review, 17 (4), pp. 462-489, 1997.

[14]   J. Čáp, " Psychologie výchovy a vyučování," Praha: Karolinum, 1997.

[15]   Z.Helus," Dítě-škola-učitel: Skutečnosti jen samozřejme,anebo take nesamozřejme," in Dítě-škola-učitel, Praha:PdF UK, 2001.

[16]   V. Kosíková, "Psychologie ve vzdělávání a její psychodidaktické aspekty," Praha: Grada, 2011.

[17]   J. Piaget, "The psychology of intelligence. České vydanie Psychologie inteligence," Praha : Portál, 1972.

[18]   J. Slavík," Hodnocení v současné škole," Praha: Portál, 1999.

[19]   V. Pokorná, "Teorie a náprava vývojových poruch učení a chování," Praha: Portál, 2010.

[20]   M. Roth, "Pohled učitele na inkluzi a inkluzivní školní prostředí založený na indexu pro inkluzi," in Pokorná, V.: Inkluzivní a kognitivní edukace. Praha: PF UK, s. 161-167, 2006.

[21]   R. Feuerstein, Y. Rand, M.B. Hoffman, R. Miller, "Instrumental enrichment: An intervention program for cognitive modifiability," Baltimore, MD: UPP, 1980.

On Some Issues of Technical University Student Behaviour

Dana Dobrovská

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological Studies
Prague, Czech Republic
dana.dobrovska@cvut.cz

Abstract—Student attitudes toward unethical practices enabled by advanced ICT competencies represent an increasing challenge for teacher behaviour at both technical and non-technical universities. Results of our study prove that students are aware of the fact some teachers cannot face flexible and innovative tricks used by students during examinations. Attitudes to cheating depend on what students have heard and seen, on their ethical qualities, teacher personality and policies

Keywords— student behaviour; teacher behaviour; ethics; moral integrity

I. INTRODUCTION

School cheating includes the wide range of activities, from traditional forms (copying, prompting) to actual methods backed by available electronic devices. Methods how to cheat keep improving, students show high creativity and are at least one step ahead of teachers.

Over the past two decades, achievement goal theory has become a prominent approach to examining how students are motivated to achieve in school and has informed how educators can foster interesting, supportive classroom environments. Goal theorists posit the existence of two types of achievement goals—mastery goals that orient individuals toward developping their ability and performance goals that focus individuals on demonstrating their ability. Recent research connected goal theory approaches with beliefs and behaviours related to academic cheating [13].

Research held in different countries shows that percentage of cheating has grown significantly in last decades. Reference [8] found out that in the time range 1969 – 1989 the number of students misusing cribs during tests increased from 34 % to 68 %. Reference [12] stated that almost 70 % of secondary school students confessed cheating in tests and almost 90 % agreed they copied assignment from a classmate. [11] wrote in his publication 76 % of secondary school students and 64 % university students admitted cheating.

Searching statistical data on the extent of dishonesty and cheating vary widely, most probably because of differences in methodology. The first large-scale study of non-electronic cheating in academic institutions was published in 1964. It surveyed over 5,000 students from different colleges and universities and found that 75 percent of respondents engaged in incidents of academic cheating [7].

Electronic form of cheating is now becoming one of the most negative effects of student behaviour. Current university students belong to the Internet generation with an almost lifelong media literacy. Not surprisingly there is a sharply rising potential for students to exploit electronic devices for study purpose. All forms of electronic cheating have one thing in common: students break the university rules in order to facilitate the study requirements.

Reference [4] pointed to the fact that the rising electronic study cheating has replaced classical cheating and stated its 3 basic characteristics:

- students break the university rules
- students gain undue advantage
- reliability of student performance assessment is reduced

II. FORMS OF ELECTRONIC CHEATING

Over the last decade electronic devices opened up to broad public. All current undergraduates have notebooks, some possess the new generations of smartphones that also facilitate access to information. Simultaneously, variety and sophistication of electronic cheating has been increasing. In 2012, following list of most common forms of cheating was suggested [3]:

- suggesting to classmates backed by electronic media
- electronic cribs
- plagiarism
- fraudulent change of the student's identity
- breaking the teacher's log-in

- special spyware
- sms

Student cheating has been researched from different views, including psychological ones. In order to find motivation to cheat in broader aspects some basic concepts were put into relation with unethical behaviour:

a) Moral integrity

Good character can be understood as a family of morally valued, positive traits of personality, which are relatively stable and generalizable across different situations, but which are not necessarily fixed or rooted in immutable genetic features [2]. These characteristics can be connected with an opposite what we understand cheating. Integrity (authenticity, fairness) is a psychological quality of being honest and having strong moral principles, moral uprightness. It is generally a personal choice to uphold oneself to consistent moral and ethical standards.

b) Scholastic Cheating

We can define scholastic cheating as a transgression against moral integrity which entails taking an unfair advantage that results in a mispresentation of a student's ability and grasp of knowledge. This includes obtaining inappropriate assistance from other person or from an online source or adjutant, plagiarism, and false self-representation [4].

c) Academic dishonesty

Academic dishonesty can be characterized as academic fraud. With this characteristics we can even see relevance to the business term fraud triangle as formulated by [11]. The fraud triangle depicts three elements present when fraud occurs. These three elements are incentive pressure, opportunity and rationalization attitude. Transferred into academic conditions incentive/pressure relates to good grading, opportunity manifests itself in an environment when "nobody is watching" and rationalization/attitude becomes prevalent and "excusable" when students believe other students cheat too [11]. All three elements that make up the fraud triangle are potentially present in the examination environment.

According some research results variety and diversity of electronic cheating has been constantly growing [3] and its most frequent are introduced in [12]:

- copying information from a mobile phone, flashdisk, diary, laptop - from the proper student or class-fellow
- dishonest test acquisition (printscreen) from a class-fellow
- seminar work plagiarized from the Internet or written by another person

- passing an exam for another person
- passing an exam for another person while misusing his/her system password
- mutual help over discuss groups during the test
- cracking teacher's computer to gain the test
- dishonest test acquisition (printscreen) from a class-fellow

Based on the results of our previous study [2] and some other resources [1] we would like to suggest 3 major groups of factors that might have impact on student cheating - some of them will be treated in our new research:

1. University and its social climate:

People are significantly influenced by their social environment. University climate represents social environment which influences students for several years. Size of the university and anonymity of its environment, university specialization (technology, sciences, humanities), existence of university moral integrity policy, sanctions for dishonest students, technological equipment + reference to technology usage, study requirements, teacher workload, level of teaching quality control – these are factors which might contribute to prevalent student his/her value system and behaviour.

2. Teacher personality (human qualities, intellectual qualities, pedagogical, presentation and organization skills):

Teaching enthusiasm, intellectual curiosity, intellectual flexibility, ICT skills, carefulness and consistency of teaching activities, teacher's subjective (over)estimation of his/her subject (course), ability to provide good explanation, justice, quality of assessment procedure, keeping the tests up-to-date, preventive measures during exams.

3. Student personality

Age, teacher/university/study/programme and their relationship to students, intellectual capabilities, study success, motive of achievement, preference of deep learning style, moral integrity, temperament structure, mental health.

III. RESEARCH TARGET, QUESTIONS, METHODS

This paper reports on two studies, one which investigates the cheating practices of transportation engineering students (n =102) and their attitudes toward cheating, and the other which investigates the same problems in the sample of engineering pedagogy students, the study programme which is based mostly on humanities (n=98). All respondents were pre-graduate students of a technical university with a long tradition (founded in 1703). The studies also intended

to identify particular problems students face in their learning and give insights into situations which can lead to poor learning practices and, in the worst cases, to cheating.

Our survey was aimed in both groups at these issues:

- specification of cheating forms

- frequency of student cheating

- subjective "justification" of dishonest behavior

- teacher attitudes toward cheating as perceived by students.

Based on queries used in our prior research on academic integrity [2, 3] and our experience in psychology courses teaching, a 15 item questionnaire was constructed for our purpose. The queries reflected issues potentially related to dishonest behaviours, and reference to technology usage when taking an examination. For some items, a 5 point Likert-type scale was the response format used, for few items 7 point Likert-type scale was used with one extra open-ended response. The survey form requested information on age, gender and prior online course experience. Student identity remained anonymous.

IV. RESULTS AND DISCUSSION

Variety, extent and frequency of cheating practice

Group I - engineering students (n=102)

- mutual help over discuss groups during the test – 37,3 %

- copying information from a mobile phone, flashdisk, diary, laptop) - 36,3%

- dishonest test acquisition (printscreen) from a class-fellow – 22,5 %

- copying from a class-fellow's computer – 16,7 %

- *never cheated* - 42,0 %

Other forms of cheating were declared in less than 3 % of answers.

Group II – engineering pedagogy students (n = 98)

- giving or receiving advice from a class-fellow during the test – 100 %

- seminar work plagiarized from the Internet – 61, 2 %

- copying information from a mobile phone, flashdisk, diary, laptop - 25,5 %

- dishonest test acquisition (printscreen) from a class-fellow – 24,5 %

- copying from a class-fellow's computer – 9,2 %

- *Never cheated* – 52 %

Other forms of cheating were reported in less than 3 % of answers.

In very few cases students admitted they had passed the exam for another person while misusing the person' s password or while misusing remote desktop. Both cases were reported by 2 engineering students.

Comparing data related to the forms and frequency of cheating there were similarities and differences in both samples which could have been caused by characteristics of study programmes. The prevalent forms of cheating as reported by engineering students were copying from a mobile phone, flashdisk, laptop, dishonest test acquisition from a class-fellow and mutual help over e-discuss groups during the test. Preference of electronic forms of cheating seems to be result of advanced ICT skills of engineering students and electronic testing dominance in engineering courses. Few students, on the other hand, were giving oral help to their class-fellows during the tests. 42 % reported not to have cheated at all.

Engineering pedagogy students reported in all cases giving and receiving oral help from a class-fellow, plagiarism, copying information from a mobile phone, flashdisk, diary, laptop, and dishonest test acquisition from a class-fellow as the most frequent form of cheating. Test acquisition was probably influenced by carelessness of one teacher which enabled students to shoot the test and distribute it in other student cohorts. (Unfortunately, this teacher has not changed his behaviour during exams after this accident as reported by students).

As mentioned, all students reported to have asked or given oral help to their class-fellows during the tests. This happened due to the fact most assessments had non-electronic form. 52 % of the students reported not to have cheated (although all respondents from the engineering pedagogy cohort admitted to have given an oral help to their class-fellows!).

Motivation to cheat and subjective "justification" of dishonest behavior

To shed more light on internal justification of dishonest behavior the students were asked to consider 14 different factors and indicate the likelihood of each factor causing them to cheat. In this case a 5-point Likert scale was used, where 1 indicates "not at all" and 5 indicates "highly likely". The six most likely reasons which seemed most "justificatory" are shown in the following list:

Sample 1 – engineering students

- I did not have time to prepare well

- The task was too hard/had no sense

- Too great a workload at technical university

- I did not want to fail
- The teacher did not control cheating
- I used a crib I had prepared at home

Sample II – engineering pedagogy students

- I had no time to prepare
- I was afraid of failing
- The task was too difficult
- One of our teachers has used the same tests repeatedly
- I helped my class-fellow to pass the test
- My class-fellow helped me as he knew how busy I had been

Results from both groups of respondents showed that six highest rated factors which could have caused frequency of cheating behaviour related to the themes of time pressure, fear of failure and subjective difficulty (quality) of the task. These "excuses" agreed with what had been found in our previous research [2] and in other studies [10], and suggested these were common areas of difficulty for students. Prevalent forms of cheating were practices related to assignment work and test situations. Time pressure and task difficulty were also the most "acceptable" forms of cheating in students' views.

Analyses of data from our questionnaires also confirmed two broad-based themes of internal and external factors that explain the pressure that may cause students to adopt poor learning behaviours.

Internal factors represent personal (individual, psychological) factors over which the student has (should have) control and tend to be course independent. Internal factors are represented for example by poor time management, lack of home preparation for tests and exams (laziness?), lack of learning skills and skills to find resources, unwillingness to follow recommended good practice, inability to seek appropriate help, and low intrinsic interest in course. External factors are those factors imposed on the students and usually depend on the environment in which students work. Among external factors that "caused" cheating behavior were indicated clumsy situational management, poorly designed tasks and easy availability of solutions (tasks are readily available, copied from textbooks or lecture notes), difficult learning situations accompanied by equipment failure.

In the accounts of their work on assignments and class tasks students described various poor learning experiences that they attributed to external factors. In many of these cases the students gave indications that they had cheated or were tempted to cheat. This is in contrast to the learning problems caused by internal factors where there were no admissions of cheating. The theory of attribution confirms that students are more likely to admit to cheating when they can excuse their behaviour by external factors. "It is not my fault, it is someone else's fault".

Teachers' attitudes toward cheating as perceived by students

Last three items of our questionnaire were targetted at potential relation between teacher behaviour and the students' readiness to cheat. It is difficult to get reliable data on such relation as reported in our previous research when we conducted a pilot study on this topic with the university staff. In a qualitative analysis of teacher reaction none of them had admitted behaviour which would have encouraged student cheating. That is why we decided to use the indirect method to get some insight into the teacher attitudes.

In both groups students reported 4 possible teacher behaviour patterns: tough control of students during the test, moderate control over the student behavior, play acting of control and obvious ignoring of student intentions to cheat. Although all 4 options were reported, more than 2/3 of the students declared teachers were practicing tough control during tests. No significant differences appeared in both groups. More than 50 % of respondents admitted their readiness to cheat in relation to the personality of teachers and the quality of their test management competences.

V. CONCLUSIONS

Evidence from our study suggests that university study of any discipline offers particular opportunities for students to engage in cheating behaviour. On the other hand it is possible to assume that students might want to take responsibility for their learning. For a teacher it is important to help students to develop strategies to manage the internal factors that lead to poor learning tendencies. It is also important for educators to address external factors which are caused by characteristics of the learning environments. Such strategy can devise activities that academics can employ to minimize students' propensity to cheat within their discipline. This is another approach to the one taken by many universities that focus on cheating detection and disciplinary measures – handling consequences rather than preventive methods. The opportunity to cheat is smaller when the teacher keeps an active position and requires that all notes, electronic devices, and other materials are put away and watches the students while working on tests. In other words teachers must be proactive in minimizing the three elements of the fraud triangle both in the traditional and in the online exam environment.

ACKNOWLEDGMENT

and Sports of the Czech Republic: "Readiness of technically educated students for the teacher profession, management and motivation".

REFERENCES

[1]   [1] S.L. Bassendowski, Is Plagiarism Creating an Opportunity for the Development of New Assessment Strategies?" *International Journal of Nursing Education Scholarship, volume 2, issue 1, article 3,(205)*, 2003.

[2]   D. Dobrovska, Student Cheating Based on Electronic Devices. Aula, Vol. 4, ISSN 1210/6658 2006.

[3]   D. Dobrovska, P. Andres, A. Pokorny, Teachers' views on student electronic cheating. 15th International Conference on Interactive Collaborative Learning (ICL). ISBN 978-1-4673-2425-0, 2012.

[4]   J. Mareš, Tradiční a netradiční podvádění ve škole. (Traditional and non-traditional school cheating). *Pedagogika.* LV, No 4, pp. 310-334, ISSN 0031-3815, 2005.

[5]   G. Maslen, "80 % admit to to cheating in survey of of students on Australian campuses." Times Higher Education Supplement, Jan. 24, 17, pp.66-74. 2003.

[6]   I. Masic, Plagiarism in Scientific Publishing. Journal of Academy of Medical Sciences 20 (4), 208-2013. doi: 105455/aim 2012 208-2013, 2012.

[7]   D.D. McCabe, The influence of situational ethics on cheating among college students. Sociological Inquiry, 62 (3), pp.365-374, 1992.

[8]   D.D.McCabe, T.K. Trevino & K.D. Butterfield, Cheating in Academic Institutions: A Decade of Research. *Ethics & Behaviour, 11*(3), pp.219-232. 2001.

[9]   J. Moten et al., Examining Online College Cyber Cheating Methods and Prevention Measures, 2013.

[10]   Ch. Peterson, M.P. Seligman, Character Strengths and Virtues. A handbook and classification. New York: Oxford University Press/Washington, DC: American Psychological Association. ISBN 978/0195167016, 2004.

[11]   M. Ramos, Auditors' responsibility for fraud detection. Journal of Accountancy, 195 195 (1), pp. 28- 35. 2003.

[12]   P.M. Scanlon, D.R. Neumann, Student online plagiarism among college students. Journal of College Student Development, 43 (3), pp. 374-385. 2004.

[13]   J. Sheard, Determination of Factors which Impact on Student Propensity to Cheat. Proceedings of the Fourteenth Australasian Computing Education Conference (ACE2012), Melbourne, Australia, 2012.

[14]   Stephens, J.M., Gehlbach, H. Psychology of Cheating. Elsevier, pp. 107-134. ISBN 978-0-12-372541-7, 2007.

Innovation Environment and the Quality of National Education System

The rankings of national economies

Lenka Švecová

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Prague, Czech Republic
lenka.svecova@cvut.cz

Abstract— **Education is one of the key factors leading to increased competitiveness of the economy. This article seeks relations between rankings for evaluation of the quality of national education systems and the innovation environment of national economies. Specific rankings systems are described in chapter II. It is (1) The United Nations' Educational, Scientific and Cultural Organization's (UNESCO) Educational for All Development Index (EDI); (2) U.S. News Best Countries Rankings; (3) U21 Ranking of National Higher Education Systems and (4) The Global Innovation Index for measuring innovation environment. Chapter III illustrates differences between results of each ranking. The last two chapters answer to the question, which ranking (of evaluation of the quality of national education systems) is the best for comparison of innovation environment.**

Keywords—innovation environment; rankings; national education systems

I. INTRODUCTION

The evaluation of the quality of national education systems provides an interesting view on rated states. There are several global rankings for evaluating the quality of education systems. In addition to standard ranking of universities (QS World University Rankings [1]; Times Higher Education World University Rankings [2]; The 2016 Academic Ranking of World Universities (ARWU) [3]; Center for World University Rankings [4]; The Ranking Web of Webometrics [5] etc.) there are also evaluated entire systems of education (The United Nations' Educational, Scientific and Cultural Organization's (UNESCO) Educational for All Development Index (EDI) [6]; U.S. News Best Countries Rankings [7] or for university education system U21 Ranking of National Higher Education Systems [8]). Evaluation of the quality of these systems provides an interesting view of not only education, but also the economies of the world.

The quality of the educational process and especially the quality of higher education affects the innovation environment, which is one of the key factors impacting on the competitiveness of national economies. Rankings for evaluation competitiveness of countries are numerous, for the purposes of this article will be used ranking of The Global Innovation Index [9].

II. PRINCIPLES AND RULES FOR NATIONAL RANKINGS

A. UNESCO − Educational for All Delevopment Index (EDI)

The areas of EDI are: (1) Universal primary education; (2) Adult literacy; (3) Quality of education and (4) Gender [6]. The value of EDI for a given country is the arithmetic mean of the four indicators. These indicators corresponds with the goals of EDI: (1) universal primary education: indicator is "the percentage of primary-school-age children who are enrolled in either primary or secondary school"; (2) Adult literacy: indicator is "the adult literacy rate for those aged 15 and above"; (3) Quality of education: the indicator is an indirect − the survival rates to grade 5, because others are unavailable or with low correlation, or both; (4) Gender: the composite index is the gender-specific EFA index (GEI) as a simple average of three gender parity indexes (GPIs): for the GER (gross enrolment ratio) in primary education, for the GER in secondary education and for the adult literacy rate. The weights of these four components are equal. The base for data is the results from EFA Global Monitoring Report and own UNESCO statistical database. Unfortunately, the Czech and Slovak republic are not included into ranking (only 115 from 205 countries had the data required to calculate the standard EDI)-

B. U.S. News Best Countries Rankings

The Best Countries for Education Rankings are based on "three equally weighted country attributes: has top quality universities, well-developed public education system and would consider attending university there" [7]. The base for data is a survey of more than 16,000 people. A total of 65 attributes (in nine groups), it is determined that survey for each country. Unfortunately, not every
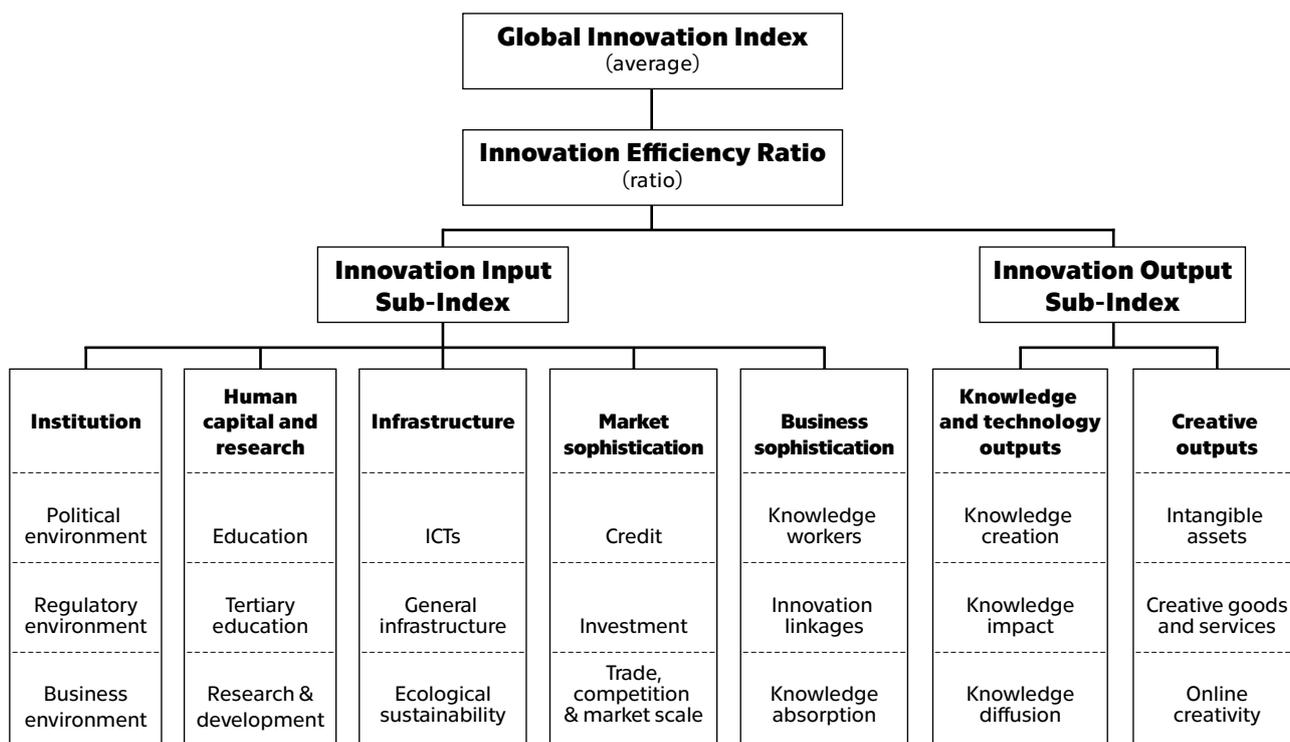
Fig. 1. Structure of the Global Innovation Index [9]

country is involved into rankings, for example this ranking is excepting Finland, Norway, Belgium or Switzerland. Groups for subrankings Best countries Rankings are: (1) Adventure; (2) Citizenship; (3) Cultural Influence; (4) Entrepreneurship; (5) Heritage; (6) Movers; (7) Open for Business; (8) Power and (9) Quality of Life. The weights of these groups are different, for example subranking Entrepreneurship has weight 17.42 % or Open for Business has weight 11.99 %.

C. U21 Ranking of National Higher Education Systems

U21 Ranking of National Higher Education Systems is the only one in the world focusing on higher education system from 2012 [8]. Only 50 countries are included. Four areas with totally 25 variables are ranked separately: (1) Resources – this area is based on expenditure by tertiary institutions as a share of GDP and expenditure per student; (2) Environment – this area includes three surveys and "female participation among both students and staff, a measure of diversity of institutions in the system, and the quality of data on higher education"; (3) Connectivity – which leads to technical changes end economic growth, measured by e.x. proportional of international students, number of open access full text, proportional of articles co-authored with international collaborators and (4) Output – this are describes "research output and impact, student throughput, the national stock of graduates and researchers, the quality of a nation's best universities, and employability of graduates". The weights are 20 % for the first three and 40 % for area Output. The scores are expressed as a percentage of the best score. Data

for evaluation are collected from various sources, for example OECD, Webometrics, Google Scholar, surveys or own estimation. More about ranking see [10] and [11].

D. The Global Innovation Index

The Global Innovation Index "is the simple average of the Input and Output Sub-Index scores" [9]. This index provides the multi-dimensional view of innovation. Fig. 1 describes the structure of the GII; Innovation Input Sub-Index involves five pillars: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. Innovation Output Sub-Index is divided into: (6) Knowledge and technology outputs and (7) Creative outputs. And each pillar is composed from several indicators.

Data for evaluation are collected from more than 30 various sources (including five surveys), for example OECD, Webometrics, Google Scholar, surveys or own estimation.

III. RESULTS OF RANKINGS OF EDUCATION NATIONAL SYSTEMS AND COMPARISON OF THESE RANKINGS

Fig. 2 describes the ranking of the top of 25th countries in 2015 for rankings Educational for All Development Index (EDI), The Best Countries for Education Rankings and U21 Ranking of National Higher Education Systems. Not every countries are involved in every rankings (see chapter II).

Innovation Environment and the Quality of National Education System

TABLE I.

Rank	Ranking of national education systems in 2015		
	EDI[a]	BC[b]	U21[c]
1	United Kingdom	United Kingdom	USA
2	Italy	Canada	Switzerland
3	Japan	USA	Denmark
4	Kazakhstan	Germany	Finland
5	Norway	France	Sweden
6	Finland	Australia	Canada
7	Switzerland	Sweden	Netherlands
8	New Zealand	Japan	United Kingdom
9	Cyprus	Denmark	Singapore
10	Sweden	Netherlands	Australia
11	France	New Zealand	Belgium
12	Denmark	Austria	Norway
13	Slovenia	Ireland	Austria
14	Ukraine	Italy	Germany
15	Hungary	Luxembourg	Hong Kong SAR
16	Ireland	Spain	New Zealand
17	Netherlands	Singapore	France
18	Lithuania	Korea	Ireland
19	Kyrgyzstan	Portugal	Israel
20	Croatia	Russia	Japan
21	Iceland	Israel	Taiwan-China
22	Tajikistan	Chile	Korea
23	Spain	Czech Republic	Czech Republic
24	Australia	Greece	Spain
25	Luxembourg	Hungary	Portugal

a. UNESCO – Educational for All Development Index (EDI), source [6]

b. The Best Countries for Education Rankings, source [7]

c. U21 Ranking of National Higher Education Systems, source [8]

Fig. 1.   RANKINGS OF NATIONAL EDUCATION SYSTEMS IN 2015

When we compare the structure, input data and the results of each ranking, so we have to say:

- UNESCO – Educational for All Development Index (EDI) is primary focused on primary education system and literacy. The measuring the quality of education through the survival rate is partially misleading. Many interesting countries not included in the evaluation, for example from Central Europe.

- The Best Countries for Education Rankings is fairly simplistic; it is based on evaluation of top quality universities, public education system and availability of university education. Many interesting countries not included in the evaluation, for example from North Europe (Finland, Norway) or Switzerland, which are famous for the quality of education.

- U21 Ranking of National Higher Education Systems declares focusing on higher education system. For evaluation are included fifty the most developed countries. The evaluation is the most complex and mostly based on official representative data.

Fig. 3 shows the values of U21 Ranking of National Higher Education Systems in years 2014, 2015 and 2016 for first 30 countries.

TABLE II.

Rank	U21 Ranking of National Higher Education Systems		
	2014	2015	2016
1	United States	United States	United States
2	Sweden	Switzerland	Switzerland
3	Canada	Denmark	Denmark
4	Denmark	Finland	United Kingdom
5	Finland	Sweden	Sweden
6	Switzerland	Canada	Finland
7	Netherlands	Netherlands	Netherlands
8	United Kingdom	United Kingdom	Singapore
9	Australia	Singapore	Canada
10	Singapore	Australia	Australia
11	Norway	Belgium	Belgium
12	Austria	Norway	Norway
13	Belgium	Austria	Austria
14	Germany	Germany	Hong Kong
15	Hong Kong	Hong Kong	New Zealand
16	New Zealand	New Zealand	Germany
17	Ireland	France	France
18	France	Ireland	Israel
19	Israel	Israel	Ireland
20	Japan	Japan	Japan
21	Korea	Taiwan-China	Taiwan-China
22	Taiwan-China	Korea	Czech Republic
23	Spain	Czech Republic	Korea
24	Portugal	Spain	Spain
25	Slovenia	Portugal	Portugal
26	Czech Republic	Slovenia	Slovenia
27	Italy	Italy	Malaysia

Rank	U21 Ranking of National Higher Education Systems		
	2014	*2015*	*2016*
28	Malaysia	Malaysia	Italy
29	Hungary	Saudi Arabia	Saudi Arabia
30	Saudi Arabia	Hungary	China

Fig. 2. RANKINGS OF COUNTRIES OF U21 RANKING OF NATIONAL HIGHER EDUCATION SYSTEMS [8]

Fig. 4 shows the values of the Global Innovation Index in years 2014, 2015 and 2016 for first 30 countries.

TABLE III.

Rank	The Global Innovation Index		
	2014	*2015*	*2016*
1	Switzerland	Switzerland	Switzerland
2	United Kingdom	United Kingdom	Sweden
3	Sweden	Sweden	United Kingdom
4	Finland	Netherlands	USA
5	Netherlands	USA	Finland
6	USA	Finland	Singapore
7	Singapore	Singapore	Ireland
8	Denmark	Ireland	Denmark
9	Luxembourg	Luxembourg	Netherlands
10	Hong Kong	Denmark	Germany
11	Ireland	Hong Kong	Korea
12	Canada	Germany	Luxembourg
13	Germany	Iceland	Iceland
14	Norway	Korea	Hong Kong
15	Israel	New Zealand	Canada
16	Korea	Canada	Japan
17	Australia	Australia	New Zealand
18	New Zealand	Austria	France
19	Iceland	Japan	Australia
20	Austria	Norway	Austria
21	Japan	France	Israel
22	France	Israel	Norway
23	Belgium	Estonia	Belgium
24	Estonia	Czech Republic	Estonia
25	Malta	Belgium	China
26	Czech Republic	Malta	Malta
27	Spain	Spain	Czech Republic
28	Slovenia	Slovenia	Spain
29	China	China	Italy

Rank	The Global Innovation Index		
	2014	*2015*	*2016*
30	Cyprus	Portugal	Portugal

Fig. 3. RANKINGS OF COUNTRIES OF THE GLOBAL INNOVATION INDEX [9]

IV. METHODOLOGY

Due to the absence of relevant data in the rankings EDI and The Best Countries for Education Rankings (for reasons see chapter III), will be emphasis for analysis on the U21 Ranking of National Higher Education Systems. For comparison are used data for 49 countries involved in U21 Ranking of National Higher Education Systems (every country expect Tchai-wan) and data from the Global Innovation Index from 2016.

To answer the question of whether there is a dependence between the evaluation of the national innovation environment and the evaluation of national education systems, they will be selected correlation and regression analysis.

V. RESULTS

The statistical dependence between rankings from U21 Ranking of National Higher Education Systems and the Global Innovation Index is confirmed. Spearman correlation coefficient is 0.921655 (it means very strong dependency). Fig. 4 is a scatter plot that represents the strength of a linear relationship between both rankings (R^2 is a little bit lower than Spearman coefficient − 0.8494).
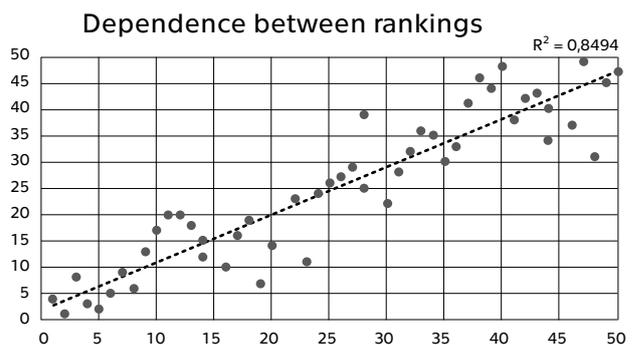
Fig. 4. Dependence between rankings from U21 Ranking of National Higher Education Systems and the Global Innovation Index

The statistical dependence between values from U21 Ranking of National Higher Education Systems and the Global Innovation Index is confirmed too. Pearson correlation coefficient is 0.916883 (it means very strong dependency). Fig. 5 represents the strength of a linear relationship between both rankings (R^2 is a little bit lower than Pearson coefficient − 0.8407).

Innovation Environment and the Quality of National Education System

Dependence between values of evaluation
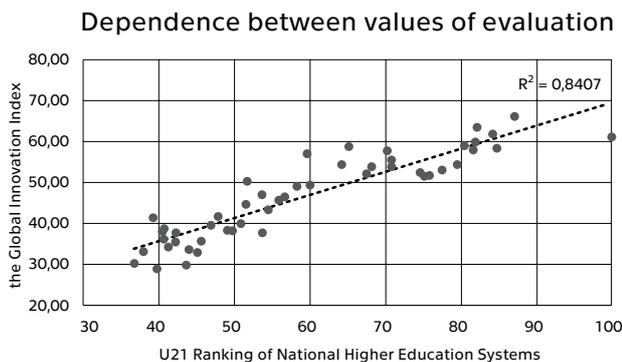
Fig. 5. Dependence between value of indexes from U21 Ranking of National Higher Education Systems and the Global Innovation Index

To complement the statistical dependence between values from UNESCO − Educational for All Development Index (EDI) and the Global Innovation Index is confirmed too, but it is weak. Pearson correlation coefficient is only 0.650633 and it was possible to use only data about 32 countries from 2012 (17 countries was not evaluated by EDI). And the statistical dependence between rankings from The Best Countries for Education Rankings and the Global Innovation Index is confirmed too. Spearman correlation coefficient is 0.786973.

Fig. 7 shows the values of correlation coefficient between results of the score and the rank of the Global Innovation Index and rankings of national education systems.

TABLE IV.

Global Innovation Index	Ranking of national education systems in 2015		
	score EDI	*rank BC*	*score/rank U21*
score	0.650633	-0.788286	0.921655
rank	-0.691826	0.786973	0.916883

Fig. 6. Values of correlation coefficient

VI. CONCLUSION

One of the factors involving the innovation environment is the quality of education system, especially the quality of higher education system. Three main rankings of education national system are The United Nations' Educational, Scientific and Cultural Organization's (UNESCO) Educational for All Development Index (EDI); U.S. News Best Countries Rankings and U21 Ranking of National Higher Education Systems). But only one of them (U21 Ranking) is constructed as multi-attribute and its attributes have relation to the factors that involve the innovation environment (measuring by the Global Innovation Index − GII). Dependency between these two rankings (U21 Ranking and

GII) is very strong. Disadvantage of U21 Ranking is that it focuses only on higher education system for selected 50 countries of the world.

ACKNOWLEDGMENT

REFERENCES

[1] University Rankings | Top Universities (n.d.). Retrieved October 18, 2016, from www.topuniversities.com/qs-world-university-rankings.

[2] Academic & University News | Times Higher Education (THE) (n.d.). Retrieved October 8, 2016, from www.timeshighereducation.com

[3] ARWU World University Rankings 2016 | Academic Ranking of World Universities (n.d.). Retrieved October 18, 2016, from www.shanghairanking.com

[4] CWUR | Center for World University Rankings [(n.d.). Retrieved October 18, 2016, from cwur.org

[5] Welcome to Ranking Web of Universities | Ranking Web of Universities (n.d.). Retrieved October 8, 2016, from www.webometrics.info/en

[6] The Education for All Development Index | Global Education Monitoring Report (n.d.). Retrieved October 18, 2016, from en.unesco.org/gem-report/node/888

[7] U.S. News & World Report News, Rankings and Analysis on Politics, Education, Healthcare and More (n.d.). Retrieved October 18, 2016, from www.usnews.com

[8] U21 Ranking of National Higher Education Systems (n.d.). Retrieved October 18, 2016, from www.universitas21.com/article/projects/details/152/u21-ranking-of-national-higher-education-systems

[9] Global Innovation Index | Winning with Global Innovation. (n.d.). Retrieved October 20, 2016, from www.globalinnovationindex.org

[10] Williams, Ross. National Systems of Higher Education: The U21 Rankings. *International Higher Education,* 2016, 84: 6-7

[11] Millot, Benoit. International rankings: Universities vs. higher education systems. *International Journal of Educational Development*, 2015, 40: 156-165.

University Positions from the Knowledge Management's Point of View

Jozef Hvorecký

Vysoká škola manažmentu/City University of Seattle
Bratislava, Slovakia
jhvorecky@vsm.sk

Abstract— **This paper analyzes academic and non-academic university ranks from the perspective of Knowledge Management. As the prevailing majority of university employees are knowledge workers, we concentrate on the balance between the knowledge strongly oriented to a particular research field and the one necessary for general (predominantly managerial) duties. The following questions are discussed: What categories of knowledge workers are typical for universities and what do we expect out of them? Do the different positions require different knowledge and skills? Why do the differences exist?**

Based on our findings we conclude that the traditional procedures of assigning academicians to university top positions (still persisting in some Central and Eastern European countries) contradict Knowledge Management principles.

Keywords—*university knowledge worker; university human resources; balancing explicit and tacit knowledge*

I. INTRODUCTION

Traditional managerial approaches concentrated on people as manpower, not on the exploitation of their intellectual capital. Peter Drucker [1] was the first one who pointed to the fact that people's knowledge is another production power and assigned the term "knowledge worker" to individuals who "think for living". The knowledge workers are the persons whose primary source of income is based upon and exploits their cerebral capacity and intellectual capability. Their position in the production process in very specific − they are rarely involved in it directly. Drucker therefore underlines the importance of developing strategies that will lead to optimal incorporation of their knowledge in production. Otherwise, the company neglects a big portion of its potential.

Nonaka and Takeuchi [2] later explained the specific position of knowledge workers for product innovation and continuing improvement by distinguishing two categories of knowledge: explicit (visible, apparent) and tacit, hidden in their brains. After a successful transfer of tacit knowledge into explicit one and incorporating the outcome into products, one gets "knowledge-intensive products" like robots or intelligent cars.

In companies, knowledge workers occupy a variety of positions: designers, developers, marketing managers, etc. Each of them requires different knowledge, skills and experience influenced by their education, position, and practice. As this applies to any knowledge worker, no two knowledge workers are identical. So, they cannot be easily shifted from their positions to new ones without a detailed consideration whether the change is possible and brings benefits in the future. In our paper, we discuss these issues in the university environment.

Nonaka and Takeuchi also underlined the importance of conditions in which knowledge workers act. They therefore stress the necessity to build ba − the environment designed and developed for knowledge workers in order to enhance originating, dialoguing, exercising and systemizing their knowledge [2]. To succeed in knowledge development and transfer, there must also exist knowledge workers responsible for building appropriate ba's. It especially applies to universities as the prevailing majority of staff are knowledge workers.

Nonaka and Takeuchi's results indirectly points to the necessity to discuss knowledge workers management as another specific field of management − a natural extension of traditional human resource management. Its standard approaches simply do not fit to knowledge workers. Mládková reacted to this challenge by introducing specific, knowledge-worker-tailored methods of approaching them [3].

Still, Mládková's framework addresses "all" knowledge workers. As the range of knowledge-intensive professions varies from research through technology to arts, her results are still undesirably general. To focus better on specifics of knowledge worker management, Kess [4] identified six types of knowledge workers categorized by different proportions between their tacit and explicit knowledge. His approach allows more specific analysis of their functions and, as a consequence, a better correspondence between person's characteristics and their perspective roles in their organizations.

The correspondence between the personal characteristics and the person's role in his/her

organization can also be studied from another angle – from the point of view of the particular branch of industry. This research direction concentrates on enhancing specific professional requirements expected to be owned by knowledge workers. Rábeková [5] applied such an approach to adult education. She designed and developed a method of facilitating educators' intellectual capital by intensifying their collaboration with their would-be learners. Bohumelová and Hvorecký [6, 7] suggest a way of using Knowledge Management's approach in the field of arts. This need seems to grow. For example, Šestáková [8] points to the importance to distinguish between different types of knowledge necessary for executing positions in banking and finance, too. The author have already applied elements of Kess' approach to university knowledge workers.

In this paper, the ideas discussed in [9] are expanded into two directions:

- Six typical profiles of university knowledge workers are specified in more detail. The categorization is accompanied by examples of typical representatives for each category.

- Due to the exploitation of their tacit knowledge, the experts cannot always explain their solutions – the solutions are too deeply rooted in their minds. As shown in [10], knowledge workers' considerations are not always fully rational. This also implies that our confidence in their knowledge and skills must be limited. It can be very high in the field of their expertise because they have a lot of rational and not-fully-rational knowledge here. Conversely, outside of their field of expertise their knowledge is usually at the level of common people, i.e. much lower than that of specialists. For this reason, to delegate to them functions not corresponding to their professional area is accompanied by risk. Each and every such step must be seriously scrutinized and its consequences examined.

In Section 2, we introduce two typologies applicable to knowledge workers.

In Section 3 we apply each of them to university knowledge workers.

In Conclusions we outline basic rules the universities should follow in order to progress and evolve. Our analysis shows that not all alterations leading to improvement are the university's hands. In detail, we discuss the situation in Slovakia and show some barriers done by Slovak legislation. Unless they are removed, the universities cannot accomplish alterations recommended by Knowledge Management.

II. TYPOLOGIES OF KNOWLEDGE WORKERS

In this section, we introduce two typologies of knowledge workers and point to similarities between them.

A. Balance between Explicit and Tacit Knowledge

Kess [4] identified six categories of knowledge workers and pigeonholed them by different proportions between their tacit and explicit knowledge – see Figure 1.
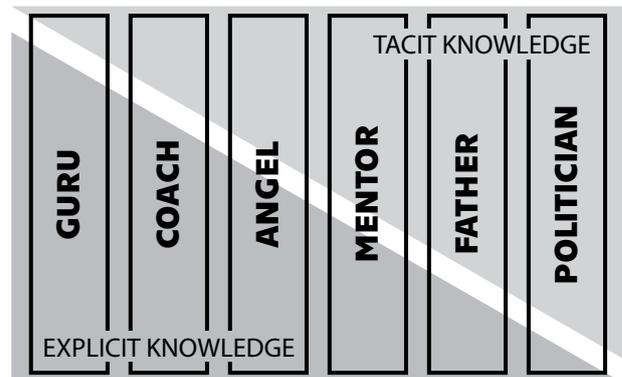
Fig. 1.   Kess' typology of knowledge workers.

By explicit knowledge, Kess especially addresses the one which is important for a well-defined specialization of an individual. By tacit knowledge he means its portion addressing more general skills and competencies.

- *Guru* has deep professional knowledge about a specific area. His interests are strongly connected to his/her expertise and may not go far beyond it. His/her tacit knowledge in his/her domain is both extensive and intensive but has a limited applicability in areas not relating to his/her profession. His/her long and rigorous expertise helps him/her to solve non-standard professional problems in a creative and innovative way – more effectively and efficiently than most specialists working in the same field would do. On the other hand, his/her too strong professional orientation may prohibit his/her relevant experience in other fields and make him/her a bit "autistic".

- *Coach* is also a specialist in a well-defined field but – in addition to that – he/she also comprehends the importance of connections between his/her field and the rest of the world. He/she is interested in them, in their mutual intersections and influences. He/she is capable of innovativeness not only inside his/her specialization but also in creating new links between it and its surroundings. He/she understands informal (unspoken) requirements on his/her field outcomes, e.g. the necessity to tailor the product's features to their users' qualification, mentality and habits.

- *Angel* is a facilitator i.e. an engine of progress. He/she does not need to belong among top field specialist. At the same time, he/she must be capable to contribute to a particular business (or businesses) by assigning needed resources or by his/her capability to acquire them and controlling their effective and efficient utilization. His/her main role is to contribute to the development of appropriate ba for other knowledge workers – "true" field specialists. His/her tacit knowledge must include a wide surroundings of the field and ability to recognize what is critical for the success of his/her effort. Otherwise, he/she would waste his/her time and other resources – including those of his/her partner knowledge workers.

- *Mentor* typically has an extensive experience in a field of knowledge. He/she is willing to share it with his/her prospective followers. His/her tacit knowledge must include the ability to select gifted candidates and the capability to transfer his/her knowledge, experience and skills to them. He/she also contributes to the development of his/her field by organizing its "marketing" i.e. by presenting it to publics. In this case, the term "marketing" is used in a very broad sense describing any promotion activity and publicity related to the field/product/idea. By their daily activities, the mentors guarantee that the field will continue to exist and will remain vital. In a way, the mentors' key role is to guarantee that the organization will fulfill its functions at the expected level of quality.

- *Father* represents the "face" and the historical background of the business. For his/her neighborhood, he/she also serves as a symbol. (In our interpretation, the "family" can be any team glued by its members' collective vision, values and collaborative activities.) Father's knowledge is strongly combined with his/her "family" values. In a way, his/her sheer presence at the stage gives a warranty to the outsiders that everything is as it should be.

- *Politician* has substantial knowledge about local, national and even international policies relevant to his/her business operations. In organizations, he/she is leading body of the entire company (or of its relevant part). The politicians communicate on behalf of their groups and present their interests to their surroundings. The politician has to be capable of both long-term visions and short-term planning and skilled in combining them with his/her leadership capacity in order to promote his/her organization. The true politicians put an equal sign between their personal success and the success of their vision. The role of politicians is to "open door" for the particular business to the society e.g. by building demand, getting public sources as well as making steps towards changing legislation in the directions suitable for his/her business. It all implies that his/her negotiation skills must be high above average.

B. Book Smart versus Street Smart

Another typology that helps in explaining roles of knowledge workers at their workplaces and their appropriateness to their positions uses distinctions between "book smart" and "street smart" individuals.

A street smart individual (as defined by the Urban Dictionary [11]) is a person who has a lot of common sense and knows what's going on in the world. This person knows what every type of person has to deal with daily and understands all groups of people and how to act around them. This person also knows all the current changes going on in the "streets" and everywhere else and knows how to make his/her own right decisions, knows how to deal with different situations and has his/her own independent opinions. He/she occasionally sets up his/her own rules of game which are then accepted by his/her neighborhood by the power of authority.

The concept was originally developed to explore the "figuring" of smartness through the perspectives of marginalized youth [12] and to capture why some of them are regarded as reputed personalities and/or leaders. This concept is a direct challenge to the dominant discourse of smartness as it operates in schools and produces *"school smart"* individuals. To the marginalized youth, "street smarts" are more important because they are being able to maneuver through structures in their lives such as poverty, the police, street culture, and abusive "others." In opposite, the school smart beings are valued by "well-mannered" communities especially for their predictable and systematic behavior.

The antinomies between those two natures were generalized in [13] for explaining why entrepreneurs have to become (at least to a certain degree) street smart in order to successfully compete in their "entrepreneurial jungle".

In the next chapter, we apply a similar approach to university knowledge workers. Now we point to a relationship between those two types. In particular, Kess' Guru and Politician represent two extremes on the scale "school smart" versus "street smart":

- *Book smart individuals* have highly developed analytical skills obtained during their education at schools and universities. They think things through, tend to be organized and thoroughly prepared with having pre-

elaborated back-up plans in case something goes wrong. Guru is a strongly book smart personality. As a pure thinker, he/she is entirely concentrated on his/her field of expertise and devoted to it. During the years spent in his/her profession, he/she learned to rely on his/her expert knowledge. Often, he/she was not requested or expected to do anything else. The amount of his/her field-oriented knowledge can be tremendous but it is primarily tied to his/her daily routine whatever "routine" it is. A prevailing majority of his/her tacit knowledge relates to his/her professional orientation with minimum links to other fields. As a result, he/she used to be quite impractical in solving problems beyond his/her own specialization. His/her professional domain must be exact (e.g. science and technology). Even in humanities, book smart individuals tend to stress its exact components which help them to introduce and to utilize a solid and rigid terminology and strict rules. This helps them to advance and promote because their systematic approach corresponds to their mentality.

- *Street smart individuals'* intelligence is practical. It has been gained using their specific experiential way, primarily through trials and errors or by self-learning. They tend to be impromptu, are ready to take risk and capable to solve sudden problems in the event of crisis. This is the case of Politicians. Among all knowledge workers identified by Kess, Politicians' dependence on their tacit knowledge (e.g. on instincts and intuition) is the greatest. For the proper execution of their role, they cannot rely on deep, well-specified knowledge from a narrow field. Their explicit knowledge must be overridden by tacit knowledge. To get quick and acceptable results, they must be capable to perform qualified guesses and their guesses must be with a high probability accurate. Depending on the field in which the Politician is active, these estimates may address social trends, business opportunities and risks, market trends, future innovative technologies, areas of investment and others. As not all of their guesses will be correct, Politicians must also be capable to orient themselves in unexpected situations and to find a way out of the troubles.

III. UNIVERSITY KNOWLEDGE WORKERS CATEGORIZED

Based on the above cases of book-smart gurus and street-smart politicians, one can easily guess that Kess' knowledge typology predetermines success of a particular type of knowledge worker in a particular position.

As gurus are "pure thinkers" focused towards their field of experience (and not looking much around), their working positions should respect this fact. At universities, the position of researcher is an appropriate one. Successful researchers have to be fully concentrated on their topics. They should not be (regularly) distracted – within their field of expertise they are invaluable. The gurus have to have their position well-defined. At the same time, their communication with their neighborhood might be difficult. This might result in problems after being placed into a research team. Also, their placement out of their narrow scope of knowledge or a request to change their orientation can result into additional problems. They often continue applying their formerly learned routines to the new field (mistakenly) presuming that they are omnipotent and applicable to all life situations. A typical example such a faulty practice is the usage of "scientometrics" [14] as an omnipotent measuring method of research, technology and innovation outcomes. This application neglects the fact that research publications and technology inventions also have their added "tacit" value(s) exceeding their sheer existence. Another problem with gurus can be their unwillingness to share their knowledge with their neighborhood in order to hold "knowledge power" i.e. a disciplinary power [15] based on strengthening their own position by keeping certain knowledge exclusive for themselves and by prohibiting others from obtaining it.

Coaches combine their expert knowledge with knowledge relevant to their field, yet not connected to its grass roots exclusively. These partner fields can be psychology, engineering, marketing, education – any which bridges a particular field with needs of society. Compare to gurus, coaches are much better prepared for making a step out of their current specialization. Due to their ability to bridge over the barriers, they can ignite or promote interdisciplinary research or open a new research field. This personal characteristics is highly valued around the world – unfortunately, not in Slovakia. The accreditation criteria expect everyone having a permanent orientation and do not support interdisciplinary activities [16]. Due to these restrictions, Slovak accreditation commission often refuses to recognize an interdisciplinary-oriented research publication because it does not fit to a particular "box". As a result of this indirect pressure, interdisciplinary studies have been substantially reduced during the last years. Another type of coach who is absent at Slovak universities is a "textbook writer" – an individual capable of presenting his/her field of knowledge in the way relevant for novices. Again, this function is not adequately valued by university officials and the Accreditation Commission. Surprisingly, uninformed outside observers may get opposite feelings because the publication of learning materials (named "skriptá") is an obligation for promoting to the docent (associate professor) posi-

tion. However, the applicant can write a material of any quality – no one checks it. Due to this fact, many study materials are of low quality, sometimes even plagiarized. The Slovak tertiary education system should develop incentives to activate its potential coaches of all directions. Otherwise no progress in this area will become noticeable in the near future.

Angels are another extinct species at universities. As stated above, they are the persons taking care of the optimal working conditions for others. They should systematically build working environments for them, enhance positive atmosphere and build organizational culture for all partners. They do not need to be top specialist but have to orient themselves in the field, to owe organizational skills and emotional potential to create optimal and friendly atmosphere. Universities which want to prosper should open relevant positions and assign appropriate persons to them, for example former researchers. These persons have their general, solid and well-consolidated knowledge making them capable of estimating future trends and looking behind horizons. The university should give them decisional power (including finance) to support the university's progress in promising areas selected by them. Often, no additional new positions must be created e.g. when professors emeritus are exploited in this way. Angel's roles could also be executed by the heads of departments. Unfortunately, in Slovakia the decisional power of department heads is very restricted by the University Act [17]. In addition, the budget of Slovak public universities is stated separately for every calendar year. This limits freedom for long-term planning and makes angels' long-term visions often obsolete.

Mentors make the future coming. At universities, they pave the road to the massive application of guru's and coaches knowledge by developing new study programs, verifying their ideas, writing publications, performing experiments in laboratories and so on. They cooperate with gurus in order to perform their respective activities in their intended ways and communicate with angels who plan and sponsor these activities. Often, the mentors also collect information from external sources – research centers and leading universities – in order to facilitate design of an innovative and competitive university vision and to develop a realistic strategy for its implementation. The university must have an army of high quality mentors to fulfill its functions in both education and research. To keep their faithfulness, their efforts should be regularly recognized and adequately rewarded.

To succeed, every vision must be introduced by a strong individual (a "father") who will adopt it and sanctify his/her life to its implementation and long-term advancement. As Kess [4] showed, fathers play their critical role in two moments of life: during launching of the company and during its depression. In the first case, their enthusiasm can inspire the others and lead them toward new aspirations. In the second case, he/she has to demonstrate the team's vitality and engage all into its regeneration. The father has to be a strong personality and a compassionate leader. He/she has to be capable of setting up the vision as a holistic body across the university's research fields and study programs. In the given moment, one can hardly speak about any true fathers at Slovak universities. "Being a father" is a lifelong duty and must be taken by a person who is ready to dedicate his/her life to it. For that reason, the fathers are quite exceptional everywhere. At universities, deans and vice-deans should be selected from among fathers. In Slovakia, their difficult position is hampered by its University Act [17], which limits durations of academic functions to the maximum of eight years. The same act also gives a big power to self-governing bodies (the academic senates). The fathers can therefore lack the power to implement their vision. To succeed, they have to master their capability to persuade the academic senates to follow their vision. Unfortunately to them, many Slovak academic communities are conservative and not ready to change their "comfort zones". Consequently, they are not ready to accept those visions which threaten disrupting the status quo. Currently, a new national strategy of education is under preparation [18]. Hopefully, it will give more autonomy to universities. This could allow them to form such an organizational structure which simplifies implementations of their father's visions. Hopefully, some "fathers" capable of designing and implementing positive visions still live and will elevate the system.

Politicians lead their community. While fathers are primarily visionaries, politicians implement their visions. A father and a politician can occasionally be aggregated into one person. If they are separate individuals, the father can remain an "elder statesman" but the politician must be clearly visible. To succeed, the politician must have a strong and comprehensible vision – often inspired by the fathers among academic leaders – and be enthusiastic to accomplish it.

In accordance to Mládková [3], knowledge workers can hardly be ordered to execute a particular task, they must be invited to join the team. So the university processes must be based on the mutual collaboration of all knowledge workers. To simplify the scheme, one can design the following model:

- A father proposes a vision of a new study program or research field. Impulses to do so often come from coaches who have discovered new opportunities for university's activities due to their frequent communication with gurus and mentors and their capability to excerpt innovation elements in these observations.

- Politicians evaluate every opportunity individually and decide whether it is worth of "investment" i.e. its implementation as a new element of a university profile.

- The coaches will then be invited to specify and build bridges between existing traditional fields and the proposed one in order to find appropriate "marketing" strategies.

- If the vision is approved, politicians and fathers invite angels to start forming conditions for its implementation inside the university. The politician's role will be to find external financial and organizational support for it. (That's why the marketing strategies must be already prepared.)

- When the new field gets its final green light, gurus and mentors are invited to accomplish it.

- Eventually, the loop can start again.

The mutual cooperation and deep motivation for the mutual university goals is the necessary tactics for making strong and durable ties between the vision and its followers. The author is quite pessimistic about achieving this state soon because many Slovak universities are divided into smaller alliances by particular interests of groups of departments and faculties. To a larger extent, the current state-of-the-art is caused by the low budget assigned to public universities and education in general [19]. Thus, even if right fathers and politicians will appear, their role may become unbearable.

IV. CONCLUSIONS

As shown above, Slovak universities do not prepare their future knowledge workers in all needed directions. Often, the Slovak university tradition goes in a very opposite direction. For example, the rectors are everywhere expected to be their leaders and university formal representatives (i.e. politicians). At the same time, the Slovak tradition requires them to be top scientists (i.e. gurus). As one can see from our argumentation, these two types are hardly compatible. They may exceptionally meet each other in the same person – but such cases are very rare. In most cases, one of these characteristics will dominate because the prominent features of guru contradict the most requested features of politician – and vice versa. As the ideal image of a Slovak rector requires the presence of both, his/her real image will have weaknesses with their negative consequences to its reputation and, possibly, to the reputation of his/her entire institution.

Let us be optimistic and presume that the newly proposed program of the Slovak educational system [20] will lead to higher autonomy of universities and that the universities will demonstrate their good will to move from traditional conservative institutions to more agile ones. How then would the structure of a university and the composition of its knowledge workers look like?

First, all of the above types of knowledge workers must be present at each university. However, their proportions will differ from institution to institution. As the mentors form the university body, their number will likely be the greatest everywhere. (And it already is.) Soon after the change, there will be very few gurus, not only because high quality gurus are exceptional but many of candidates ran away from the system or the country as there are not angels to build appropriate *ba*. (Partially, due to underfinancing.)

On the other hand a small number of politicians is a condition sine qua non for any institution because their abundance would lead to struggles, possibly "wars", among them – with possibly disastrous consequences. Every larger branch and research field of the university should have its own coaches, angels and fathers. They will guarantee its development in their respective directions. To progress, they should cooperate with each other for the reasons explained in our above model. There is no reason to waste their precious time by any internal struggles. Sooner or later these would be reflected in the university image as shown in [19].

Atop of all, the organizational culture of Slovak universities must change significantly. As shown in [19], there is still lot of unethical behavior from corruption to plagiarism. Unless this improves, the quality of research and education cannot progress. To believe that high reputation of universities and low academic standards are compatible is likely the biggest fault of Slovak academic community. Being an excellent knowledge worker should also mean to be ethically strong – regardless of the person's position in Kess' typology.

As we have indicated above, posing right people to right positions is not enough. At the same time, changes in legislation are necessary. Some have already appeared in [19]. One of their goals is to increase the universities' autonomy. Such a step would likely lead to the diversification of universities because their fathers and politicians could fulfill their visions more easily. Up to now, the criteria of accreditation force them to correct their visions otherwise they risk that the university academic privileges will be reduced or abolished. The Accreditation Commission still believe that "one model fits all". Unless this changes, no progress takes place.

REFERENCES

[1]   P.F. Drucker, Landmarks of Tomorrow. New York: Harper & Row, 270 pp., 1957

[2]   I. Nonaka, H. Takeuchi, The Knowledge Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford University Press. UK. 304 pp., 1995

[3]   L. Mládková, Management of Knowledge Workers, Bratislava: IURA Edition, 190 pp., 2012

[4]   P. Kess, "Knowledge transfusion from external sources to small and medium companies." Proceedings of the conference „Human capital without borders", Portorož, Slovenia, 1157-1164, April 2014

[5]   L. Rábeková, Vzdelávacie stratégie pre malé skupiny špecialistov. PhD. thesis, Vysoká škola manažmentu v Trenčíne, 206 pp., 2016

[6]   M. Bohumelová, J. Hvorecký, "Digitized art promotes the cultural heritage." In: Emerging eLearning Technologies and Applications (ICETA), 13th International Conference on, 5 pp. IEEE, 2015.

[7]   M. Bohumelová, J. Hvorecký: „Museums and Galleries: From Traditional to Learning organizations". In: Emerging eLearning Technologies and Applications (ICETA), 13th International Conference on, 7 pp., IEEE, 2016

[8]   M. Šestáková, "New Demands for Abilities and Skills of Knowledge Workers in the Financial Sector". In: International Workshop on Knowledge Management, Vysoká škola manažmentu v Trenčín, 10 pp., 2016

[9]   J. Hvorecký: Knowledge of University Knowledge Workers. In: Smart City 360°, pp. 783-789. Springer International Publishing, 2016.

[10]   J. Hvorecký, J. Šimúth, B. Lichardus, "Managing Rational and Not-Fully-Rational Knowledge". Acta Polytechnica Hungarica Vol. 10, No. 2, 2013, pp. 121-132

[11]   Urban Dictionary, Street Smart. Available at http://www.urbandictionary.com/define.php?term=street%20smart

[12]   B. Hatt, Street smarts vs. book smarts: The figured world of smartness in the lives of marginalized, urban youth. The Urban Review, 39(2) (2007), 145-166.

[13]   G. Roth (ed.), Street Smart: Competition, Entrepreneurship, and the Future Roads. New Brunswick: Transaction Publishers, 564 pp., 2011

[14]   Wikipedia, Scientometrics. Available at https://en.wikipedia.org/wiki/Scientometrics

[15]   A. A. Huczynski, B. Buchanan, Oganizational Behavior, 8th ed. Pearson, Harlow, 2013, p. 770

[16]   Akreditačná komisia Vlády SR, Kritériá akreditácie. Available at: http://www.akredkom.sk/index.pl?tmpl=kriteria

[17]   Zákon o vysokých školách, č. 131/2002 Z. z.

[18]   J. Nestorová-Dická, Vysoké školstvo v krajinách Vyšehradskej štvroky v čase postsocialistickej transformacie. Acta Geographica Universitatis Comenianae, 57 (2013), pp.195-2011.

[19]   J. Hvorecký, Testament vedca. Promedia, Bratislava, 105 pp. , 2015

[20]   Ministerstvo školstva, vedy, výskumu a športu SR: Tézy k národnému programu rozvoja výchovy a vzdelávania. Available at: http://www.minedu.sk/tezy-k-narodnemu-programu-rozvoja-vychovy-a-vzdelavania/

Nonverbal Deception Detection and its Relation to Emotional Intelligence

Soft Skills Among Students of Economics and Management

Lenka Mynaříková

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological Studies
Prague, Czech Republic
lenka.mynarikova@cvut.cz

Abstract—**In the presented study 265 university students attempted to detect truths and lies told by suspects during their videotaped police interviews. Truth detection accuracy was significantly lower than the accuracy found in previous research; lie detection accuracy was not significantly lower or higher. On average respondents were better than chance in lie detection, but worse than chance in truth detection. The stereotype about eye gaze aversion has been confirmed. Differences between deception clues used by successful and unsuccessful men and women indicate gender differences in lie detection in the Czech Republic. All respondents completed emotion intelligence test battery. A negative correlation between lie and truth accuracy rates and well-being was found. Results also suggest a negative correlation between truth detection accuracy and sociability and between lie detection accuracy and happiness, coping with stress and optimism.**

Keywords—*emotional intelligence; lie detection; nonverbal behavior; well-being.*

I. INTRODUCTION

The relationship between emotional intelligence and truth or lie detection accuracy on the observation of nonverbal behavior has already been pointed out in a comparison of Social Skills Inventory scores and deception detection accuracies [1]. As with the detection of truth / lies, only few people score significantly above-average results in tests of emotional intelligence. One might therefore expect that those who score high in one area would achieve above-average results also in the other one. A possible relationship between emotional intelligence and detection accuracy was farther promoted in another research [2], using the Social Interpretation Task, which includes also tasks directly aimed to detecting lies. An interesting contribution from other area of deceptive behavior is a series of studies that have found a close relationship between emotional intelligence and self-deception [3], [4]. Developmental aspect to the issue added research by Dunn and Hughse [5]. Children at the age of 4 years, who achieved better results in tasks aimed at emo-

tional understanding and deceiving others, were about 7 months later better at differentiating and identifying emotions of their mothers and other relatives.

Emotional (EI) and social intelligence, according to different concepts, overlap to some extent, but the main difference is that EI is made up of both intra- and interpersonal factors, while social intelligence comprises only interpersonal components [6]. Since the truth/lie detection is - as mentioned earlier - part of interpersonal communication, but it also depends on a number of intrapersonal factors, it seems more appropriate to use the model of emotional intelligence as a framework for monitoring variables entering the lie detection.

Models of EI can be divided into two categories. The first represents the EI as a set of mental abilities and skills that relate to the processing of emotionally relevant information. This model of abilities includes 4 components – perception of emotions, emotional support of thinking, understanding of emotions and managing emotions [7]. EI in this concept is measured by performance tests, such as the Mayer-Salovey-Caruso Emotional Intelligence Test. The second category is represented by feature models that focus on the perception of own abilities, skills, behavioral tendencies and personality traits. These models emphasize the characteristics of personality, responsible for individual differences in processing of emotional information [8]. In this concept EI is related to personality and is measured by questionnaires and inventories as The Trait Emotional Intelligence Questionnaire. In our research, we followed the second model and tried to investigate the relationship between the truth/lie detection accuracy and EI as a personality characteristic.

II. DECEPTION DETECTION

Deception detection has gained increasing attention in the recent years. One of the important ways to detect lies, which is prominent even in

our daily lives, is the analysis of verbal and non-verbal behavior of liars. People generally look at and evaluate the nonverbal behavior of others, because it is an important communication aspect and the source of information about thoughts and emotions of the communication partner [9]. A variety of studies investigated the role of emotions, cognition or behavior control in the deception and leakage of deception. Emotional arousal during deception may lead to pupil dilatation, higher voice pitch, or more frequent speech distortions [10]. Specific emotions as fear of getting caught, anxiety or guilt may occur and lead to a slower speech rate, gaze aversion, more frequent feet movements, or indirect speech [11]. Feelings of joy or hope may also occur. Cognitive load and a tendency to control behavior lead to other modifications, which may be visible or audible in the verbal and nonverbal behavior of the liar. The variety in quality and intensity of the behavior, experience of the lie detector, possible personal characteristics, and other aspects may affect the deception detection accuracy.

Studies on the nonverbal deception detection accuracy among professionals (police officers, investigators, secret service officers) and laypersons have mostly found a low accuracy in both groups [11], [12]. The accuracy rates are usually below chance, reasons for this are discussed in a couple of profound studies, e.g. [13]. Among the main factors, we can mention the expectations of people that their communication partner is telling the truth, little knowledge in the problems of deception detection, orientation on various deception cues not proved to be connected with deception, or the absence of a training in distinguishing between truth and lies. Yet there are exceptions to the results mentioned beforehand. Ekman and O'Sullivan [14] have found a group of respondents, whose deception detection abilities were high above the average in the population. Those persons of various age, profession or interests had a couple of similar characteristics and were called lie detection wizards. Other studies have investigated this research and have found methodological problems, so it is inconclusive whether there is or is not such a group [15].

Studies on the behavior of liars and the detection of lies may be especially beneficial in fields as forensic psychology and forensic science in general. The psychological support of crime investigation may improve the outcomes of those investigations, whenever police officers and other persons involved feel the need to distinguish between truthful and deceptive statements of suspects or witnesses. The impression of truthfulness or deceptiveness of a statement might lead the investigation in a wrong direction. In some cases, when there is not enough credible witness information or evidence, the tendency to use intuition in the evaluation of suspects might become more prominent [16].

Deception has also become a growing problem in the field of employee recruitment. One in three applicants falsifies information about their education, praxis, or work responsibilities [17]. It has been also suggested that lying of managers may have a destructive impact on their employees. It might lead to the loss of trustworthiness, task delegation, or work effectivity evaluation [18]. Dishonesty of job applicants to present information during the recruitment is connected to non-effective behavior such as absenteeism, drug abuse, disciplinary problems, and other behavior, that may be highly financially demanding for the organization [17], [19], [20]. There is only a limited amount of information on the lie detection accuracy during recruitment. Only few studies were directed precisely to this area, e.g. [21].

III. GOALS OF THE STUDY

The study focused on the area of deception detection through monitoring of nonverbal and paraverbal expressions. The main goals of the conducted research were: (1) Identification of average lie, truth and total deception detection accuracies, (2) Identification of nonverbal cues to deception used by respondents, (3) Investigation of possible relationship between deception detection and factors of emotional intelligence.

IV. METHOD

A. Participants
There were 265 respondents (age range 19-26), 143 men and 122 women, all of them were students of an economics and management study program with specializations in human resources and human resources management.

B. Procedure
Respondents were asked to judge the veracity of testimony of real people in real "high stakes" situations. Specifically, they saw 21 video clips depicting 7 suspects and 1 witness (6 men and 2 women) from the criminal investigation. Camera position was changing; in some cases, it showed face or upper body, in others it scanned the whole scene, including investigator, other characters and environment. There were 5 investigated crimes and all involved murder and/or robbery. Records were modified so that it was not possible to understand the verbal language, yet the nonverbal a paraverbal characteristics of speech were preserved. We chose such cases, in which there was evidence for the truthfulness or falseness of the testimony of the person interviewed (information from the file materials). Respondents who wanted to further cooperate wrote down their contact information (name and e-mail), otherwise they could provide only gender and age. Then they were given instructions: "You will see a set of videos in which people submit testimony regarding a committed crime. Throughout each testimony,

you will hear either true or untrue statements. After viewing each video clip, please write in the sheets whether the person you saw was lying or telling the truth and disclose what led you to your decision." The length of each clip was approximately 30 seconds and among the 21 video clips there were 12 truthful and 9 false testimonies.

Respondents reported their answers in a recording sheet. Along with determining whether the investigated person was telling the truth or lying, they wrote down their reasons for this decision. They had to decide to what extent various stereotypical cues to deception detection relate to lying. We obtained description of cues that respondents actually used in the detection of deception and we also learned about their beliefs regarding these clues. In reality people do not necessarily use those clues, which they theoretically connect with lying. The combination of these two methods thus provides a more detailed view.

Finally, respondents filled a sheet with a set of 19 stereotypical clues, often associated with lying behavior. On a 5 point Likert scale they had to label to what extent they related those clues to actual lying. Due to the group administration this research phase took approximately 90 minutes.

In the second phase of the study respondents filled a battery of three tests, focused on emotional intelligence. The reasons for choosing emotional intelligence as a possible personality variable related to lie detection are explained above. Selected tests were TEIQue – The Trait Emotional Intelligence Questionnaire [8], STEM – Situational Test of Emotion Management [22], and STEU – Situational Test of Emotional Understanding [22]. Completing the questionnaires took approximately 60 minutes altogether.

C. Variables

Dependent variables were detection accuracy (in percentage and in total scores), reasons supporting respondents' choices about truth and lies, stereotypical cues to lie detection and emotional intelligence scores.

Detection accuracy was calculated so that the correct answer was assigned with score of 1 and false answer with a score of 0. Accuracy has two components - lie detection accuracy, calculated by dividing the number of correctly identified false testimonies with the total number of false testimonies; and truth detection accuracy, obtained by dividing the number of correctly identified truthful testimonies with the total number of truthful testimonies. The number of truthful and false testimonies was not equal to eliminate the effect of guessing. Potential influence of the truth or lie bias on the results was examined after calculating the accuracy scores separately. We found a significant difference, suggesting the results were affected by lie bias.

Behavioral cues, by which respondents differentiated between true and false statements, were investigated by an open question in the answer sheet ("Please, write down what helped you to decide"). We only followed the currently used clues to deception detection in the projected video clips. Some researchers monitored whether there was a change in the answers if respondents answered the question both before and after the screening of videos [14], [24], but the results suggest there are no significant differences. The responses were coded by two independent coders to ensure greater reliability of the coding system. Respondents mentioned 52 behavior cues, which were coded into 7 superior categories (voice, facial expressions, gestures, emotions, speech, self-control and subjective impression).

To verify the extent, to which the stereotypical cues to deception detection were anchored among respondents, we provided them with a sheet of 19 behavior cues, which were chosen based on the analysis of literature. This allowed us to determine the variable "stereotypical cues".

Emotional intelligence score and its various components were computed for each test we used. For the TEIQue, it is the global score of EI, 4 main factors and 12 subfactors. For STEU, it is the total score, understanding positive emotions, and understanding negative emotions. For STEM, it is total score, managing fear, anger and sadness, and managing emotions at home and in the workplace.

V. RESULTS

The group of respondents was divided into 3 subgroups and each of them saw the video sequences in a different order. To investigate possible differences in accuracy between the 3 orders of video clips, two analyzes of variance were executed with subgroups as an intergroup variable and obtained scores and truth/lie detection accuracy as dependent variables. The ANOVA was not significant neither for the total score, $F_{(2, 27)} = 2.637$, $p = .089$, nor for the detection accuracy, $F_{(2, 27)} = 2.665$, $p = .088$. In subsequent analyzes the scores of respondents were therefore processed together.

The truth / lie detection accuracy rate and its relationship to characteristics of respondents

For the tested group of respondents, lie detection accuracy was 0,627, which is significantly higher than chance and also than the documented average lie detection accuracy of 0,440 [25] at the 0,01 level. Truth detection accuracy was 0,469, which is not significantly lower than chance, but is lower than the documented average truth detection accuracy of 0,670 at the 0,01 level. Total detection accuracy was 0,544, which is significantly higher than chance. Three respondents reached 100 % truth detection accuracy, six respondents

reached 100 % lie detection accuracy and two reached 100 % total deception accuracy. Men were slightly better in all three categories, but the difference is not significant. All accuracies are independent of gender, age and field of studies of respondents.

Behavioral clues, which respondents used to distinguish between true and false information

The most frequently used cue to deception detection was *averting the eye gaze*, mentioned by 113 respondents. The second most frequent clue was *intuition, subjective feeling*, mentioned by 101 respondents. Facial expression, subjective feeling and speech characteristics were the most commonly used clues to deception in both false and true testimonies. Between the number of criteria used in false and truthful video clips there was no significant difference. Examining the differences between successful and unsuccessful respondents indicated that successful men relied more often on facial expressions and unsuccessful on speech cues. On the other side, successful women relied on speech cues and unsuccessful women relied on facial expressions. These differences were significant at the 0,05 level, but need to be verified on a larger sample of respondents.

Analysis of variance also showed that successful and unsuccessful respondents did not differ significantly from each other in evaluation of stereotypical cues to deception detection. Respondents evaluated direct eye gaze, short pauses in speech and straight posture as the most definite cues to deception. Successful and unsuccessful respondents differ significantly from each other only in two items. Unsuccessful respondents related *increased respiratory rate* more often with lying. while successful respondents agreed more often with the cue *repeating phrases and words*. Correlations for the most common stereotypical cue to deception detection, "averting the eye gaze", did not significantly distinguish between the successful and unsuccessful respondents.

The relationship between demographic variables and TEIQue scores

When administering the test TEIQue, we achieved relatively high internal consistency of the test, r = 0,816. For the TEIQues, no correlation was found between global trait of EI or 4 basic factors and age or gender of respondents. Among the subscales correlation appeared between age and optimism (r = 0,672, p < 0,05).

The relationship between TEIQue, STEU, STEM and lie detection accuracy

Among the main factors significant correlations were established between *lie detection accuracy and well-being* (r = - 0,629, p < 0,01) and between *truth detection accuracy and well-being* (r = - 0,613, p < 0,01) and *sociability* (r = - 0,536, p < 0,01). Among the secondary factors lie detection accuracy correlated significantly with *happiness* (r = - 0,693, p < 0,05), *coping with stress* (r = - 0,570, p < 0,05), and *optimism* (r = - 0,670, p < 0,05). Detection of truth correlated significantly with *confidence* (r = - 0,614, p < 0,05), *social awareness* (r = - 0,617, p < 0,05), *impulsivity* (r = 0,670, p < 0,01) and *adaptability* (r = - 0,670, p < 0,01). Except for impulsivity, all of these correlations were negative. Only well-being correlated significantly with both truth and lie detection.

Neither truth nor lie detection accuracy correlated significantly with results obtained from tests STEU and STEM (STEU total score, understanding positive emotions in STEU, understanding negative emotions in STEU, total score in STEM, managing fear, anger and sadness in STEM, managing emotions at home and dealing with emotions in the workplace in STEM). The accuracy of lie detection correlates negatively, but not significantly, with total score in STEU and with total score in STEM. Scores in tests STEU and STEM were not significantly different between successful and unsuccessful respondents neither in truth detection nor in lie detection.

VI. DISCUSSION

Many studies with students, but also with professionals, came to conclusion, that people are no better than chance in detecting deception. Our results show *above average results for both lie detection and total detection accuracy*. Lie detection accuracy was also significantly higher than the documented lie detection accuracy of 44%, reaching above 60%. Truth detection accuracy found in our study was significantly lower than chance. Respondents reached average truth detection accuracy rates under 50 %, which is also significantly lower than the documented truth detection accuracy 67%.

Discrepancy between lie and truth detection accuracies may be affected by the aforementioned **lie bias** – tendency to evaluate people, situations or statements as deceptive rather than as truthful. Lie bias is typical for police officers, secret service agents and other specialized groups, which are in a close contact with deceitful persons or persons who conceal information. In a general population we would expect the existence of truth bias, i.e. a tendency to evaluate statements, situations, and behavior as truthful. People in general should be expecting others to be truthful and trustworthy [25]. Yet our respondents showed similar tendency to evaluate the statements of suspects as deceitful. It is possible that students expected the persons in video clips to be lying as the study was aimed to deception detection. It is also possible that respondents from our research are more suspicious in general. Results may be affected by stereotypical beliefs about cultural or gender identity etc. Especially respondents considered the suspects of different nationality than theirs, op-

Nonverbal Deception Detection and its Relation to Emotional Intelligence

posite gender than theirs, younger suspects, and suspects with distinct features (e.g. a man with a bald head) to be more deceitful than others.

Also we studied the deception detection ability in nonverbal and paraverbal setting. Respondents could not recognize exact words, only the tone of voice, lenght of speech pauses and other paraverbal characteristics of voice and they could se nonverbal behavior as hand and feet movements, various position shifts, eye movements etc. The question might be whether our respondents would reach similar accuracies in a verbal setting.

From the general point of view, it is important to reflect the *impact of the characteristics of our research sample and materials used for the study*. The people in our research video clips are in a real and very stressful high stake situation and they might be highly motivated to lie. The sample of the people that are portrayed at the video clips is very diverse according to age, criminal experience, gender, intelligence and other characteristics. The use of real life investigation footage in our study is helpful in creating a reliable set of truthful and deceptive statements, but those materials, which are common for groups as police officers, are unusual for students. They would probably experience other types of deception and deceiving persons would have different level of motivation than crime suspects. The video materials might also affect the expectations of respondents – the crime investigation scenario may imply that the persons in question would be lying simply because of the fact that they were suspected of the crime.

In the study we found only few respondents, whose deception detection accuracies were high above the average and who reached 100 % accuracy. In existing researches, e.g. [26], such extraordinary lie detectors were called lie detection wizards, but there is an ongoing debate about this concept. We would need to repeat the research with the same group of respondents to investigate, whether their results would be stable in time.

The results of behavioral clues that were indicative for lie were evaluated according to the information given by the respondents. The *stereotype about eye gaze aversion* has been confirmed – it was mentioned by more than a half of respondents. As for other behavioral clues, the connection of this clue with lying has not been discovered in any study [11], [28]. Another trend in the beliefs of the respondents in our sample was focused on *intuition, a subjective feeling* that is connected with preference of the complex evaluation of the behavior. Very interesting is *the inverse tendency found in men and women* – successful and unsuccessful ones. The focus of successful men was on facial expression and the focus of successful women was on speech – in the cases of unsuc-

cessful groups the focus was exactly opposite. These results are however preliminary and have to obtain more attention.

Successful respondents indicated the **r***epeating of the phrases and words* and **s***haking and shifting* as a clue to deception, the unsuccessful ones referred about expected connection between lie and *increased respiratory rate*. These are results obtained from the questionnaire about the beliefs of the respondents. We cannot be sure, if they really use these clues or if they are fully aware of the clues they use for the evaluation of the detection of deceit.

Based on the results of TEIQue we found an interesting *negative correlation between lie and true detection accuracy and well-being*. Research has repeatedly demonstrated that extraverted, emotionally stable people are more satisfied with life [29]. The level of well-being significantly affects the quality of interpersonal relationships [30].

We also found a *negative correlation between truth detection accuracy and sociability*. Based on the secondary factors we found a *negative correlation between lie detection accuracy and happiness, coping with stress and optimism*. Several studies have shown that positive mood promotes a heuristic processing of information, e.g. [31]. *Truth detection accuracy correlated negatively with confidence, social awareness and adaptability, positively with impulsivity*. All these results will obtain further attention.

In a planned follow-up research, we would like to achieve a balanced number of men and women among respondents and among interrogated persons, displayed in the video recordings. We could better verify whether the deception detection depends on the gender of respondents and interrogated persons and focus on clues used by men and women. Although variables such as gender and age do not appear to be significant in studies of deception detection, given the current lack of researches on this subject in the Czech Republic it is appropriate to focus on these basic demographic characteristics. Our goal is to obtain data from a wide range of respondents, e.g. police officers and others who are faced with the task of lie detection in their profession. We would also like to increase the number of video clips to obtain more precise data about respondents and sufficiently eliminate the effect of chance. The successful respondents will be further retested with a new set of video clips and will complete a test battery.

Due to the low informative value of STEM and STEU tests for our purposes we would probably replace them with another method, focused on well-being, stress management and/or perceived feeling of happiness that have been shown to be important factors related to successful deception detection. In our sample, well-being seemed to

be the most important factor of emotional intelligence related to deception detection accuracy. We should keep in mind that well-being, according to our results, affects the deception detection accuracy in a negative direction; hence a lower level of well-being is associated with higher detection accuracy. Among the variables that are important in relation to personality and well-being, neuroticism and extraversion might be investigated in further researches. Also the positive influence of faith, which may lead to a higher level of well-being and lower divorce rates, depressiveness, anxiety or suicidality, has been pointed out [32]. It would be interesting to include a method oriented on these variables into the test battery.

REFERENCES

[1] Riggio, R.E. (1987). The Charisma Quotient. New York, NY: Dodd, Mead.

[2] Costanzo, M., Archer, D. (1993). The Interpersonal Perception Task - 15 (IPT-15). A Guide for Researchers and Teachers. Berkeley, CA: University of California Extension.

[3] Erez, A., Johnson, D. E., & Judge, T. A. (1995). Self-deception as a mediator of the relationship between dispositions and subjective well-being. Personality and Individual Differences, 19, 597-612.

[4] Sahdra, B., & Thagard, P.R. (2003). Self-Deception and Emotional Coherence. Minds and Machines, 13(2), 213-231

[5] Dunn, J., & Hughes, C. (1998). Young children's understanding of emotions within close relationships. Cognition and Emotion, 12, 2, 171-190.

[6] Austin, E. J., Saklofske, D. H., & Egan, V. (2005). Personality, wellbeing and health correlates of trait emotional intelligence. Personality and Individual Differences, 38, 547-558.

[7] Mayer, J.D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey & D. Sluyter (Eds.) Emotional development and emotional intelligence: Educational implications (pp. 3-31). New York, NY: Basic Books.

[8] Petrides, K. V., & Furnham, A. (2001). Trait emotional intelligence: Psychometric investigation with reference to established trait taxonomies. European Journal of Personality, 15, 425–448.

[9] DeVito, J.A. 2008). The Interpersonal Communication Book.New York: Allyn & Bacon, Incorporated.

[10] Ekman, P. (1996). Why don't we catch liars? Social Research, 63(3), 801-817.

[11] DePaulo, B.M., Lindsay, J. J., Malone, B. E., Muhlenbruck, L., Charlton, K., Cooper, H. (2003). Cues to deception. Psychological Bulletin, 129(1), 74-118.

[12] Vrij, A. (2004). Why professionals fail to catch liars and how they can improve. Legal and Criminological Psychology, 9, 159-181.

[13] Blair, J.P., & Kooi, B. (2004). The gap between training and research in the detection of deception. International Journal of Police Science and Management, 6(2), 77-83.

[14] Ekman, P., & O'Sullivan, M. (1991). Who can catch a liar? American Psychologist, 46(9), 913-920.

[15] Bond, C. F. (2008). Commentary: A few can catch a liar, sometimes: Comments on Ekman and O'Sullivan (1991), as well as Ekman, O'Sullivan, and Frank (1999). Applied Cognitive Psychology, 22, 1298–1300.

[16] Porter, S., & ten Brinke, L. (2009). Dangerous decisions: A theoretical framework for understanding how judges assess credibility in the courtroom. Legal and Criminological Psychology, 14, 119–134.

[17] Dalton, D. R., Metzger, M., & Wimbush, J.C. (1994). Integrity testing in personnel selection: Review and research. In G. R. Ferris (ed.), Research in Personnel and Human Resources Management, vol. 12 (125-160). Greenwich, CT: JAI Press Inc.

[18] Bourque, R. (2000). Lying's never a good idea, no matter who's doing it. New Hampshire Business Review, 22(4), 6.

[19] Tesser, A., Millar, M. & Moore, J. (1988). Some Affective Consequences of Social Comparison and Reflection Processes: The Pain and Pleasure of Being Close. Journal of Personality and Social Psychology, 54 (1), 49-61.

[20] Meier, R., & Short, J. (1982). The consequences of white-collar crime. In J. Edelhertz and T. Overcast (eds). White-collar crime: An agenda for research. Lexington, MA: DC Health.

[21] Kraut, R.E., & Poe, D. (1980). Behavioral roots of person perception: The deception judgments of customs inspectors and laymen. Journal of Personality and Social Psychology, 39, 784-798.

[22] MacCann, C., & Roberts, R. D. (2008). New paradigms for assessing emotional intelligence. Theory and data. Emotion, 8, 540–551.

[23] Mann, S., Vrij, A., & Bull, R. (2004). Detecting true lies: Police officers' ability to detect suspects' lies. Journal of Applied Psychology, 89, 137-149.

[24] Vrij, A. (2000). Detecting lies and deceit: The psychology of lying and its implications for professional practice. Chichester: Wiley.

[25] O'Sullivan, M. (2007). Unicorns or Tiger Woods: are lie detection experts myths or rarities? A response to on lie detection „wizards" by Bond and Uysal. Law and human behavior, 31(1), 117-123.

[26] Mann, S., Vrij, A., Bull, R. (2002). Suspects, lies, and videotape: an analysis of authentic high-stake liars. Law and Human Behavior, 26 (3), 365-376.

[27] Costa, P. T., & McCrae, R. R. (1980). Influence of Extraversion and Neuroticism on subjective well-being: happy and unhappy people. Journal of Personal and Social Psychology, 38, 668-678.

[28] Biswas-Diener, R., Diener, E., & Tamir, M. (2004). The psychology of subjective well-being. Daedalus, 133(2), 18-25.

[29] Chaiken, S. (1980). Heuristic Versus Systematic Information Processing and the Use of Source Versus Message Cues in Persuasion. Journal of Personality and Social Psychology, 39, 5, 752-766.

[30] Stríženec, M. (2001). Psychological aspects of spirituality (Psychologické aspekty spirituality). Československá psychologie, 65(2), 118-125.

Culture of Electronic Communication as a Part of Professional Language Training of Students at Secondary Technical and Vocational Schools in Slovakia

Juraj Miština

University of Ss. Cyril and Methodius in Trnava
Faculty of Natural Sciences
Department of Professional Language Communication
Trnava, Slovakia
juraj.mistina@ucm.sk

Abstract—**The paper deals with an important issue of language training of secondary technical and vocational school students for professional practice at the global job market, where, beside the others, foreign language communication skills play a crucial role in placement of applicants in well-defined occupations. Author presents results of the project team and defines communication skills in foreign language along with a development of other key competences. He focuses on the importance of acquiring various forms of electronic communication for professional purposes. The results presented in this paper are unique and the research team has built a specific language-training programme for the target group reflecting the results of investigation.**

Keywords—*component; formatting; style; styling; insert (key words)*

I. INTRODUCTION

How can we best prepare students to succeed in the 21st century? This is a question of paramount importance to most educators, employers and the professional public. The concept of twenty-first century skills and the need to prepare students for global economy and labour market are spreading worldwide. Critical thinking, communication, creativity, and collaboration are four major learning and innovative skills labelled by Partnership for twenty-first Century (2011) in Framework for twenty-first Century Learning [1] (Figure 1). The same document accents information, media and technology skills. Since today, we live in a technology and media-driven environment, marked by access to an abundance of information, rapid changes in technology tools and the ability to collaborate and make individual contributions on an unprecedented scale. Effective workers, thus our target group – the secondary technical and vocational school leavers, must be able to exhibit a range of functional and critical thinking skills, such as:

- Information Literacy
- Media Literacy
- ICT (Information, Communications and Technology) Literacy.
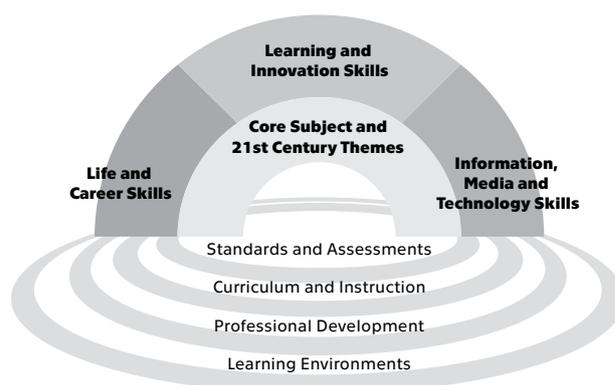
Fig. 1.   Framework for 21st Century Learning [1]

II. ICT LITARACY

The world in which students live has changed dramatically — and educational institutions stand in front of the same task - they must change as well. The explosion of powerful technology has altered traditional practices in workplaces and communities. Fifty years ago, factory and office workers worked on a single machine, performing the same task day after day. Technology has simplified and, in some cases, eliminated such routine tasks, which means there are increasingly fewer positions available to workers with minimal skills. By contrast, there are more opportunities for highly skilled workers. Today, factory and office workers perform multiple tasks on much more sophisticated machines and electronic equipment in workplaces that are constantly evolving to respond to market expectations for customized products and services.

For many students, the impact of technology on everyday life is no surprise. They connect with their friends via e-mail, instant messaging and chat rooms online; search the Web to explore their interests; express themselves fluently using new social media; learn with educational software; play video and computer games in virtual realities; manipulate digital photos; chat on and take photographs with smartphones.

As this paper makes clear, technology is and will continue to be a driving force in workplaces. In this environment, the need for technologically literate citizens and workers increases every year. Skilled people need to understand how to use technology tools. These tools enable people to perform effectively at work and in their daily lives, by using such tools as spreadsheets for calculation, budgeting and building scenarios; graphic and multimedia programs for presentations; databases for research; and networks for communicating with others. Students need to learn how to use the tools to take full advantage of the vast array of research and multimedia resources, digital content and communications options available to them. Although that many institutions, not only those dealing with educational content, and many authors deal with the issues of electronic communication skills and the learning content needs [2] [3] [4] [5] [6] [7] [8].

III. MATERIAL, METHODS AND RESEARCH RESULTS

The above introduction sufficiently justifies the need to integrate the education of students in the field of electronic communications for the target environment of the labour market in order to identify the needs of the target environment. The analysis has been done with a purpose to prepare effective and flexible course of professional English communication to meet the needs of the target professional environment. Within the research phase, we applied mostly qualitative research, using the field research methods including the study of educational documents, interviewing students and teachers, distributing and evaluating questionnaire survey, etc. Therefore, as first, we carried out a needs analysis, in which we approached vocational and technical school students, grammar school students as well as technical school undergraduates within the 5-year period from 2011 to 2015, observing and comparing their real awareness on the culture of electronic communication, particularly on the netiquette oriented towards professional environment. Within the mentioned period, we distributed questionnaires throughout selected schools, and evaluated the students' awareness on professional netiquette (Figure 2).

Awareness of the culture of electronic communication
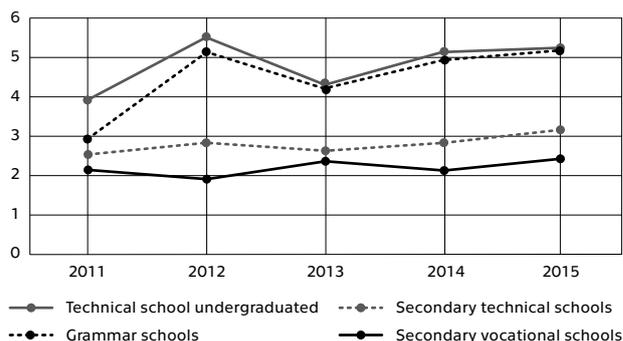
Fig. 2. Students' awareness of the culture of electronic communication in a professional environment

Before carrying out the questionnaire survey, we set out two hypotheses:

1) Only a very small percentage of students have sufficient awareness of the culture of electronic communication in a professional environment;

2) Awareness of the culture of electronic communication is not growing as fast as the development of ICT skills.

As shown by the results projected into the graph, students at all types of secondary schools, have very low awareness of the culture of electronic communication in a professional environment, even lower than we expected. Deviations between students of technical and vocational schools and students of grammar schools are negligible and represent 1.0 % - 1.5 %, what may be considered a statistically insignificant deviation.

The resulting curves show approximately the same results between vocational school students and the students of secondary technical schools. It can be interpreted as the lack of educational content in this area, comparing the students of grammar schools, where the awareness of electronic communication culture is slightly higher, probably due to curricular content that is different from those at vocational and technical schools, especially in language communication, humanities and social science subjects. Anyway, there is nearly zero content oriented on professional communication in the target professional environment, and if there is some, it is, mostly in all cases, minimized on technical vocabulary, but not to technical/professional communication. From interviews with English language teachers, as well as the others, we have found out that teachers are insufficiently informed, loaded by amount of administration, which is not directly related to their professional orientation. Thus, they carry out their work routinely, like 10-15 years ago, even with the same teaching materials (textbooks and workbooks), by traditional forms and methods, they

are not they are motivated to explore and apply new content and new trends in teaching.

The resulting curves show approximately the same results between grammar school students and the technical university undergraduates, what can be interpreted as the same or very same target group, since grammar schools prepare students mainly for tertiary education. So far, we did nor searched for the educational content of the university courses of English language and the progress of this group of students in the field.

Coming back to all the types of secondary schools, the resulting solution might be in the design of the professionally oriented course of English language, helping the teachers with the material development, as well as in-service professional methodological training.

IV. USING THE TEMPLATE

In the globalized world, English is the international language tool for communication in all the fields of professional life. At present, the leavers of secondary technical and vocational schools are exposed to more English information than ever either in grasping the new trends of technological development or interacting with foreigners in future career. According to our survey among potential employers (seven multinational large companies, fourteen small-size companies mostly from IT, automotive and electrical engineering industries, and eight small-size businesses), the three out of eight qualities highlighted by them were related to communication skills. One of them is strong ability to communicate orally and in written forms, the other one is presentation skills, and the last but not least is the ICT being used for the purpose of fast and effective communication with customers, business partners and internally within the company hierarchy. All of the surveyed entities declared the request of communication in English language. Therefore, sufficient technical knowledge and solid English language base, both English language communication skills and specialized knowledge, are required for learning the specialised course, necessary for future technical personnel.

The course is in the process of testing and verifying of the efficiency. Most results have been published in ICEE Conference in Florence 2015 [9] and in Belfast 2016. Currently, the most detailed information, analysis and outputs are going to be presented in the monograph as the output of the research,

So that to fulfil one of the goals of the Project, to investigate correlation of the use of information and communication technologies and teaching professionally oriented foreign language, we have prepared for students the project semester. The feasibility study of the project semester has been verified within the natural pedagogical

experiment on the sample of 36 third-grade students Their knowledge of English was at intermediate level after studying two years of the general English (and former learning of English at basic school) from "New Opportunities" textbooks (Pre-Intermediate /Intermediate). We tested the functionality of the model, methodology and acceptability of selected outputs. We used observation as a method to verify the feasibility of pedagogical experiment in practice. The project focused on three objectives:

- Training and improvement in the technical vocabulary and practice of professional communication in using oral and written professional genres.

- Improving information and computer literacy of students.

- Increasing the share of time working with foreign language beyond the normal teaching.

At this stage, we have used direct action research aimed to enhance, improve and positively influence the educational process. The established practice of traditional methods of working with text was replaced by project teaching, i.e. teaching in which the project teaching is the dominant methodology. Students are facilitated to solve complex problems and gain experience through practice and experimentation. We were thus enhancing the flexibility of the students, their creative thinking, strengthening their communication skills and developing a positive creative atmosphere. Involvement and use of ICT [10] purposefully lead to the increase of students' competence in this field and thus, it should streamline their education.

We selected a set of knowledge and skills from ECDL syllabus as the background and skills that are necessary to practice, acquire or improve. The selection was implemented on the basis of empirical analysis of frequent errors and deficiencies that students make in their use of ICT in solving problems in the learning process. Measurements were compared with measurements of the pilot phase of the project (2014, 2015) on two independent, structurally and size-compatible samples.

For the project, we have chosen the issue of "the History of Inventions". At the beginning of the semester, students become familiar with the project itself, its rules, timing and desired output. The project was spread over ten weeks of the 14-week semester to have a time reserve and time for evaluation. After the end of the experiment, based on the experience gained by observation, feedback, comments and observations of students, we analysed the methodology of the project, its content and formal aspects. The project was carried out within the following syllabus and time schedule:

1st week

Selecting a topic: technical invention, discovery, development (it is good to discuss the possibilities in order to prevent possible misinterpretation, duplication, etc.);

2nd – 3rd week

After topics approval, e.g. "History of metals discovery and processing", students search for, select and backup websites. They collect and process the initial text in MS Word on one side of A4, font Times New Roman pt. 12, 2.5 cm margins, single spacing, justified, with referred resources and the name of the student (!). Students send Word-processed text as an e-mail attachment to the teacher.

4th week

Analysis of the correctness and etiquette of electronic mail and the sent texts, common mistakes, discussion on the used computer skills (copy, paste, format, language settings, spell checking, removing hyperlinks, using the tab key, ...), netiquette (e-mail etiquette), proper sending of formal electronic news.

5th - 6th week

Poster processing - sample (Fig. 2), sent by e-mail:

- In MS Word format, A4;
- Upper area: one quarter, column heading included personal and professional data (name of school in English, word wrap;
- Lower area: three-quarters, two columns (different style has to be discussed);
- The main text of approx. 2000 characters single space, any kind of technical font;
- Pictures, photographs, illustrations;

7th – 8th week

Analysis of posters, discussion;

Task: Preparation of oral 5-minute presentation with PowerPoint support;

- Seminar on "How to efficiently design presentation PowerPoint slides";
- Seminar on "How to successfully present the oral presentation";
- Poster - Transformation MS Word file into a PDF file;
- Submission of a poster (PDF) and PPT presentations in compressed files;
- Printing a poster (regardless of submitted files).

9th week

Presentations of selected topics; evaluation of presentations, exhibition of posters, the best poster competition.

10th week

Evaluation of project activities. Discussion.

After the semester course, we analysed the experience gained by observation and informal conversations with students. The analysis led us to the fact that this project after minor adjustments is suitable for the intended project semester and is effective in the development of language skills and improving communication and information competences.

Results of the analysis and proposed solutions:

- Of the planned 10-weeks, the experiment stretched up to 12 weeks. It will be necessary to improve the course time management by increasing the share of electronic communication with individual students and with the whole group. Theoretical and practical lesson aimed at preparing for an oral presentation move into the third or fourth week. Reduce some selected tasks.
- Some students had a problem with printing the poster. Consider a poster only in electronic form. Provide centralized printing. As one of the top rated activities by student was the competition for the best poster.
- Part of the students was charged with the task of compressing files. Keep this task merely as voluntary.
- Many students have chosen Wikipedia as a source. Establish criteria that Wikipedia cannot be used as the main source for project solution.
- For the oral presentation of the project, two weeks should be allocated.

We were interested in qualitative assessment. At usefulness, students in both experimental groups oscillated between presentations and electronic netiquette. Finally, the majority of both groups agreed that the presentation, including the preparation of the creation of PowerPoint slides was the most useful activity for them. They appreciated that the information was new to them, and that they were given it in the context explained. They expressed the assumption that they will use this experience in professional practice. On the direct question how many of them knew principles of e-mail etiquette prior to this project, only 4 of 36 declared the knowledge. 7 of 36 students considered work on the poster as too difficult. Two students identified it as unnecessary. They answered the question *"why?"* superficially: *"What good will in life the "poster" be for?"* After discussion, and explaining that it was not a post-

er itself, but work with technical foreign language text, while poster was just a form that defined limits, and that while working on the poster they had to train more computer and language skills, they eased their arguments, but insisting that this activity was difficult.

While so far both groups agreed in all tested parameters, in assessing demandingness, any of the students in second group did not indicated poster as difficult. This interesting phenomenon can be explained that in verification of the activity in the pre-research and then in the experimental group, we clarified methodology so that the task was clearly articulated and clearly indicated. The difficult one was designated the task in identifying sources, materials selection and processing of primarily reduced text. Activity was marked as time-consuming. Some students said that the most difficult was the choice of subject itself. The second group did not think that any activity was unnecessary. On the contrary, they appreciated their applicability.

V. CONCLUSION

The main benefit of the project is the development of the course of English for professional communication for secondary technical and vocational schools and job seekers in the field of the European labour market (mainly focusing on improving language communication competences, computer literacy and culture of electronic communication of the target group). We expect the impact of activities implemented in the project on specific target groups: especially on educational institutions and the learners. We prepared and designed universal modern tools to implement to improve teaching and learning towards the quality improvement, particularly the quality of the school graduates at the European labour market.

We are aware of the fact that project work is not a cure for everything. It requires a highly professional preparation, field analysis, it is more demanding but also more satisfying activity than traditional methodologies, and that for teachers and students as well. It expects a teacher with advanced methodological competencies. As we mentioned in the introduction, project work is not a method. It is up to the teacher what methodological approach s/he will decide for within this demanding educational process, so that to achieve the efficient and effective results that would satisfy both students and the teacher. The benefit is that many other key competences required by labour market are developed, particularly creativity. Ultimately, they are the prospective future employers of graduates, demanding for workers with high language competence, who should be satisfied. Project work is one of the means to attract, challenge and involve students in their professional development.

We described a dominant part of our project. Currently a demanding task of wide national verification of the so far achieved results is in the state of launching the activities. We addressed 40 secondary technical and vocational schools all over Slovakia, and got positive responses to enter the process. We prepare and design universal modern tools to implement them to improve teaching and learning towards the quality improvement, particularly the quality of the school graduates at the European labour market.

REFERENCES

[1] Partnership for twenty-first Century Skills. (2011). Available on Internet: www.p21.org. Accessed November 11, 2016

[2] The PISA Framework for Assessing ICT Literacy: Draft Report to Network A, (2003)

[3] Dow, M. J. (2007). Assessing information and technology literacy: How do we know our students learn? School Library Monthly

[4] Leu, Jr., D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. Journal of Literacy and Technology. Volume 14, Number 1: March 2013 ISSN: 1535-0975

[5] Morgan, B. (2010). New literacies in the classroom: Digital capital, student identity, and third space. The International Journal of Technology, Knowledge, and Society, 6(2), pp. 221-239.

[6] Voogt, J., & Roblin, N. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. Journal of Curriculum Studies, 44(3), pp. 299−321.

[7] Chmelíková, G. & Mironovová, E. (2011) Building corporate social responsibility via entrepreneurial skills development in STU english language training. In Upravlenije ekonomikoj: metody, modeli, technologii : 11. Meždunarodnaja konferencija s elementami naučnoj školy dlja molodeži. Sbornik naučnych trudov. 01 - 03. 11. 2011, Ufa - Krasnousoľsk. Ufa : UGATU, 2011, pp.257-258. ISBN 978-5-4221-0233-4.

[8] Chmelíková, G. & Mironovová, E. (2009) Entrepreneurial skills development via fostering cultural and humane aspects in english language training in STU. In SCHOLA 2009 : 9. medzinárodná vedecká konferencia Inovácie vo výchove a vzdelávaní inžinierov. Trnava, 3.-4.12.2009. 1. vyd. Trnava : AlumniPress, 2009, pp.152-155. ISBN 978-80-8096-106-0.

[9] Hrmo, R., Krištofiaková, L., Miština, J. (2015) Building a Quality System of Technical and Vocational Education in Slovakia Towards a European Labour Market. In: WEEF 2015 : Proceedings of 2015 International conference on Interactive Collaborative Learning (ICL). - Florencia : IEEE, 2015. - ISBN 978-1-4799-8706-1, pp. 237-243.

[10] Šimonová, I. (2014) CALL and foreign language education. In: Call and foreign language education. Nitra: Univerzita Konštantína Filozofa, 2014, pp. 100-105. ISBN 978-80-558-0621-1.

Teaching Mathematics in the Undergraduate Programme for Economy Students

Jitka Jurková

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Economic Studies
Prague, Czech Republic
jitka.jurkova@cvut.cz

Abstract—Teaching mathematics at Czech universities is currently facing range of problems. Firstly, discussion on theoretical approach versus practical approach in teaching mathematics is going on, secondly, it is decreasing standard of mathematical knowledge gained at the secondary schools, and last but not least it is changing of student attitudes towards mathematics. The other changes can be found in student preferences related to use of didactic tools and the management of mathematical courses. In this paper we introduce results of quantitative research conducted among students of bachelor study programme Economy and Management at the Masaryk Institute of Advanced Studies of the Czech Technical University in Prague.

Keywords—didactic principals; student attitudes; teaching aids; utility of mathematics

I. INTRODUCTION

The Czech Technical University in Prague, similarly to other universities not only in the Czech Republic, but worldwide is currently facing two main attitudes in teaching mathematics: theoretical approach on one hand, and practical approach on the other hand [1]. Besides learning mathematical content knowledge, advocates of the theoretical approach emphasises the importance of learning the mathematical way of thinking as a special and valuable mental ability that is able to directly support decision making process and positive solving approach in general. Mathematical thinking may be explained as precise, logic, analytical and quantitative way of thinking [3]. This approach includes problem-solving strategies, developing mathematical methods or mathematical models or cultivating and extending mathematical thinking through investigative problems [4]. The practical orientation of mathematics on the other hand supports the idea of teaching mostly practical knowledge and skills while focusing mostly on practical exercises with the orientation on real life and tasks from the world of economics. Therefore, the practical approach prefers solving real economic problems, practical competence and direct applications of mathematical subjects [2].

Moreover, several authors have documented a downward drift of entry requirements for mathematics which is connected with decreasing valuable process skills in mathematics on secondary school level, increasing number of students with diverse academic background and intellectual transformation between secondary schools and universities. Students face courses that are very different from mathematic courses encountered at secondary level schools they graduated from [9]. In addition, there has been a significant decline in many mathematical skills that are regarded essential for undergraduate degree courses with a significant mathematical content [5].

Student attitudes toward mathematics may refer to one of three types described below [10]. The first type is defining attitude to mathematics as a positive or negative degree of affect only. The attitude towards mathematics is at this point of view only an emotional disposition toward mathematics. Provided we investigate three different components of attitude generally (i.e. the cognitive component, the affective component and the behavioural component), the first type of attitude to mathematics would be considered as the affective component only. The second type of attitude to mathematics may be seen as a bi-dimensional definition, where attitude to mathematics is seen as a pattern of beliefs and emotions associated with mathematics, i.e. including the cognitive and affective component of attitudes. While the third type of student attitudes toward mathematics can be based on a multidimensional definition, i.e. including all 3 components of attitudes, as the cognitive component, the affective component and the behavioural component. Therefore, it includes emotional response associated with mathematics, the student beliefs and the behaviour related to mathematics. To sum up, some authorities may regard attitude toward mathematics as just a like or dislike for mathematics, while others may broaden the meaning to include beliefs, abilities, skills and the awareness of usefulness and utility of mathematics [8].

Nevertheless, it is not exactly defined anywhere what does "positive" or "negative" attitude really mean and moreover, the three meanings often overlap. When "positive" refers to an emotion, it usually means doing mathematics with pleasure. When it refers to beliefs, "positive" is often understandable as shared by the experts or simply, that mathematics is useful. When it refers to behaviour, positive attitude to mathematics is usually connected with high achievement or high study results, i.e. a successful behaviour [10]. In addition, student attitudes toward mathematics may be researched from other points of view, e.g. focusing on the attitudes based on gender differences, learning environment, or motivation [6].

II. MATERIALS AND METHODS

Further in this paper, a research survey on student attitudes to teaching mathematics and its results is described. The research study focused on student opinions on the importance of theoretical base for learning mathematics, usefulness and utility of mathematics for economic studies and student preferences with regard to didactic principals and teaching aids.

The survey extends a similar survey which was made in the previous academic year among students of the same study programme. It was conducted among 1st year students of a bachelor study programme Economy and Management (i.e. a study field Management and Economy of an Industrial Enterprise and a study field Personnel Management in Industrial Enterprises) at the Masaryk Institute of Advanced Studies at the Czech Technical University in Prague during May 2016. Mathematics at this study programme is taught during the 1st year of study only, mostly on theoretical base, forming the ground for further applications. Quantitative methodology was used for the survey. A total number of 325 questionnaires was distributed which represents all students of the both study fields of the study programme. A number of 94 questionnaires was properly filled and returned, out of which 46 students were from the Personnel Management study field (49%) and 48 students from the Management and Economy study field (51%); 72 women (77%) and 22 men (23%) filled the questionnaire in properly. In the questionnaire, closed ended questions including response options were used. The range included endorsement, influence or intensity ordinal mostly 5 scales questions with the exception of several identifiers.

III. RESULTS

As students enrolled at the Masaryk Institute of Advanced Studies for their economic study programme come from different secondary and other schools, secondary school level background or other school background naturally formed one of the identifiers of the survey. Secondary schools in the Czech Republic are represented by several types of schools, most of them belong to grammar schools, business academies or secondary technical schools. Besides the secondary schools students may be enrolled after their (usually unsuccessful) studies at colleges or universities and their faculties. Mathematical knowledge gained at all these types of schools very differ, usually the most comprehensive good standard mathematical base is gained at grammar schools and the secondary technical schools. Students coming from technically oriented universities usually have sufficient knowledge in mathematics, as well. The distribution of students according to their secondary school level background can be found in Fig. 1 below.

School level background – absolute frequencies
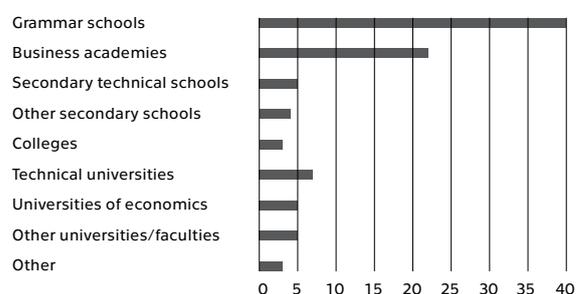
Fig. 1. Diverse School Level Background, 2016

A. Theoretical versus Practical Approach to Teaching Mathematics

As we mentioned above, theoretical and practical approach regarded teaching mathematics is currently being discussed [1]. The discussion is being proceeded especially among academic and research workers. However, in this survey we have gained additional information not only from the teaching personnel, but also from students. We have gained information on students' attitudes to implementing practical exercises from economic field into mathematical course and on the level of the respondents support to the idea of mathematical thinking development in order to increase the capability of solving real world problems. The results are shown in Tables I and II below.

TABLE I.
IMPLEMENTING PRACTICAL EXERCISES FROM ECONOMIC FIELD INTO MATHEMATICAL COURSE, 2016

	Definitely yes	Rather yes	Neutral	Rather no	Definitely no
Absolute frequency	24	37	14	15	4
Relative frequency	25.5%	39.4%	14.9%	16.0%	4.3%

TABLE II.
SUPPORTING THE IDEA OF MATHEMAT. THINKING DEVELOPMENT, 2016

	Definitely yes	Rather yes	Neutral	Rather no	Definitely no
Absolute frequency	11	18	12	38	13
Relative frequency	13.0%	19.6%	13.0%	41.3%	14.1%

Tables I and II reveal that the respondents prefer in general the practical attitude. The respondents would welcome decline in theoretical studies and prefer studies supporting practical exercises with the focus on solving real world economic problems.

B. Utility and Usefulness of Mathematics for Economic Studies

The usefulness of mathematics for students of economy represented one of the dominant features of the survey. Mathematic courses at the Masaryk Institute of Advanced Studies are being taught in mostly theoretical way, Mathematics represents the theoretical base for further courses taught subsequently, as Microeconomics, Macroeconomics, Statistics or Finance. Mathematics is being taught in the first year of the bachelor studies only, until the academic year 2015/2016 it was taught only in the first term. Beginning the academic year 2015/2016 mathematic courses were extended to both terms of the first academic year, the theoretical approach remained in both terms. However, the aim is to adjust the second term theoretical mathematics to mathematic applications.

The numbers in Table III reflect the uncertainty with the utility and usefulness of the course of mathematics among the respondents. It might be recommendable to form closer relationship between mathematical theory and its practical application, and immediately practice examples from real economic situations. Further courses using mathematics are usually taught in the following terms and not simultaneously which may be advisable.

TABLE III.
USEFULLNESS OF MATHEMATICS FOR ECONOMIC STUDIES, 2016

	Very useful	Useful	Neutral	Useless	Very useless
Absolute frequency	10	26	27	18	13
Relative frequency	10.6%	27.7%	28.7%	19.1 %	13.8%

C. Emotional Attitude to Mathematics

Emotional attitude towards mathematics is another crucial topic for the students responding in the survey. In a certain extension, it may have an origin in the previous section on utility of mathematics – students who do not see the usefulness of mathematics can hardly have a strong positive emotional attitude towards mathematics. A significant correlation of 0.891755 (Pearson correlation coefficient) can be found in the relationship between attitude to usefulness of mathematics and emotional attitude to mathematics.

In addition, the result of emotional attitude to mathematics may be a result of the fact, that mathematics is one of the most difficult courses during students' studies at the Masaryk Institute of Advanced Studies (as follows from students' study results). Nevertheless, it may be connected with a broader issue of decreasing the mathematical knowledge of students during their previous secondary level studies (Matějů, 2013). On the other hand, the attitude toward mathematics among the respondents is not negative, as positive results we may consider that more than one third of the respondents have positive or very positive attitude to mathematics and another third of respondents neutral emotional relationship toward mathematics (see Table IV).

TABLE IV.
EMOTIONAL ATTITUDE TO MATHEMATICS, 2016

	Very positive	Positive	Neutral	Negative	Very negative
Absolute frequency	10	24	29	21	10
Relative frequency	10.6%	25.5%	30.9%	22.3 %	10.6%

D. Importance of Didactic Principles in Teaching Mathematics

In the survey two main topics related to didactic principals were questioned: the management of the courses and teaching aids. Regarded management and lecture/seminars organization students were asked at their preferences related to the type of lessons during the course, the number of lessons per week and other teaching and learning activities. Currently, one 90 minutes' lecture and one 90 minutes' practical exercise is scheduled every week in the course. Most students (value 4 of 5-range scale) prefer practical exercises, homework (value 2.3 of 5-range scale) and tutorials (value 2.2 of 5-range scale) to lectures (value 1.7 of 5-range scale). As a very positive result we can consider the information on students welcoming homework and additional work.

Regarded the extent of lectures and practical exercises most students (79%) feel practical exercises much more useful than lectures that are

usually theoretical. In absolute numbers: 43 students (46%) would strengthen practical exercises with no need in lectures, 31 students (33%) suggested to keep one lecture a week, but to double the number of lessons of practical exercises.

Regarded teaching aids students expressed their favourite teaching aids choosing the least and the most attractive. As most useful teaching aids were found textbooks focused on practical examples (value 4.5 of 6 range scale), handouts and textbooks focused mostly on mathematical theory (value 3.5 of 6 range scale) and notes from lectures (value 3 of 6 range scale). Software applications were found the least useful (value 2.8 of 6 range scale). Further teaching aids used by students are e.g. videos accessible via open internet, esp. you tube teaching mathematics videos or notes from secondary schools, esp. from grammar schools.

E. Overall satisfaction with the Mathematical Course

In order to conclude our survey, below you can find overall satisfaction of the respondents with the mathematical course that corresponds with the respondents' attitudes discussed above (see Table V).

As the highest portion of the respondents is satisfied or very satisfied with the mathematical course, it seems that we not necessarily have to think about modifications of the course.

Nevertheless, in the content of the theoretical versus practical approach or utility of mathematics results, there still remain significant space for improvements and making the mathematics more attractive for the students. Moreover, we can assume that students with very negative attitudes to mathematics rejected to answer the survey.

TABLE V.
OVERALL SATISFACTION WITH THE MATHEMATICAL COURSE, 2016

	Very satisfied	Satisfied	Neutral	Unsatisfied	Very unsatisfied
Absolute frequency	7	36	34	16	1
Relative frequency	7.4%	38.3%	36.2%	17.0 %	1.1%

IV. CONCLUSION

Survey undertaken among bachelor students of economic study fields at the Masaryk Institute of Advanced Studies revealed that students prefer practically oriented studies to discussing theoretical issues of mathematics. Students need to see direct usage of mathematical methods learned. As there is also high correlation in the relationship between attitude to usefulness of mathematics and emotional attitude to mathematics, including more practical exercises in the lessons may support overall positive attitude to mathematics among students.

Regarding didactic principals in teaching mathematics, students prefer practical exercises and tutorials to lectures, while in choosing teaching aids they remain rather conservative and prefer textbooks and handouts to software applications.

Nevertheless, while expressing overall satisfaction with mathematical course, students responding to the questionnaire still remain with their mathematical course satisfied or at least neutral.

REFERENCES

[1] M. Cardella, "Which mathematics should we teach engineering students? An Empirically Grounded Case for a Broad Notion of Mathematical Thinking", in Teaching Mathematics and its Applications, vol. 27 (3), 2008, pp 150-159.

[2] O.R.Christensen, "Closing the Gap between Formalism and Application – PBL and Mathematical Skills in Engineering", In Teaching Mathematics and its Applications, vol. 27 (3), 2008, pp 131-139.

[3] K. Devlin, Introduction to Mathematical Thinking. Palo Alto : Keith Devlin, 2012.

[4] B. Jaworski, "Helping Engineers Learn Mathematics: a Developmental Research Approach". In Teaching Mathematics and its Applications, vol. 27 (3), 2008, pp 160-166.

[5] D. Lawson, "Changes in Study Entry Competencies". In Teaching Mathematics and its Applications, vol. 22 (4), 2008, pp 171-175.

[6] M. Lourdes et. al, "Attitudes towards Mathematics: Effects on Individual, Motivational, and Social Support Factors",In Child Development Research, 2012, ID 876028

[7] P. Matějů, Barriers on the way to reaching technical diploma (Překážky na cestě k technickému vzdělání), In: MM Průmyslové spectrum. 2013.

[8] J.K. Mensah, M. Okyere and A. Kuranchie, "Student attitude towards Mathematics and Performance: Does the Teacher Attitude Matter?" In Journal of Education and Practice, vol. 4 (3), 2013, pp 132-134.

[9] J. Ridgway, M. Swan and H. Burkhardz, "Assessing Mathematical Thinking via FLAG". In: The Teaching and Learning of Mathematics at University Level, Kluwer Academic Publishers, 2001, pp 423-424.

[10] R. Zan, P. Di Martino, "Attitude toward Mathematics: Overcoming the Positive/Negative Dichotomy". In The Montana Mathematics Enthusiast. Monograph 3, 2007, pp158-159.

Learning Through Questionning: What are Suitable Questions Good for?

Blanka Jirkovská

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological Studies
Prague, Czech Republic
blanka.jirkovska@cvut.cz

Abstract— **The mastery of asking right questions in the right time can create a motivating atmosphere where every opinion is welcomed and taken into account. Such principle is suitable to use in the educational process and also in the working process. Everyone, who is asked to share his view on the problem, can feel usefulness which is highly interconnected with inner motivation. This paper discusses the importance of asking questions by teachers and managers and describes impact of such behaviour on students and employees.**

Keywords— *questions; Socratic method; learning organization; questioning culture*

I. INTRODUCTION

Asking questions and seeking answers is elemental to all human creativity and thoughtful living. The method of asking questions can serve as a highly effective tool in schools, at universities, as well as in organizations. This method is almost as old as mankind. It derives from ancient times when the world known philosopher and a great teacher Socrates (470-399 BC) used questions in his "Dialogues" to develop the mental skills of his students. This article will describe why, and will share how effective is the mastery of asking the right questions for learning and teaching processes both at school and in managerial world.

II. BASIC PRINCIPLES OF SOCRATIC METHOD

First of all we describe the basic principles of method founded by Socrates which was based on teaching students through asking proper questions. A contemporary American philosopher, teacher and photographer Richard Garlikov published several articles about this method. In his article called *"The Socratic Method: Teaching by Asking Instead of by Telling"* he writes about the principles of the Socratic method and also about its practical use at school.

Socratic Method is only one form of teaching that utilizes what students already know and can reason out in order to help them attain more knowledge and understanding through asking questions in a logical sequence.

As Garlikov describes, there are the four critical points about the questions according to Socratic principles.

- Questions must be interesting and intriguing to the students.

- Questions must be introduced by incremental pieces of information.

- Questions must be presented in a logical sequence of smaller steps, from the students' prior knowledge or understanding, in order to be readily answered and, at some point, seen to be evidence toward a conclusion, not just individual, isolated points.

- Questions must be designed to get the student to see particular points.

Teaching following these four principles stimulates students' thinking in certain focused areas. It draws ideas out of them; in contrast with the typical style of teaching by pushing ideas into listeners what can possibly diminish the effect of absorbing and assimilating the important knowledge.

When a lecturer can think of the topic in a way of teaching by asking suitable questions, the learning material is much more interesting for students. Students' interest is not automatically simple to reach when a lecturer just tells things passively, when he supports reading texts at home without discussing it later in class or when he prepares worksheets or some listening activities for students without giving them feedback.

If you can get the right questions in the right sequence, kids in the whole intellectual spectrum in a normal class can go at about the same pace without being bored; and they can "feed off" each other's answers.

The point is to try to stimulate and challenge all students as much as possible. The Socratic method is an excellent way to do that. It works for any topics or any parts of topics that have any logical natures at all.

Socratic method takes a lot of energy and concentration when beginning a new topic. A teach-

er cannot do this for every topic or all day long. It takes a lot of preparation, and a lot of thought. When it goes well, it is so exciting for both the students and the teacher. When it does not go as well, it is very taxing trying to figure out what you need to modify or what you need to say.

III. SOCRATIC METHOD EXPERIMENT BY RICHARD GARLIKOV

The point of this experiment was to demonstrate the power of the Socratic method for both teaching and also for getting students involved and excited about the material being taught. The author used this method when teaching in the elementary school at the American suburb. There were 22 students in the class. He was told ahead of time by two different teachers (not the classroom teacher) that only a couple of students would be able to understand and follow what he would be presenting. When the class period ended, he and the classroom teacher believed that at least 19 of the 22 students had fully and excitedly participated and absorbed the entire material. The three other students' eyes were glazed over from the very beginning, and they did not seem to be involved in the class at all. The whole class took only 25 minutes.

The experiment was to see whether he could teach these students basic principles of binary arithmetic (arithmetic using only two numbers, 0 and 1) only by asking them questions. None of them had been introduced to binary arithmetic before.

TABLE I.
SHORTENED EXAMPLE OF TEACHING BINARY ARITHMETIC BY SOCRATIC METHOD

Question (comment)	Answer of listeners (pupils/students)
How many is this? (I held up ten fingers.)	ten
Who can write that on the board? (virtually all hands up; I toss the chalk to one kid and indicate for her to come up and do it). She writes	10
Who can write ten another way? (They hesitate than some hands go up. I toss the chalk to another kid.)	||||||||||
Another way?	┼┼┼┼ ┼┼┼┼
Another way? (inspired by the last idea)	2 x 5
What if we were aliens with only two fingers? How many numerals might we have?	2
How many numbers could we write out of 2 numerals?	Not many. There would be a problem.
If we only have two numerals, what numerals would we have?	0,1

Well, what does this 1 and this 0 mean when written in these columns?	1 ten and no ones
What was the first number that needed a new column for you to be able to write it?	ten
Could that be why it is called the ten's column?! What is the first number that needs the next column?	100
And what column is that?	hundreds
First number that needs a fourth column?	one thousand
What column is that?	thousands

a. Source: [3]

After finishing this lesson, Garlikov got some feedback from the teacher of those children. He told him that after he left, the children talked about the newly learned principles of binary logistics until it was time to go home. Moreover, pupils did not get bored or lost concentration during the lesson because they were actively participating.

To point out the benefits of using principles of Socratic method in teaching, the chief advantages of it are that it excites students' curiosity and arouses their thinking, rather than diminishing it. Properly constructed Socratic questioning sessions enable students of all levels to enhance their arguments and enrich their critical-thinking skills. It also makes teaching more interesting, because most of the time, not only pupils/students learn from the teacher, but also the teacher learns from the students.

"Finally, two of the interesting, perhaps side, benefits of using the Socratic method are that it gives the students a chance to experience the attendant joy and excitement of discovering (often complex) ideas on their own. And it gives teachers a chance to learn how much more inventive and bright a great many more students are than usually appear to be when they are primarily passive" [3].

IV. SOCRATIC SEMINAR

A good example of another possible use of the Socratic Method in class is introduced by Jeniffer Gonzales [4]. She wrote a comprehensive article about different strategies of involving students into class discussions. She divides the discussion strategies into three groups: strategies that need higher preparation, strategies that need lower preparation and ongoing strategies. The strategy called Socratic Seminar belongs to the first group so it needs some bigger preparation of the teacher as well as of students before application in class. The teacher chooses a text or group of texts and gives it to students. They read it at home and prepare some questions for discussion about the texts. The questions should be open-ended and

they should provoke different opinions. At the beginning of the seminar class, the teacher or some student discussion leader poses all the questions. Students sit in a circle and start to discuss about the first question. They try to support their claims with proper reasoning from the texts and other sources. The students speak in no particular order, they don't have to raise their hands but they encourage each other to share their opinions. When students are not able to think of any good open-ended questions on their own, the teacher can prepare some sample questions before or groups of students do the discussion question together. When there is a bigger amount of students in the class, the can be divided in two groups. One group sits in the inner circle and plays the role of discussants and the second group sits in the outer circle and plays the role of observers. The next time the students change their roles.

V. ASKING QUESTIONS IN THE WORLD OF MANAGERS

As written in the previous paragraphs, the method of asking good questions can lead students to the new knowledge with keeping their interest and passion for discovering things on their own. However, the method of asking questions can also bring many positives in the managerial world. The ability to ask right questions in the right time defines the best leaders. Peter F. Drucker, who was a leadership guru of the 20th century, said: *"The leader of the past was a person who knew how to tell. The leader of the future will be a person who knows how to ask."* [1] The contemporary world is interconnected in many spheres and overwhelmed with billions of information. The nowadays leaders cannot know everything necessary for good functioning of their companies. They are dependent on other people who are experts in different areas. If they know who, what and how to ask, they are on the best way to reap the success on the market and also to maintain the motivation of employees. Similarly, Jeanne Liedtka claims that in business settings, the way to breakthroughs comes from asking innovative questions instead of discussing existing solutions [6].

One of the most influential specialists in the topic of leadership is Michael J. Marquardt. He is Professor of Human Resource Development and International Affairs, as well as program director of the Executive Leadership Program at George Washington University.

Marquardt wrote a book called *"Leading with questions; how leaders find the right solutions by knowing what to ask"* in 2014. For his book he interviewed thirty leaders in various areas from a range of countries. He asked them the following questions:

- When did you start using questions and why?

- What are some of the ways in which you use questions?

- What questions have been most effective?

- What has been the impact of leading through questions on your organization?

- How has the use of questions changed you as a leader?

After interviewing the experienced leaders from various organizations, Marquardt realized the importance of asking questions when working with people and especially leading them. The basic characteristic of questions consists in waking up curiosity of people. Questions prompt new ideas and new ways of doing things; they show people new inspiring perspectives. They help people admit that it is impossible to know all the answers. This idea can bring more self-confidence to the communicators.

VI. LEARNING ORGANIZATIONS

A growing count of managers recognizes that their organization's achievement, if not its very survival, depends on making a learning organization. This is a quickly adaptable company in the contemporary globalized world. A learning organization takes every challenge as an opportunity to learn something new and enriching. The method of asking questions is interlinked with the ability to learn. Therefore the learning organization should encourage all employees to ask questions as well as to seek for possible answers.

Questions and questioning approach are useful in everyday communication for giving feedback, problem solving, strategic planning, resolving conflicts, team building and more. Questions can encourage people to take risks. Risk taking was often a trigger of many great ideas in the history. For any kind of progress, people have to ask whether the contemporary conditions could change to be improved. *"Questions needed to be asked: What could happen if I did this? Is there any other way to think about this? What possibilities exist that I haven't thought of yet? For example, Columbus could have asked himself, "Is there a sea route to India?" Or Picasso, when moving to cubism, "In what other ways could I depict the human form?"* [7] Moreover, there were several catastrophic events caused by not asking the basic questions by those who were responsible: for example Sinking of Titanic (1912), The 1961 Bay of Pigs Invasion or The Explosion of the Challenger Spacecraft (1986).

VII. QUESTIONING CULTURE

Marquardt states, that when people ask questions they also share information together with responsibility. The shared responsibility forms a questioning culture where every problem is taken as "ours" and also every success is shared. The

relationship between managers and their subordinates in the questioning culture is more equal because every opinion is respected.

The author characterises a questioning culture with six features. *"When an organization has a questioning culture, the people in it*

- *Are willing to admit, "I don't know."*

- *Go beyond allowing questions; they encourage questions.*

- *Are helped to develop the skills needed to ask questions in a positive way.*

- *Focus on asking empowering questions and avoid disempowering questions.*

- *Emphasize the process of asking questions and searching for answers rather than finding the "right" answers.*

- *Accept and reward risk taking".* (Marquardt, 2014, p.34)

One benefit of questioning culture lies in the formation of the motivating atmosphere. Asking employees good questions brings them the feeling of importance. They realize that their view on the problem is appreciated and taken seriously. This realization pushes people to work harder and to take responsibility for their proposals which can result into solutions.

Another benefit lies in the support of decision making and problem solving in the companies. A questioning culture promotes learning; it also helps improve decision making and problem solving. Questioning helps managers and employees get different perspective and understand the perspectives of others. As people recognize organizational issues from different points of view, they gain a complex view of the situation and also enrich the amount of possible explanations. The right questions will lead people sooner or later to right answers.

To sum up, what are the biggest benefits of questioning culture for the organization? Questions if rightly applied can serve as a helpful tool for enlarging three levels of learning in every organization: individual, group and organizational. *"Organizations that ask questions will be more dynamic, agile, collaborative and creative."* [7]

VIII. SUMMARY

The mastery of asking questions, instead of providing telling statements brings benefits for those who are asked (students, employees), as well as benefits for those who do the asking (teachers, leaders).

Benefits for those who are asked (students, employees):

- Asking questions gives the students a chance to experience the attendant joy and excitement of discovering (often complex) ideas on their own

- Questioning helps people gain perspective and understand the perspectives of others.

- People are energized when they are questioned, because they have been asked for their ideas.

- Questions can also encourage people to take risks – and risks are the precursors to most of the great ideas of history. For a step forward, someone had to wonder whether a current situation could be changed or made better. Questions needed to be asked: What could happen if I did this? Is there any other way to think about this? What possibilities exist that I haven't thought of yet?

Benefits for those who ask (teachers, leaders, managers):

- Greater self-awareness

- Greater self-confidence, openness, and flexibility

- Better listening and communication – When leaders listen carefully to the answers given to their questions, the people around them appreciate their efforts and attention.

- Stronger commitment to learn and develop – Leaders who ask questions develop their emotional intelligence through questions. Questioning leaders thus improve their ability to teach, mentor and coach.

- Asking questions gives teachers a chance to learn how much more inventive and bright a great many more students are than usually appear to be when they are primarily passive

REFERENCES

[1]   Drucker Institute. "The Fab Five". 2011. Retrieved from: http://www.druckerinstitute.com/2011/04/the-fab-five/ [accessed 11-08-2016]

[2]   R. Garlikov, "Teaching Effectively: Helping Students Absorb and Assimilate Material". 2000. Retrieved from: http://www.garlikov.com/teaching/absorb.html [accessed 9-27-2016]

[3]   R. Garlikov, "The Socratic Method: Teaching by Asking Instead of by Telling". Retrieved from: http://www.garlikov.com/Soc_Meth.html [accessed 9-27-2016]

[4]   J. Gonzales, "The Big List of Class Discussion Strategies". Cult of Pedagogy. 2015. Retrieved from: http://www.cultofpedagogy.com/speaking-listening-techniques/ [accessed 11-07-2016].

[5]   M. Hlinak, "The Socratic Method 2.0". Journal of Legal Studies Education, 31 (1). p. 1-20. 2014. DOI: 10.1111/jlse.12007.

[6]   J. Liedtka, "If Managers Thought Like Designers". *Rotman Magazine*, Spring/Summer, pp. 14-18. 2006.

[7]   M. Marquardt, *Leading With Questions: How Leader Find the Right Solutions by Knowing What to Ask.* (Revised and updated). Jossey-Bass Publishers. San Francisco, 2014.

Application of ICT at Contemporary Schools in the Czech Republic

Alena Vališová

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological Studies
Prague, Czech Republic
alena.valisova@cvut.cz

Petr Svoboda

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological Studies
Prague, Czech Republic
petr.svoboda@cvut.cz

Pavel Andres

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological Studies
Prague, Czech Republic
pavel.andres@cvut.cz

Abstract— **To prepare all the pupils and students for the wide-ranging use of electronics and computer technology both in the future employment and personal life is one of the basic goals of the contemporary school. The exigency of these issues arises from the continual development of the existing science disciplines (that already co-operate with the pedagogy traditionally) but also from the development of the newly emerging branches (for example cybernetics, ergonomics, cybernetic pedagogy, information theory, engineering pedagogy). A great attention is paid to the modernization of the materially technical basis at all types and levels of schools not only in the Czech Republic. The article is focused on selected issues that concern education for processing of information, proper use of information sources in teaching, on questions concerning computation of the education process and on some technical information means, in the first place on use of computers in teaching at all types and levels of schools. The emphasis is primarily put on the need of an optimal balance between the use of information and communication technology on the one side and classical books (reading technology and perception of the printed text) on the other side.**

Keywords— *cybernetics; ergonomics; cybernetic pedagogy; information theory; engineering pedagogy; information and communication technology*

I. INTRODUCTION

To prepare all the pupils and students for the wide-ranging use of electronics and computer technology both in the future employment and personal life is one of the basic goals of the contemporary school. The exigency of these issues arises from the continual development of the existing science disciplines (that already co-operate with the pedagogy traditionally) but also from the development of the newly emerging branches (for example cybernetics, ergonomics, cybernetic pedagogy, information theory, engineering pedagogy). A great attention is paid to the modernization of the materially technical basis at all types and levels of schools not only in the Czech Republic. The article is focused on selected issues that concern education for processing of information, proper use of information sources in teaching, on questions concerning computation of the education process and on some technical information means, in the first place on use of computers in teaching at all types and levels of schools. The emphasis is primarily put on the need of an optimal balance between the use of information and communication technology on the one side and classical books (reading technology and perception of the printed text) on the other side. The paper is supported by the Fund of Educational Policy of the Ministry of Education, youth and sport of the Czech Republic: Readiness of Technically Educated students for the Teacher Profession, Management and Motivation.

II. APPLICATION OF ELECTRONICS IN THE FORMATIVE EDUCATIONAL PROCESS

A great attention is paid to the modernization of the materially technical basis at all types and levels of schools. The topicality of these issues results from the continual development of the existing science disciplines (that already regularly co-operate with the pedagogy) but also from the development of branches newly emerging or newly cooperating with the pedagogical branches (for example cybernetics, ergonomics, cybernetic pedagogy, information theory, etc.). To prepare all the pupils and students for the wide-ranging use of electronics and computer technology, both in

the future professional and personal life, belongs to basic goals of the contemporary school [1].

The application of electronics in the formative educational process comprises three basic spheres:

- teaching that concerns electronics as a branch of study and science in separate subjects or as a part of other subjects,

- teaching that concerns computers and their application as a branch of study and science in separate subjects or as a part of other subjects (it concerns primarily the algorithm development and programming).

- application of computers and electronics (video technology) in the formative educational process for support and management of the teaching and learning [2].

Computers and video technology in this third sphere can be perceived as an important didactic technology that together with other electronic devices function in teaching as important tools for intensification of knowledge in various school subjects or studying branches.

These devices can be used both for direct teaching and individual learning, testing and evaluation but also for self-control. It is possible to state that acquiring of modern information and communication technologies will be assigned as a tantamount part to such basic cultural technologies as are reading, writing and computing. These technologies will become a part of the general and professional education. Its alternative forms will also be used in the distance education that is currently topical in the sphere of pedagogical theory and school praxis also in our country. Distance education is basically a certain type of extra-mural studies that is intermediated by media – broadcasting, television, telephone, computer etc. – and that is above all based on structured programmes and on the so called individual learning. One of the forms of the distance education is the so-called correspondence college namely at the university study level. The recent expansion of computers, smart phones and Internet has contributed to the growth of the so-called e-learning and m-learning that from a certain aspect can be considered as a computer form of correspondence college [3]. The methodology of e-learning courses preparation often draws from the knowledge of the preceding methodology of the distance education and correspondence college. The advantage of e-learning and m-learning consists in the possibility of using multimedia and interactivity provided by the contemporary information and communication technology. These media are for example suitable for preparation of various simulators and interactive training that beside the distance education can also be used as a suitable supplement for the classical form of teaching (combination of classical forms of teaching with the use of e-learning media is sometimes called blended learning) [3].

The pupils should acquire at the schools the respective information and practice for working with the computer technique and use of Internet for retrieval of information. This will become a good basis not only for rational acquiring of information from the computer media but also for the use of computers in professional and private life. The following part of the text will deal with the importance of computers in teaching.

Actual application of electronics in the educational system requires implementation of some basic elements:

- provision of reliable computer technique, video-technology and electronic visual aids;

- incorporation of questions concerning electronics, computer technique and informative communication technology into the real teaching, not only into the teaching plans and syllabuses of the individual subjects;

- optimal training of school teachers;

- solution of problems concerning the creation of a software for teaching and use of personal computers in individual subjects;

- use of computers for school administration and outside the school activities.

III. POSSIBILITIES OF USING COMPUTERS AT SCHOOLS

Our attention will now be paid directly to the problems concerning the use of computers in teaching. It corresponds with the use of tablets and smartphones as well. Acquiring of the computer literacy (that can be understood as a part of the information literacy) and intermediation of this goal through the process of teaching belongs to the basic goals at the contemporary school. Computers should fulfil its basic mission at the school – to help the teacher manage the learning activities of pupils, help the pupils in their advancement and the school director in administration and management of the school. [4]

The efficiency of using computers in the process of teaching is not possible to assess one-sidedly and separately. The success of using computers depends, beside other things, also on the didactic skill of the teacher, on his previous successful work with a whole complex of teaching means, on his complex attitude as to the use of computers in teaching. The experiences show that a direct computer operation by pupils themselves is much more efficient and more attractive than using the computer in the process of teaching only by the teacher himself. This approach is

also meaningful for the development of the computer literacy as such. [5]

The use of a computer can be primarily determined on the basis of the function criteria: using computers in the formative educational work (both by the teacher and the pupils) and using computers in school management as of the whole educational system.

Possibilities of using computers in the formative educational work can for example comprise:

- processing of written and oral exam results;

- selection of testing questions, composition of benchmark tests;

- databanks of some subjects that enable to create gradually the rules for classification (personalities, data, spheres, themes etc.);

- creation and printing of textbooks;

- retrieval and work with information on the Internet;

- multimedia teaching aids, simulators and e-learning courses.

Computers in school management can be for example used for [6]:

- databank of the pupil and student files;

- saving and printing of a timetables, lectures, seminars, eventually also its partial creation;

- transfer of the complete records of the class teacher to a computer method of recording and processing with the aim of time saving as against the classical method.

In consideration of the problems connected with the introduction of computers into the schools it is especially important to take into account the methodology of the programme creation, the possibilities of using the programmes in individual subject teaching, the possibilities of programme implementation in the framework of the complex methods of teaching and also school modernization.

Many sociological and psychological research studies have confirmed that children and young people will live in an ever more tell-all world. Computers, tablets, smartphones, video, television and Internet nowadays become to a considerable extent common realities of their living environment [3]. There is no doubt about the fact that using information and communication technologies will markedly influence the teaching environment of the school and the pedagogical process itself in the new millennium. A complete series of new didactic and pedagogical problems will consequently arise including the training of future teachers.

The role of computers in teaching should not be generally overemphasized. The computer from the point of view both of pedagogues and ICT experts should be perceived as a tool, that can find a suitable fulfilment in some spheres of teaching and on the contrary in others it could be less efficient than classical methods and sometimes it could be even counter-productive. In spite of the fact that technologies, used in the society have generally a great influence on the way of communication and the social interactions are metaphorically reflected in the philosophy of the period, the technology itself does not improve or make more efficient the process of teaching from the principle of the point. The chance to do it has only the respective methodology that uses the technology as its means. This commentary does not in any way cast doubt upon the steadily growing importance of computers and the necessity of computer literacy development, it only strives, based on experiences, to adjust a realistic and productive approach to the use of this technology in the process of teaching.

Let us briefly to determine the advantages of using computers at the school and its possible reserves.

Among the advantages can be included:

- computer enables to respect the individual learning activity tempo of pupils;

- enables to present different demanding programmes (diversely difficult tasks and exercises) to pupils;

- realizes the displaying possibilities, enables to programme the successiveness and motion;

- fairly evaluates and thus properly motivates pupils as to their respective activity;

- enables to the teachers and pupils to issue their own texts (including the possibility of a fast and cheap publication on the Internet);

- enables to the teachers individual selection of the supplement schoolwork (multimedia encyclopaedia, resources on Internet etc.);

- motivates the pupils to work with information and communication technique.

Among problems connected with the use of computers in the process of teaching are most often mentioned:

- insufficient emotional education;

- reduction of written and spoken language;

- restriction of the divergent thinking (excessive adaptation to certain rules and models, favouring of operation with clear conditions, postulates offering only one right conclusion);

- absence of direct observation (new information technique submits the findings indirectly, the direct observation of the life, recognizing people, nature, things and ideas is missing);

- lowers the socialisation of a human being, the stay and contact with people and visit of cultural institutions;

- problems with the development of creativity and thinking evaluation etc.

Pupils from our schools are acquainted with the modern technology already at home and many of them also with computers. The children at home prefer playing computer games more often than make use of the education programmes. The world experiences a huge development, production and sale of computer games. If the child sits excessively at the monitor, especially playing computer games, it results in the lack of exercise, restriction of creativity and mental and psychical disturbance. The school should have many other means enabling to balance and overcome with unquestionable positives the potential undesirable consequences of some computer games [7].

As for the educational function of the communication technology, it also changes the social task of the book that cannot be replaced in any case. The role of the reference encyclopaedia or aids for the regular knowledgeableness of a human being can gradually assume the services based on the video-technology. Nevertheless, the immediate reading of classical books, whether it concerns the belles-lettres or scientific literature, represents a non-replaceable asset. It requires an active engagement of psychical energy and imagination. Read text offers a deeper and many-sided understanding than following a spoken language or an image displayed from a technical device.

Beside the work with computers in the role of an information resource at the school, it is also necessary to develop the education focused on the work with books and other text aids and to develop a whole complex of skills for the work with information and information resources.

REFERENCES

[1]   Vychová, H. *Best Practices ve vzdělávání – příklady ze zahraničí (Best Practices in education – examples from abroad)*. 1. vyd. Praha: VÚPSV, 2010, s. 22. ISBN 978-80-7416-086-8.

[2]   Dobrovská, D., Semrád, J., Vobořilová, J, Vaněček, D., Andres, P. *Pedagogic and Psychological Aspects of Applying Multimedia in Teaching*. In.: Information and Communication Technology in Education (Mechlová Ed.), Ostrava, Ediční středisko TU Ostrava, 2003, p. 142-146. ISBN 80-7042-888-0.

[3]   Sharples, A., Ferguson and team. *INNOVATING PEDAGOGY: Open university innovation report 3*. [online]. [2015] [cit. 2015-15-5]. Dostupné z (available at) <http://www.open.ac.uk/blogs/innovating/. ISBN 978-1-4730-0335-4>.

[4]   Vališová, A., Kasíková, H. et al. *Pedagogy for Teachers̓*. Prague: Grada Publishing 2007, p. 211-221.

[5]   Dobrovská, D., Andres, P. *Technical Teachers and Technical Teacher Education – Research Results*. Acta Polytechnica, 2002, Vol. 42, No. 4, pp. 3-7. ISSN 1210-2709.

[6]   Svoboda, P. *ICT jako neopominutelná komponenta manažerské způsobilosti*. In Trojan, V., Svoboda, P. (eds.). Sborník příspěvků z mezinárodní vědecké konference školského managementu. 1. vyd. Praha: Univerzita Karlova, 2012, s. 114 - 120. Dostupný z WWW: <http://www.csm-praha.cz/userfiles/Dokumenty/Sbornk_CM.pdf>. ISBN 978-80-7290-602-4.

[7]   Vališová, A. *Teacher training – alternative aproaches (the social competence of teachers-engineers)*, p. 257-260. In: Design of Education in the 3rd Millenium. Frontiers in Engineering Education. Vol. I. September 12.-15. 2005. Istanbul: IGIP, Yeditepe University, 2005, p. 903.

[8]   Kmecová, I. *Information literacy and information education at universities*. Open Online Journal of Research and Education, Baden: Pädagogische Hochschule Niederösterreich, 2015, Neuveden, č. 4, s. 138-143. ISSN 2313-1640.

Social Climate in Class

Daniel Kučerka, Markéta Majerová

Institute of Technology and Business in České Budějovice
Department of Field Didactics
České Budějovice, Czech Republic
kucerka@mail.vstecb.cz
majerova@mail.vstecb.cz

Roman Hrmo

DTI University
Department of Didactics
Dubnica n/V, Slovak Republic
hrmo@dti.sk

Abstract—The subject of this paper is the issue of the social climate in a classroom. The paper in its first part deals with the environment, atmosphere and social climate.

Another section is devoted to school climate, class climate, the position of a teacher in the classroom and learning climate.

In the last section the authors describe the approach to the exploring the climate and ways how it is possible to measure the climate in a classroom.

Keywords—environment, atmosphere, class, class climate, climate type, ways of measuring the climate in class

I. INTRODUCTION

Most school educational activities take place in a classroom. Besides the family, it is the second most important pupil's social environment. School climate as well as climate in a class can significantly affect the course of the entire educational process.

We think that the social climate in a classroom needs to be continuously monitored. We are particularly interested in the fact how the climate is perceived by pupils themselves. It is also important to think about how we can change and improve the class climate.

II. ENVIRONMENT, SCHOOL AND CLASSROOM CLIMATE

Basic education in the Czech Republic and the Slovak Republic should fulfill the following tasks:

- children who enter it has to be taught the prescribed curriculum,

- educate them to become quality people,

- socialize them to allow them to enter to social life without any obstacles,

- teach them how to learn to be able to educate themselves throughout their lives,

- teach them independence, so that they can gradually take responsibility for their lives into their own hands

A. Environment, atmosphere, social climate

The main technical terms in the issue of the climate of a school class are the terms environment, atmosphere, social climate (of a school, teaching staff, class). Some authors use these terms as conceptually neutral, without evaluating the content.

As an environment it is considered a variety of factors, from the aspects of architecture (the overall conception of a classrooms, furniture placement, etc.) through hygiene aspects (quality of lighting, heating and ventilation) up to the acoustic aspect (the level of noise, sound reflection, etc.).

In the professional literature we can find an overview of the various typologies of the environment. Environment can be understood as the sum of the factors in our environment that affect us (Čábalová, 2011, p. 194). Types of environment from the socio-pedagogical perspective according to Čábalová (2011):

- exogenous (outside) = environment

- endogenous (internal) = everything that concerns a man (genetic predisposition, physical and mental disposition, etc.).

Atmosphere is a term that expresses the variability and a short duration. It is influenced by the interactions and interrelations of all involved. According to Mareš (1998, p. 4), "the atmosphere varies during the school day, or even one lesson. Think of the atmosphere in the classroom before the repeating lesson, during graduation written works, after a big break, after a brawl of students, while supplementation or informing that there will not be the lesson of the difficult subject etc."

Experience of educators are as follows. If they teach in the same classroom in the same day twice, it seldom happens that the atmosphere is nearly the same.

Social climate on the other hand designates the long-term effects. Phenomena that are typical of the class for several months or years. This is a complex of relations and processes of the interactions between teachers and students. As it is reported by Mareš, the climate of a class is a social-psychological variable that represents the

enduring socio-emotional attunement, attitudes and relationships. (In Průcha, Walterová, Mareš, 2003, p. 100).

B. School and classroom climate

It can be stated that in the professional literature there were attempts for making various taxonomies of the concept of climate. The first attempts are represented by authors Tagiuri (1968) and Anderson (1982). They distinguish four levels: ecology, environment, social system and culture.

The social climate in a class can be divided according to several aspects. Prokop (1996, pp. 37-38) provided two basic aspects of the climate division:

1. According to the perceived atmosphere - the interaction between a teacher and pupils

- Warm and friendly climate - students in such environment feel that the teacher is favourably disposed to them and if necessary he pays attention to them in his free time.
- Cold climate - teacher concentrates on satisfying his own needs, pupil feels as only a necessary means or even obstructing element of the learning process.

2. According to the distribution of power in the classroom

- Authoritative climate – here are important decisions taken by a teacher.
- Democratic climate –here are important the decisions taken by the whole team.
- Hostile autocratic climate.
- Laissez-faire climate.

Educational communication is an essential means of educational interaction between a teacher and a student. We can generally say that the method and the form of educational communication and interaction affects the motivation of pupils. An angry teacher does not bring anything positive to the communication climate in the classroom.

C. The position of a teacher

According to Gavora (2005) we can also talk about certain eight characteristics of the interaction of a teacher which are called the dimensions. The original authors of this model are Wubbels, Créton and Hoomayers (1987) from the University of Utrecht in the Netherlands. They published their findings in specialized texts.

The various dimensions of an interaction style (In Gavora, 2005, p. 46): The organizer of teaching helps the pupils. The understanding teacher leads the students to responsibility. Others are insecure, unsatisfied, scolding and a strict teacher.

III. TEACHING CLIMATE

When implementing the lesson it is not only important what the teacher does, but equally important is the way how he does it. A teacher significantly evokes the atmosphere (of different types) immediately after his coming in class. A perceptive pupil knows his eventual bored or tired appearance.

A teacher in order to induce a positive climate therefore should always have in mind that a pupil should perceive his behavior as a certain, relaxed and purposeful behaviour. A nervous teacher transfers his nervousness into the pupil. And so the total teaching climate suffers. The ability to pass on pupils the interest in the subject is an important aspect of the teacher s performing.

The teacher itself should consider other alternatives of solving specific tasks going beyond the school. To achieve this goal the activities as "listen, make notes … etc. will not help him very much. Thus organized instruction can have the adverse impact on the overall climate of teaching. The pupil can either resign, he will have a negative experience, he can create the negative attitude toward the subject , etc.. The educational climate will be negative for him.

A. Research methods

When examining the issue of the social class environment we can deal with the research problem: How does a student perceive the social climate in the class? Does he perceive it as well as his teacher? Are there are the significant differences in perceptions of the climate for pupils of different classes? How the social climate in the classrooms is perceived by teachers?

In determining the climate in the classroom we can use the following methods:

- *Observation* is a planned and targeted monitoring of the educational reality. It is one of the basic techniques for monitoring the pedagogical phenomena and plays an important role in the field of scientific methods in both quantitative and qualitative research. It provides a single point of contact with the educational reality. The disadvantage is time-consuming when evaluating the data and also the fact that the presence the researcher might „disturb" the natural processes
- *Interview* - it is a research method based on communication and interaction between a respondent and a researcher. It is divided into structured, unstructured and semi-structured. It is quite a good research tool to investigate the climate in a classroom. For the success of this method it is necessary to think well in advance each stage of the examination (interview preparation, course of the interview, evaluation interview).

IV. CONCLUSION

Class climate that prevails in the classroom has a major impact on pupils' motivation and their attitude towards learning. Climate in classes can be manipulated. However, it can not be affected equally in all its components, it can not be done quickly and without the cooperation of all participants involved. It is a long-term issue.

The creating of a purposeful climate task oriented will largely contribute to successful learning. It is important to ensure the most efficient use of the learning time, ie. start the lesson timely and quickly, carefully monitor the progress of pupils and pay attention to the organization of the lesson. All this will ensure the smooth progress of teaching and keep students active.

The order in a classroom largely contributes to the climate in a class, that's why it is necessary to impress the sense of order to pupils' mind. The climate in classes can not be underestimated in any case. It is very suitable to evaluate periodically the climate in a classroom and derive the appropriate measures from the data obtained.

ACKNOWLEDGMENT

REFERENCES

[1]   Caha, Z.: Učitelé a výukový personál v rakouském sektoru Fachhochschulen. In Quaere 2013 : sborník příspěvků. 1. vyd. Hradec Králové: Magnanimitas, 2013. s. 1977-1984, 8 s. ISBN 978-80-905243-7-8.

[2]   Čábalová, D.: Pedagogika. Praha: Grada, 2011. ISBN 978-80-247-2993-0.

[3]   Čapek, R.: Třídní klima a školní klima. Praha: Grada, 2010. ISBN 978-80-247-2742-4.

[4]   Gavora, P.: Úvod do pedagogického výzkumu. Brno: Paido, 2000. ISBN 80-85931-79-6.

[5]   Gavora, P.: Učitel a žáci v komunikaci. Brno: Paido, 2005. ISBN 80-7315-104-9.

[6]   Chráska, M.: Metody pedagogického výzkumu: základy kvantitativního výzkumu.

[7]   Janoušková, J. a Caha, Z.: Conceptualization of the Working Process and its Reflection in the French Language. In MMK 2014 : sborník příspěvků. 1. vyd. Hradec Králové: Magnanimitas, 2014. s. 1882-1885, 4 s. ISBN 978-80-87952-07-8.

[8]   Mareš, J.: Sociální klima školní třídy: Přehledová studie. [online]. 1998 [cit. 2012-12-01]. Dostupné z: http://klima.pedagogika.cz/trida/doc/Mares__Klima__tridy. pdf

[9]   Prokop, J.: Škola jako sociální útvar. Praha: Ped. fakulta UK v Praze, 1996, 44 s. ISBN 80-86039-01-3.

[10]   Průcha, J., Walterová, E., Mareš, J.: Pedagogický slovník. 4. aktualiz. a rozš. vyd. Praha: Portál, 2009, 400 s. ISBN 978-80-7367-647-6.

[11]   Szőköl, I. Educetional Evaluation in Conterporary schols. 1. vyd. Szeged: A-Szinvonal Nyomda, 2016. ISBN 978-615-5372-60-5.

Background and Objectives for the Continuing Vocational Education of Pedagogical Staff

Michaela Tureckiová

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological Studies
Prague, Czech Republic
michaela.tureckiova@cvut.cz

Abstract— **In its introductory part, the paper gives a general delimitation of situation and trends in continuing vocational education in the Czech Republic, comparing that with relevant situation of the field of adult education elsewhere in the EU. Afterwards, the paper deals primarily with the backgrounds and objectives for continuing education of teachers (educational staff). Finally, the paper presents an overview of study expectations of specific group of teachers of technical subjects, participants of tertiary education (as a part of their further professional development), organized by Masaryk Institute of Advanced Studies, Czech Technical University in Prague.**

Keywords—Continuing vocational education; pedagogical staff; objectives

I. INTRODUCTION

In the European context, adult education is defined as "everything described as basic and continuing education and assisted learning for youth and adults, formal, non-formal or informal. This all-inclusive term therefore covers anything not counting as school or university education or initial vocation training for young people or adults" [1]. In order to strengthen this segment of lifelong learning, attention needs to be paid not only to various types of educational activities, but also to all of its components. These include civic education (or education towards active citizenship), interest-based (or hobby) education, and continuing vocational education and training. At this point, it needs to be stated that this division of adult education is based on Czech tradition and does not have a legal or factual support in official documents or in the Czech educational policy, not to speak of the common European educational framework. The only exception is, of course, the definition of lifelong learning as *"all learning activity undertaken throughout life, with the aim of improving knowledge, skills and competencies within a personal, civic, social and/or employment-related perspective"* [2].

This paper further examines primarily the area of continuing vocational education and training. This is also the area receiving the greatest attention in EU documents [3], as well as in the theory and practice of adult education in the Czech Republic [4].

II. CURRENT SITUATION AND TRENDS IN CONTINUING VOCATIONAL EDUCATION AND TRAINING IN THE CZECH REPUBLIC

One could also state that in the Czech Republic, adult education is becoming synonymous with continuing education and training. The author of this text is lead to this statement at least for the following reasons:

With literacy rate of 99%, the Czech Republic ranks among countries with a very low proportion of illiterate adults [5]. Admittedly, this information does not encompass secondary, functional or other types of illiteracy, which in reality complicate the employability and social status of such adults in the current state of social development. Nevertheless, this figure can be seen as one possible explanation, why in Czech conditions, continuing education is virtually synonymous with adult education.

The most fundamental argument to support the claim that even continuing vocational education and training in the Czech Republic can be seen as virtually synonymous with continuing education or adult education is the fact that so far the only legal framework addressing the area of lifelong education, Act. No. 179/2006 Coll., on the verification and recognition of results of continuing education, came to being as a result of an EU initiative to create within Member States such national systems of qualifications that would allow recognition of qualifications obtained in various types of education and their international comparisons. Although by its name the Act addresses continuing education as a whole, in fact, by its connection with the qualifications framework it deals only with continuing vocational education and

training [6]. Also most other strategic documents devoted at the national level to continuing education deal in fact predominantly with continuing vocational education which leads to a disproportionate development of different components of adult education in the Czech Republic. This stems not only from the fact that the other components of adult education (civic and hobby education) do not receive such attention from public authorities. It appears that in the Czech Republic continuing education is more important for persons oriented on performance which is traditionally linked with work [7].

While vocational training is guaranteed by the Ministry of Education, Youth and Sports within the system of formal education, the organisation and focus of continuing vocational education and training is still fragmented into several relatively independent categories. Firms and NGOs are among the most important providers of continuing vocational education and training. In accordance with the labour law of the Czech Republic, they provide opportunities for training of new employees, and maintain and develop employees' qualification [8]. Continuing vocational education and training is provided in the Czech Republic also by labour bureaus (in terms of retraining programmes), private education agencies, professional associations and universities. The costs of such education are paid by employers, but with some exceptions the participation in it is not compulsory. The obligation to carry on learning applies to very few professions - one of such are teachers (more generally teaching staff of schools and school facilities) [9]. Forms and methods of providing continuing vocational education and training, of its validation and evaluation vary greatly.

In recent years, voluntary participation in continuing vocational education and training has been slightly increasing in the Czech Republic in connection with socio-economic changes. An important and relatively well functioning part of continuing vocational education in the Czech Republic is employees education and development. As a minimum this involves the so-called statutory education (mainly occupational safety and health protection and specific exams done by law), the employer's obligation to provide education (training) to graduates and to foster the development of human capital of the organisation.

An international comparative survey carried out by Eurostat found out that as many as 72% of employing organisations in the Czech Republic educate their employees systematically beyond and above the obligations stipulated by law. The figure thus shows an above-average share of organisations training their employees in the Czech Republic (the average for EU-25 was 60% in the period observed), but the Czech Republic still lags behind 7 countries of EU-27. In 4 of these, the share of employing organisations training their employees exceeded 80%; in the UK it is even 90% [10].

According to a survey by the National Training Fund, even higher rate of opportunities to learn (86%) exists in the so-called innovative organisations, i.e. those that have a strategic approach to the development of their employees' potential [11]. The survey does not specify particular types of educational activities. However, based on author's experience, organisations with a strategic approach to education and the development of their employees tend to choose individualised forms and methods of education depending on the importance of the employee (based on an assessment of his/her work performance and development potential) and the importance of his/her position for the organisation. Typical education activities include tailor-made training courses in special skills, individual or group coaching, mentoring, participation in projects or shadowing. For groups of employees with high performance in important positions, the activities include also those connected with the prevention of the burnout syndrome, optimisation of work-life balance.

A discussion is under way in particular among education professionals as to whether continuing vocational education and training should not be supported more in legislation, regulated and mandatory for a greater range of professions. The positives presented for this approach include especially maintenance of employees' qualification and employability, assurance of their competence and better service for the public. The major negatives include absence of a system of continuing vocational education and training in the Czech Republic, non-existence of financial or other support from public administration and a risk that such "decreed" education would become merely formal.

The main risks of maintaining the status quo in the whole segment of continuing education include a deteriorating socio-economic situation of individuals as well as worsening prospects for the national and EU economy; declining investments into continuing education, including lack of capacity or will to invest own finance into it; missing quality standards and also lack of effectiveness of the continuing vocational education and training. It is also alarming that some groups of adult learners are being marginalised, primarily because of their age or low existing level of their competences [12]. This is important primarily for continuing vocational education as retirement age is being raised also in the Czech Republic and it will be necessary to develop appropriate vocational training programmes for senior citizens in general and/or for senior (superior) professionals, including "senior" teachers and headmasters.

III. SITUATION IN THE EDUCATIONAL SECTOR - COMPULSORY CONTINUING VOCATIONAL EDUCATION AND PROFESSIONAL DEVELOPMENT OF PEDAGOGICAL STAFF

In the Czech Republic, the requirements concerning the education of pedagogical staff and continuing vocational education of pedagogical staff are laid down by Act No. 563/2004 Coll. on pedagogical staff [9]. Hence, pedagogical staff are one of a few professional groups for which adult education is not only an option, but also an obligation. They also belong to not so few groups of adults of productive age which take part in formal education at universities. According to a comparative survey on adult education in the Czech Republic in a European context, almost 4% of adults aged 25-64 years take part in formal education in the Czech Republic. In most cases they are younger than 40 years and the share of adults in total population undergoing formal education has been slightly, but continuously growing [13].

The following are usually considered as general preconditions to ensure the effectiveness of employees education from the perspective of a work organisation: application of a strategic approach to education; setting the objectives for employees education and development in the upcoming period already in the phase of education planning; securing the desirable effects of education through effective education expenditure and suitable education means; continuous monitoring; evaluation of the level of desirable agreement between plans and effects/achieved education goals [14].

From the perspective of educational organisations, the objective of employees education and development is to achieve such a level of professional and personal development which will not only remove negative differences in current and desirable profile of competencies, but which will primarily enable the educational organisation to achieve its fundamental goal. The goal is a verifiable development of key competences of pupils and students or a transformative development of competences of adult participants in education. In summary this means that within educational organisations there should be transformative development of such competences which will lead on the one hand to improved work performance of pedagogical staff and on the other hand to achieving the desirable level of outcomes or educational objectives in individual types and levels of schools and other educational organisations and ultimately to the advancement of education at the level of the whole society [15].

Besides the perspective of educational organisation, it is of course desirable to know also the objectives of the actual participants in continuing education – in this case pedagogical staff taking part in formal as well as continuing education at universities. The objectives/goals and expected outcomes/effects of continuing education from the viewpoints of pedagogical staff were investigated by the author of this paper in March 2016. The target group was constituted by 34 employees of different types of educational organisations (from the segments of secondary education, interest education and continuing vocational training of adults), participants in formal bachelor degree education specialising in pedagogy at the Masaryk Institute of Advanced Studies of the Czech Technical University.

The variant of moderation gallery was used within a seminar which focused on the types of education objectives in the context of lifelong learning. The basic themes were constituted by the objectives with which the participants entered the given types of continuing professional education and their expectations concerning the effects of this education. The results presented here summarise the work of originally eight- or nine-member sub-groups to which the participants were divided so that different ages and genders, as well as different types of schools and school facilities were represented in each sub-group.

IV. RESULTS OF THE SURVEY

The informants divided the objectives of continuing education to a work and non-work domain and grouped them to the following clusters (in the work domain not hierarchically, but nevertheless in an explicitly mentioned link with the Maslow's hierarchy of needs, the most known to them; after hyphens there are only the most frequent examples of specific objectives on which the participants in the group work agreed as the most typical ones):

Work domain: 1. Security – keeping the job, to be a match for others, keeping back doors, money (secured through work); 2. (Self)confirmation – to be a match for others at work, to be better than others at work; 3. Status – to gain better status; 4. Recognition – to obtain certificate/degree, to be a respected expert; 5. Development – professional: to widen knowledge/to gain more knowledge (to learn something new), to develop skills, to acquire new skills, to be a better teacher.

Non-work domain: 1. Self-perception – to increase self-confidence, to catch up with others, to learn better oneself, to be more satisfied with oneself, feeling of insufficiency; 2. Interest – to liven up one's life (change), education as a hobby, internal satisfaction, money (for hobbies); 3. Family – to surprise family, to be a good example to children; 4. Social relations outside of family – to meet new people; 5. Lifestyle – positive change of lifestyle; 6. Living standard – higher…, social status and influence on events in the society; 7. Development – personal: to train ones brain („to prevent atrophy"), self-development, to gain general knowledge, thirst for knowledge.

It is obvious that the declared objectives of education can be designated also as desirable outcomes of education. The participants of the seminar mentioned as expectable positive effects of education also the effects for themselves from the part of the organisation („better conditions for further education" and „better working conditions") and for the organisation they work for („better chances of graduates to find job", „better results of school-leaving exams„ and „increased prestige of the organisation" and „increased interest of prospective students"). The aforementioned effects of continuing professional education can be thus divided into two areas which are focused on: 1. further employment of the graduates of continuing education, 2. better functioning of the educational organisation and better prospects of its graduates.

V. CONCLUSION

Staff education and development belong traditionally to monitored personnel and managerial activities in all types of work organisations. The application of a systematic and strategic approach to the development of employees is considered by experts as a contribution to and even as a precondition for effective and successful functioning of an organisation. For theoretical as well as practical development of continuing education of pedagogical staff, it is necessary to further look into the strategy of continuing education and the creation of learning opportunities for the staff of educational organisations, and the development of strategic human resource management as one of the key competences of managers of educational organisations. As follows from the aforementioned survey, for the pedagogical staff themselves their continuing education is important from the perspective of their professional and personal/family interests, as well as from the perspective of the organisations for which they work. The interconnection of the perspective of an organisation with that of its employees creates an important strategic axis for continuing education of pedagogical staff.

REFERENCES

[1]   "Adult education trends and issues in Europe," 2006, p. 6. Accessed 27.10.2016, http://www.ginconet.eu/sites/default/files/library/AE_trends_issues_Europe.pdf

[2]   European Commission, "European report on quality indicators of lifelong learning," 2002, p. 7. Accessed 28.10.2016, http://ec.europa.eu/education/lifelong-learning-policy/doc/policy/qualityreport_en.pdf.

[3]   "ET 2020 - Framework for cooperation in education and training," 2009. Accessed 27.10.2016, http://ec.europa.eu/education/policy/strategic-framework_en

[4]   "Strategy of lifelong learning of the Czech Republic," "Strategie celoživotního učení ČR," Praha: MŠMT, 2007.

[5]   UNDP, "List of countries by literacy rate," 2010. Accessed 19.12. 2015, http://en.wikipedia.org/wiki/List_of_countries_by_literacy_rate.

[6]   "Act No 179/2006 Coll. on Verification and Recognition of Further Education Results and on the Amendment to Some Other Acts (the Act on the Recognition of Further Education Results), "Zákon č. 179/2006 Sb., o ověřování a uznávání výsledků dalšího vzdělávání a o změně některých zákonů (zákon o uznávání výsledků dalšího vzdělávání), ve znění pozdějších předpisů," 2006. Accessed 28.10.2016, http://www.msmt.cz/vzdelavani/zakon-c-179-2006-sb.

[7]   Donath-Burson-Marstelle, "Adult education in the Czech Republic - A survey on the perception of adult education by lay and professional public" "Vzdělávání dospělých v ČR - Průzkum vnímání problematiky vzdělávání dospělých u laické a odborné veřejnosti, 2009, p. 4. Accessed 19.12.2015, http://www.dbm.cz/pfile/1Vysledna%20zprava%20pruzkum%20vzdelavani.pdf.

[8]   "Act No 262/2006 Coll., Labour Code" "Zákon č. 262/2006 Sb., zákoník práce," 2006. Accessed 30.09.2016, http://www.mpsv.cz/ppropo.php?ID=z262_2006_6.

[9]   "Act No 563/2004 Coll. on Pedagogical Staff, as amended," "Zákon č. 563/2004 Sb., zákon o pedagogických pracovnících a o změně některých zákonů," 2004. Accessed 30.0.9.2016, <http://www.msmt.cz/dokumenty-

[10]   CES VŠEM, "Competitiveness of the Czech Republic 2010: Development of main indicators" "Konkureční schopnost České republiky 2010: Vývoj hlavních indikátorů," 2010, pp. 127-128. Accessed 19.12.2015, http://www.vsem.cz/data/data/ces-soubory/rocenka/A_Rocenka_final_CD.pdf.

[11]   Z. Matoušková, O. Kofroňová, "Approaches of innovative companies to human resource recruitment and development" "Přístupy inovačních podniků k získávání a rozvoji lidských zdrojů," Praha: NVF, 2006, p. 11.

[12]   "DV Monitor - What is our standing in continuing education?" "DV Monitor - Jak si stojíme v oblasti dalšího vzdělávání?" 2016. Accessed 30.10.2016, http://www.dvmonitor.cz/.

[13]   ČSÚ, "Adult education in the Czech Republic in the European context" "Vzdělávání dospělých v České republice v evropském kontextu," 2014, p. 8. Accessed 20.09.2016, https://www.czso.cz/documents/10180/20561197/23004114.pdf/2defbde6-c04e-4355-93b9-78acdf7b0b4d?version=1.0.

[14]   M. Tureckiová, "Human resource development and management" "Rozvoj a řízení lidských zdrojů," Praha: Univerzita Jana Amose Komenského v Praze, 2009.

[15]   J. Průcha, "Czech education" "Česká vzdělanost," Praha: Wolters Kluwer, 2015.

Towards Competitive Innovation in Higher Education

Monika Hřebačková, Eugenie Rinnová

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Language Studies
Prague, Czech Republic
monika.hrebackova@cvut.cz
eugenie.rinnova@cvut.cz

Abstract— **In an increasingly globalised world of international business and intercultural dialogue, courses taught in higher education institutions are facing challenges such as changing intercultural communication needs of the global job market, the demand for internationalization, or the need to use and integrate new ICT, and enhance electronic literacy. Although the need for the acquisition of intercultural communication skills is clearly stated in the EU language policy, this concept is wide, leading to multiple interpretations and solutions for university courses across European higher education institutions. This paper discusses an ongoing two-year international project developed by four universities based in the Czech Republic, Hungary, Portugal, and Spain in order to illustrate new trends in language and intercultural education which reflect the changing requirements of the globalized labour market.**

Keywords — *education; employability; globalization; innovation; internationalization; labour market*

I. INTRODUCTION

The paper addresses theoretical and practical questions connected with the changing goals and approaches in higher education (HE), focusing on the role of language and intercultural learning and teaching in globalizing economies in which the interconnectedness of people of diverging backgrounds is rapidly increasing. Building on the concept of international and intercultural communication and English as a lingua franca, taking into account the human capacity to innovate, and the desire to grow to better the performance and achieve qualitatively higher goals, the discussion assesses the rationale behind the intercultural language competence acquisition, considers its challenges and opportunities in the field of international project cooperation, and demonstrates shifts in language teaching approaches in higher education.

II. THEORETICAL BACKGROUND

As the process of globalization, increased mobility, and technological development shape the ways of living, working, and communicating in the 21st century, the use of English as a world language in international communication has been gaining on recognition and fundamental importance, which brings along new concepts of English itself and some other languages as lingua francas (ELF). This trend is pointed out by theorists, such as Jenkins, who in their studies systematically theorise ELF as „a contact language used among people who do not share a first language" [1]. From an ELF perspective, we all need to make adjustments to our local English variety when we take part in lingua franca English communication. ELF is thus a question, not of orientation to the norms of a particular group of English speakers, but of mutual negotiation involving efforts and adjustments from all parties [2].

There have been various in-depth descriptions of features of ELF in contrast to English as a native language including lexical and grammatical systems as in the use of articles, inserting redundant prepositions, confusing relative pronouns, misusing idiomatic language, and others [3]. These descriptions relate to linguistics, applied linguistics, but also sociolinguistics as well as cultural and intercultural studies. They also outline some research and pedagogical questions as there is an urgent need for „a secure theoretical and descriptive base" [1, 4]. Researchers in this field typify and categorize ELF features [1, 2, 4, 5] and point out that "it has proved particularly beneficial to consider the various theoretical accounts of globalization when dealing with this matter" [2]. Interestingly, a number of scientific insights in cross-cultural encounters in the international context see the standards of ELF too complex or controversial. McKay [6] investigates this problem from the perspective of intelligibility. Using the term 'international language', she defends English as an international language (EIL) which is taught to a global community and notes that such design is "no longer linked to a single culture or nation but serves both global and local needs as a language of wider communication" [6]. On the other hand, when rethinking the goals and approaches, she concludes "that the concept of thinking globally but acting locally is highly rel-

evant to the teaching of EIL". Relevantly to this, she stresses pluralistic, intercultural approach which recognizes the importance of local educators and learning styles. Yet, there are perspicuous geographical, socio-political and economic reasons including the recent migration patterns, and the propensity of multinational companies to expand which strengthen the worldwide spread of English. It is worth reminding ourselves at this point that McKay [6] reflects a few objections which touch the negative aspects that may slow or hinder the English language spread in the future. As part of the debate, these may include political frameworks, ideological misconceptions of native speakers, and dislikes of non-native accents and critical attitudes of non-native speakers themselves.

III. INNOVATION

Given the unprecedented changes on such a complete and global scale, it is simplistic to believe that using the ever same practices and tools will enable the speakers of ELF to maintain pace with the changes and sustain radically different society, workforce and marketplace. To put the matter in simple terms, we need to innovate to stay relevant and be able to evolve and meet the changing requirements of the employers and the globalizing job market. Innovation is the engine of growth and the progression of human well-being. Additionally, it brings a competitive advantage and feeds human curiosity. There are many definitions that combine factors such as having a new idea, executing a new idea, adding a new value to the company, and moving forward. Dyer describes these factors in terms of 'innovator's DNA' and gives five basic skills that distinguish the most innovative people in business from the others. These qualities are associating, questioning, observing, networking and experimenting [7]. He points out that these qualities - if we are not born with them - can be developed and cultivated. Therefore, it is misleading to presume that innovations are reserved for geniuses. Drucker speaks of "knowledge workers" who substantially contribute to innovations not only in the field of technology but also includes professionals such as lawyers, teachers, and researchers of all kinds [8]. For the purpose of this article we see innovation in education as a collaborative process which uses capabilities of teams, in which team members address a specific challenge and contribute to implementing new ideas in order to bring a relative advantage to both the institution and the specified target group while taking into account practical matters of implementation.

IV. CHALLENGES AND NEEDS OF HIGHER EDUCATION TODAY

Over centuries, education has always strived to react to the emergence of new social and geo-political trends. Therefore, it is not only the world of business but also higher education institutions that must adapt to the new conditions the changing international developments have brought. Innovations have become more of a rule than an exception and as such are embedded in many HE strategic documents on European, national, and local levels [9, 10, 11, 12]. Shalberg points out that in effort to promote competitiveness of their graduates, educating institutions must react flexibly and creatively to the changing needs of the global labour market [13]. According to Carnoy, globalization has accelerated international dialogue in business [14] as well as in education. Subsequently, these changes have brought a greater need for intercultural communicative competence (ICC) [15, 16, 9]. Communication barriers, cultural stereotypes, prejudice, failures in conflict identification and resolution, and language deficiency which compounds the lack of skills to interact successfully are among the identified multiple challenges [9, 10] of HE. Other significant factors include the need to use and integrate new ICT in HE methodologies and enhance electronic literacy [9, 10].

More and more employers value intercultural skills as highly as formal qualifications [17]. Most of the 367 large employers in 9 countries interviewed in the global research [17] carried out under the supervision of The British Council confirm that education providers do not develop intercultural skills in students sufficiently before they enter the job market. Needs analysis summarized in the transnational report [18] of the ICCAGE project [19] and carried out among 28 multicultural corporations in four European countries, the Czech Republic, Hungary, Portugal, and Spain, showed that 58% of respondents claim that graduates lack sufficient intercultural competence. However, 63% of the responding employers do not provide intercultural training for new employees. The need for intercultural training was also reflected in a needs analysis among students of the four universities in the above mentioned countries [18]. The results showed that 61% of students have never been trained in intercultural communicative competence, and only 36% realise they lack opportunities in HE to develop intercultural skills. Another research set out to examine the relationship between participation in cultural activities and people's propensity to do business with the UK [20] presents "a powerful challenge to the myth that business and culture are mutually exclusive or, even worse, in competition or conflict. Instead, it shows how complementary the two are and why together they are a critical part of the UK's success" [20].

In the Czech Republic, the relevant national policies and strategies have been summed up in The National Programme for the Development of Education [11]. In its strategic documents for 2016-2020 [12, 21], The Czech Technical Univer-

sity (CTU) systematically emphasizes internationalization, in particular the dire need to increase student and teacher mobility, the quality of education which requires focus not only on technical skills and knowledge but also on improving students' access to job market via soft skill acquisition that allows them to face the challenges introduced by the changing social, intercultural and demographic landscapes and finally, the development of language skills in students as well as employees.

Some new trends and directions in this area offer opportunities for universities to support their internationalization policy by 'globalizing their curriculum' [22, 23]. They engage students in an online dialogue with partners in other countries as they build on Internet communication tools and online intercultural exchange [22, 23], most recently called telecollaboration. Byram introduced another value that makes the globalizing job market more accessible through developing an intercultural sensitivity which allows to interact more effectively with others, to accept other perceptions of the world, "to mediate between different perspectives, and to be conscious of their evaluations of difference" [24].

V. CASE STUDY

An example of international cooperation for innovation and the exchange of good practices in the field of intercultural communication is the project "Intercultural Communication - Advantage for Global Employability" (ICCAGE, 2015-2017) [19] aimed at developing transversal skills, in particular the intercultural communicative language competence through the integration of an information communication and technology platform. The project adopts the definition of intercultural competence as described by the Council of Europe [25], that is as a combination of attitudes, knowledge, understanding, and skills applied through action which enables individuals to understand themselves and others in a context of diversity, and to interact and communicate with those who are perceived to have different cultural affiliations from their own [19, 25]. Implementing a number of innovative teaching approaches using ICT and telecollaboration, both as means and tools of the virtual international university project team-work in the field of ICC and language teaching and learning, such approach enables to vary the curricula and enrich the traditional in-class methods focusing on elements which have often been held back in foreign language acquisition. In practical international communication, this means slow shifting in the direction of avoiding conflict, minimizing misunderstanding, checking comprehension, and responding in adequate ways. Needless to stress here that knowledge, implicit or explicit, cannot be omitted. Further, the project aims at developing the mutual perception of intercultural aspects, and finally, it is generally developed with English as a lingua franca. The selected topics include setting up a business abroad, working in international teams, mediating between cultures, dealing with space and time and collaborating online. The task-based approach uses three main categories of tasks, such as information exchange, comparison and critical analysis, and collaboration and product creation. Examples of these tasks are providing information, comparing products from both cultures, and a joint production of texts, presentations and/or audiovisual materials. Also, the project created a pool of experts at the four partner HE institutions who share ICC best practice and are able to train other colleagues in ICC skills. In-service support for university educators in the ICC area, which could either be approached through language courses or transversally in the curricula, may prove helpful in overcoming barriers in local contexts of cultural and linguistic homogenisation in European countries such as Hungary and the Czech Republic, and in implementing strategies to motivate teachers and students to go beyond their own cultural comfort zone.

VI. SUMMARY

Incorporating ICC into the HE curricula can be perceived as a relevant contribution towards increasing student mobility and assisting effective integration of university graduates into the global labour market. The concepts of a lingua franca as well as ICC both represent innovative approaches in the field of language teaching and their successful implementation contributes to conquering linguistic and cultural barriers. As the experience acquired during the discussed case study reveals, the integration of elements of ICC-based tuition into the HE language education necessarily goes hand in hand with the successful implementation of relatively new ICT tools (ICT-aided telecollaboration, virtual teams) and methodologies that promote virtual mobility of students and/or whole student teams, and lead towards establishing more effective and dynamic learning environments that combine features of e-learning as well as of more traditional in-class education. The dissemination of best practice in the field of integrating ICC into HE education should therefore rely on a detailed needs analysis of all involved international partners, careful study of existing learning environments, and the ability to respond dynamically to the changes in both relevant theoretical/methodological standpoints and challenges imposed by business practice.

REFERENCES

[1]   J. Jenkins, A. Cogo, and M. Dewey, Review of developments in research into English as a lingua franca, in Language Teaching 44, Cambridge University Press, 2011, pp. 281–315.

[2]   J. Jenkins, English as a lingua franca: interpretations and attitudes, in World Englishes, Vol. 28, No. 2, 2009, pp. 200–207.

[3]   A. Mauranen and E. Ranta, English as a lingua franca: Studies and findings, Cambridge Scholars Publishing 12, 2009.

[4]   B. Seidlhofer, (2004). Research perspectives on teaching English as a lingua franca, in Annual Review of Applied Linguistics 24, Cambridge University Press, 2004, pp. 209-239.

[5]   M. Dewey, English as a lingua franca: Heightened variability and theoretical implications. In Mauranen & Ranta (eds.), 2009, pp. 60–83.

[6]   S. McKay, Teaching English as an international language: Rethinking Goals and Perspectives. New York: Oxford University Press, 2002, p. 24, p. 129.

[7]   J. H. Dyer, H. Gregersen, The innovator's DNA, mastering the five skills of disruptive innovators. Boston: Harvard Business Review Press, 2013.

[8]   P. Drucker, Landmarks of tomorrow, New Brunswick and London, Transaction Publishers, 2011.

[9]   Council of Europe, White paper on intercultural dialogue, retrieved from http://www.coe.int/t/dg4/intercultural/source/white%20paper__final__revised__en.pdf, 2008.

[10]   Council of Europe, White paper on education and training, retrieved from http://europa.eu/documents/comm/white__papers/pdf/com95__590__en.pdf, 1995.

[11]   Ministerstvo školství, mládeže a tělovýchovy, Národní program rozvoje vzdělávání v České republice, retrieved from http://www.msmt.cz/dokumenty/bila-kniha-narodni-program-rozvoje-vzdelavani-v-ceske-republice-formuje-vladni-strategii-v-oblasti-vzdelavani-strategie-odrazi-celospolecenske-zajmy-a-dava-konkretni-podnety-k-praci-skol, 2001.

[12]   ČVUT, Dlouhodobý záměr vzdělávací a vědecké, výzkumné, vývojové a inovační, umělecké a další tvůrčí činnosti ČVUT v Praze na období 2016 – 2020, retrieved from https://www.cvut.cz/sites/default/files/content/006b43a6-ada4-4c61-8e5d-5027e692c719/cs/20161212-dlouhodoby-zamer-cvut-pro-roky-2016-2020.pdf, 2016.

[13]   P. Sahlberg, Education reform for raising economic competitiveness, in Journal of Educational Change, 7(4), 2006, pp. 259-287.

[14]   M. Carnoy, J. Hallak, and F. Caillods, Globalization and educational reform: what planners need to know, UNESCO, International Institute for Educational Planning, 1999, pp. 13-37.

[15]   P. L. Schmidt, In search of intercultural understanding: A practical guidebook for living and working across cultures, Meridian World Press, 2007.

[16]   G. H. Hofstede, and G. Hofstede, Culture's consequences: comparing values, behaviors, institutions and organizations across nations, Sage, 2001.

[17]   British Council, Culture at work, retrieved from https://www.britishcouncil.org/sites/default/files/culture-at-work-report-v2.pdf, 2013.

[18]   M. Morgado, L. V. Gomes, and M. C. Arau Ribeiro (eds.), The survey of ICC best practice: transnational report. Intercultural communicative competence: An advantage for global employability (ICCAGE) output 01. Project n°.2015-1-CZ01-KA203-013992, unpublished.

[19]   Intercultural communicative competence: An advantage for global employability (ICCAGE), Project n°.2015-1-CZ01-KA203-013992, unpublished.

[20]   British Council, Culture means business, retrieved from https://www.britishcouncil.org/sites/default/files/culture-means-business-report-v2.pdf, 2013.

[21]   ČVUT, Plán realizace strategického záměru ČVUT pro rok 2017, retrieved from https://www.cvut.cz/sites/default/files/content/006b43a6-ada4-4c61-8e5d-5027e692c719/cs/20161212-plan-realizace-strategickeho-zameru-cvut-pro-rok-2017.pdf, 2016.

[22]   F. Helm, The practices and challenges of telecollaboration in higher education in Europe, in Language Learning and Technology, Volume 19, Number 2, 2015, pp. 197-217.

[23]   R. O'Dowd, Online intercultural exchange, Clevedon, UK: Multilingual Matters, 2007.

[24]   M. Byram, M., A. Nichols, and D. Stevens, (eds), Developing intercultural competence in practice, Clevedon UK: Multilingual Matters, p. 5, 2001.

[25]   Council of Europe, Living together: Combining diversity and freedom in 21st century Europe, Report of the Group of Eminent Persons of the Council of Europe, Strasbourg, Council of Europe Publishing, 2011.

Online Remote Labs in Education: Different Ways of Experiment's Task Solution

David Vaněček

Czech Technical University in Prague

Masaryk Institute of Advanced Studies

Department of Pedagogical and Psychological Studies

Prague, Czech Republic

david.vanecek@cvut.cz

Michal Křelina

Czech Technical University in Prague

Faculty of Nuclear Sciences and Physical Engineering

Deptartment of Physics

Prague, Czech Republic

michal.krelina@cvut.cz

Abstract— **In this paper we present online remote laboratory where we discus and demonstrate different approaches to solving the experiment exercise. For this purpose, we designed and built own remote laboratory with experiment: "Measurement of volt-ampere characteristics of LED diodes and determination of approximate Planck constant" technically based on experimental board k8055 and AJAX technology. This experiment can be evaluated by "classic" way via a web control such as buttons, radio boxes, webcam etc. Besides this, we present different, more complex, approach to experiment solving including creation of control system for the experiment at software level. This type of task is suitable for technical and ICT high school and university students who could design and construct own devices or experiments in future.**

Keywords— *online remote laboratory, experiment*

I. INTRODUCTION

The importance of online remote laboratories increases with integrating of ICT into the educational process where remote labs can serve such as demonstration aid in the lecture; extension of laboratory exercises; or homework. The main focusing of remote labs is on physics and other nature sciences, but, also, application of remote labs is suitable for ICT and electrical engineering [1].

This experiment measure volt-ampere (VA) characteristic of LED diodes where the current flow can be described by [2]

$$I = I_s e q(V_F - R_s I_F)/(n k_B T),$$

where I_s is saturation current, q is magnitude of electron charge, V_F and I_F is voltage and current in the electrical circuit, R_s is resistance in series with diode, n is diode ideality factor, and k_B and T is Boltzmann's constant and the junction temperature, respectively. By measurement of current and voltage on the diode we can yield the VA characteristics of diode as shown in Fig. 1.
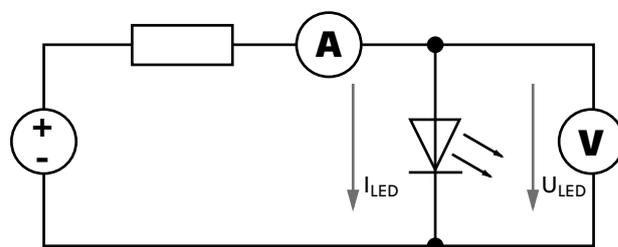

Fig. 1. Schematic of measurement of the current–voltage characteristics.

Then we can compute Planck constant from the knowledge of electron behaviour in semiconductors. In LED diodes the electron which moves from the conduction band to the valence band, emits a photon with energy $E \geq E_g$ where E_g is the width of the band gap. The energy of the emitted photon is

$$E = h v = h c \lambda,$$

where h is the Planck constant, c is the speed of light and v and λ is frequency and wave length of the emitted photon, respectively.

From VA characteristics we can determine the threshold voltage U_T when LED emit photon and compute the minimal energy to overcome the band gap

$$E_g = U_T e,$$

and calculate the Planck constant

$$h = e U_T \lambda c.$$

II. TECHNICAL DESIGN AND IMPLEMENTATION

The measurement of VA characteristics of LED diodes means to measure voltage and current at different input voltage. Then, from VA characteristics we can determine LED diode threshold voltage important for calculation of Planck constant. There are seven LED diodes in visible light range (red, blue, green, yellow, purple, blue-green and orange) and one UV LED diode.

Hardware solution of the experiment is based on experimental USB board k8055 which performs functions of voltmeter, ammeter (indirectly) and regulated voltage sources. The board k8055 includes 8 digital outputs (used for selection of LED diode), 2 analog output 0-5 V (one of them is used such as regulated voltage source), 2 analog inputs (used for measuring the voltages) and 5 digital inputs (not used in this experiment). The current in circuit is calculated indirectly on the basis of knowledge of voltage drop across the known resistor. Concrete the circuit diagram is shown in Figure 2.
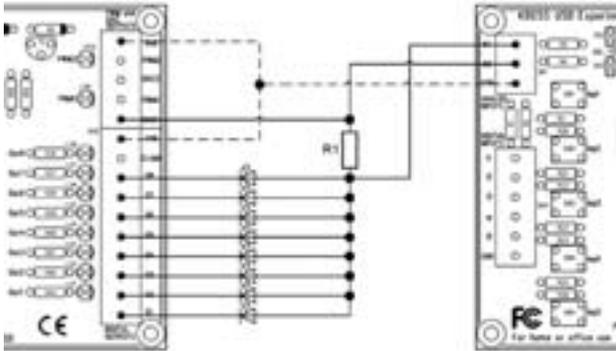

Fig. 2. The electrical circuit diagram of the experiment.

Server-side software solution is based on the Apache, PHP and Linux library for k8055 which is called directly from PHP. The user controls the experiment through internet browser through the web with AJAX technology and Python online interpreter Skulpt.

III. DIFFERENT WAYS OF EXPERIMENT SOLVING

As we mentioned above, user can solve this experiment in two ways. First way (Task 1) use standard techniques for online remote labs where the user has controls such as buttons, radio boxes, webcam view etc. In this case, the user can concentrate on physic; and he can easily understand its principles. There, it is important for the user to know what he do and why. In our laboratory user can control voltage in circuit, change LED diodes, read the current on the diode and he can see LEDs through the webcam.

Second way (Task 2) is more complex and more instrumentally oriented. Here, the user, next to physics, must deal with the actual experimental controlling. It is means to understand the wiring diagram, became familiar with experimental board k8055 – what is logic of the board, how work A/D and D/A converters, how to control the board etc. Last but not least, the user must learn the basics of the Python programming language.

For this purpose, we created online environment where the user has an online Python interpreter Skulpt with simply example program, view to the experiment through the webcam and manuals, shown in Fig. 3. This online environment

allows to users create control program which automatically measure the VA characteristics of LEDs and even if the user is qualified, he can write program which calculate the Planck constant and statistics.
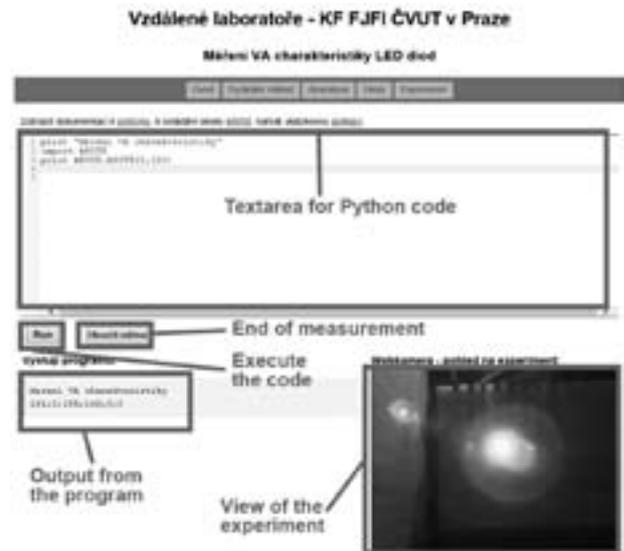

Fig. 3. Online environment for experiment controlling through own program.

IV. DISCUSSION AND CONCLUSION

In this work we present new approach to online remote laboratories focused on advanced engineering and science skills suitable for advanced students of technical secondary schools and students of technical universities. This new approach is based on two types of tasks. The first type of tasks is introduction to the topic, physics and basic methodology of measurement where the standard techniques of online remote labs are used. The second type of tasks builds on the previous type where users acquired basic knowledge and leads to a wider understanding of experiment mainly on the engineering level and is finished by creation of own program for experiment control at software level.

For demonstration of this new method we built our online remote laboratory with experiment on measurement of volt-ampere characteristics of LED diodes and determination of approximate Planck constant. The hardware part of this experiment is based on the experimental board k8055 and software part is based on AJAX technology and Python online interpreter Skulpt in which user can write own code to control the experiment. At present, we test this remote online laboratory as part of Special Practicum 2 at Department of Physics, FNSPE, CTU in Prague.

We believe that this new approach can expand the possibilities of applying of remote online laboratories in education that reduces one of remote labs disadvantage - the inability to touch and feel the experiment.

REFERENCES

[1]   Khalil, A.; Hasna, M.; Benammar, M.; Chaabane, M.; Ben Amar, C., "Development of a remote lab for electrical engineering program," Signals, Circuits and Systems (SCS), 2009 3rd International Conference on , vol., no., pp.1,5, 6-8 Nov. 2009

[2]   Wen Jing, Wen Yumei, Li Ping and Li Lian; "Current-voltage characteristics of light-emitting diodes under optical and electrical excitation"; J. Semicond. 32 084004 doi:10.1088/1674-4926/32/8/084004

[3]   Vaněček, D, "Electronic Education," Czech Technical University, 2011, ISBN 978-80-01-04952-5.

[4]   Vaněček, D a kol:, "Didaktika technických odborných předmětů," Czech Technical University, 2016, ISBN 978-80-01-05991-3.

The Issue of Building Culture in Education

Petr Štěpánek

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Public and Regional Studies
Prague, Czech Republic
petr.stepanek@centrum.cz

I. INTRODUCTION

This text reflects the results of the research project by TAČR TB030MMR003 *Výzkum vhodných nástrojů ke zvyšování stavební kultury (Research of the Appropriate Tools of Building Culture)*, concluded in june 2016.

The project aimed to help realize positive changes in tuition regarding the building culture and urbanism in schools of all levels, through changes to the Framework Education Programme. The intention wasn't only to affect the training of experts and officials, but mainly the education of future general public, educating existing and oncoming city users. Within its scope, the project simultaneously addresses the problems which have been framed by document *Analýza stavební kultury v ČR (The Analysis of Building Culture in Czech Republic)*. The results of the project should have underlying impact on quality of participatory planning and management of settlements.

The project was realized by research team composed of experts from SUT in Bratislava, CTU in Prague, Brno University of Technology, TBU in Zlín and TU of Liberec, implementer and coordinator of the project was BEZK, that operates for over 20 years in the field of enviromental education, counseling and journalism.

II. THE LACK OF AWARENESS OF THE ISSUE OF BUILDING CULTURE AND IMPACTS ON PARTICIPATORY PLANNING AND MANAGEMENT OF SETTLEMENTS

The lack of education in building culture, therefore in field of architecture, urbanism, spatial planning, design, garden architecture, green infrastructure, sustainable development of settlements etc. has a negative impact in several areas and has implications on relatively wide range of settlement functioning. Lack of knowledge limits the ability to implement concepts of so called smart cities, it manifests in insufficient and ineffective participation level among stakeholders in the approval and implementation of development projects and building physical public space, prevents acceptance of foreign know-how, negatively manifests on ability to perceive interdisciplinary the issues of construction and sustainabil-

ity of settlements. All this despite that the level of physical environment of towns and municipalities, their economic, social and environmental sustainability unambiguously determine their competitiveness and quality of life within them.

Building culture as a term primarily refers to aesthetic quality of buildings and public space, their energetic and environmental sustainability, vitality, integration into the territory and into the environmental context, spatial arrangement of settlements and so on. Today, however, all that is subject to natural or even forced participation and consensus of all participants on building, management and usage of buildings and public space.

Public participation in the planning and management of municipalities, towns and larger regional units is, namely, one of the basic assumptions of functional, city-forming and of course democratic self- government and it particularly determines the economic and social sustainability of settlements, the quality of life within them, affects the competitiveness, the influx of investment and transformation processes such as implementation of concepts of smart cities.

Participation provides public feedback to investment intentions, conceptual documents and so on. It is important that it is not derrived solely on the platform of narrower (mandatory) lagislative framework or to be seen as so called necessary evil. Conversely, a well implemented participatory activities may have a positive impact on populations' belonging to the place they live in, on profilation of the identity of location, community development, quality of social bonds etc.

Participation, however, is often hindered by the limits of knowledge of both general and professional public. It is, however, even more limited by sectoral perception of the issue. To overcome this barrier should also help the project *Výzkum vhodných nástrojů stavební kultury (Research of the Appropriate Tools of Building Culture)*. Ability to participatory planning and management of settlements is limited, among other things, by knowledge deficit of aspects of building culture. The low level of knowledge about the functioning of the settlements is the reason of tensions between stakeholders, usually self-government,

civil public and developers / investors in planning and management of settlements and regions. The Project of Research of the Appropriate Tools of Building Culture has ambition to improve and streamline participation by raising awareness of the settlement functioning and the aspects that influence them.

Ability of participation should be strenghtened from the lowest levels of education and it is necessary to differentiate methodology itself and the content, because the share of municipal management in the broadest sense is also conditioned by apropriate knowledge and skills to handle them in a dialogue wit others. Target grops are primarily municipalities, but also non-governmental organizations and schools. Developed topic of participation is then integral part of curriculum with penetration to the issue of building culture. Foreign examples, experiences and materials as well as already prepared documents included in updated information sources on informational platform www.stavebnikultura.cz can be used in teaching.

The concept of participation in the context of building culture includes activities that involve public in the preparation process, design and adjustment of public space incl. spatial and strategic planning. It is based on city-forming principle of sharing public space by all its users. Participation can have both consulting and decision-making character. Participation itself then generates broader social ties in an area to which it relates. It can be implemented both institutionally and spoutaneously, civilly („from the bottom"). Stakeholders involved are considered as equal partner in decision-making process, as well as in prior planning process.

Participation is traditionally, albeit in a narrower sence, anchored in the legislative framework as an element enabling codecision. Consulative dimension of participation, which makes feedback on the proposed solutions and planned decisions accessible, is seemed to be equally significant (if planning and creation of settlements should coherently reflect the needs of all groups of interest). Participation should balance and take account of the possibilities of actors to get involved in it, eliminate the efforts of its misusement to particular interests to legitimize inappropriate projects.

Within education, participation itself should be associated with the subject matter of building culture. It should be associated with the following topics:

- awareness of participation as a way to co-decide on a place we are living in,
- to link participation with planning processes and knowledge of the roles of its actors,
- knowledge of the benefits that participation brings,
- awereness about the methodology of participation, communication related to it, the legislative framework,
- effective implementation of participation,
- to involve participation in planning methods and creation of settlements.

Target groups of these activities are:

- city creators (architects, planners, planning institutions, management of municipal government),
- investors,
- wider professional public, professional associations, a non-government organizations,
- the public in the political sense, organized and unorganized public, individuals,
- groups of interes, businesses,
- public administration.

Goals, opportunities and functions of participation in the field of building culture supported by educational projects in this area:

- usage of a broader knowledge base for planning and decision-making,
- strengthening social ties and cohesion,
- taking into account (often unknown) requirements of actors of public space,
- increase efficiency, quality and value of projects,
- linking local and professional know-how,
- preventing conflicts among actors,
- increasing the political legitimacy of investment projects and decisions,
- strengthening the identity of location, development of communal life,
- improving dialogue between actors,
- raising awareness of settlement functioning,
- informational phase (description of the problem, solution proposals, reasoning, benefits, etc.)
- cooperative phase (solution proposals from actors, opponency, implementation into institutional plans, public involvement in planning [eg. strategic] of settlements),
- consulting,
- evaluation.

III. EDUCATION IN AREA OF BUILDING CULTURE

Research of the Appropriate Tools of Building Culture project, formulates in keeping with the re-

quirements of the contracting authority (Ministry of Regional Development CZ, Technology Agency of the Czech Republic) formulates the necessary extent of education for relevant target groups. Among those are, notably:

- Pupils of kindergardens and primary schools (through Framework Education Programs, School Education Programs and Group Education Programs, etc.)

- Pupils of Grammar Schools, secondary technical schools and other secondary schools (through Framework Education Programs, School Education Programs).

- Students of higher education institutions differentiated in 12 groups[1] of study programs/fields of study (through accreditation of courses).

- Students of the Universities of the Third Age (through syllabus)

- Public administration, institutions that participate in decisions affecting the quality of the physical public space

- Educationalists (through syllabuses of lifelong learning).

- Experts (for example among Czech Chamber of Certified Engineers and Technitians Engaged in Construction, Czech Chamber of Architects).

The project results are then precessed through adjustments to Framework Education Programs of kindergardens, secondary schools, syllabuses for universities, U3A and lifelong learning, Sample School Education Plans and modules, in some cases to particular lectures[2]. This key part of the project will concentrate on support of teaching topics that were identified in the project and topics arising from the implementation of Architectural Policies and vuilding culture in Czech Republic (consequently, building culture in different extent focused on spatial planning, marketing and urban economy, functioning of settlements and landscape, issues of sustainability of settlements and regions etc.) and teaching of architects.

Research of implementation capacity of primary and secondary schools for this subject matter was also conducted. The project includes a subsidy audit mapping the possibility of financing these activities, communication plan, participation manual and especially open information platform www.stavebnikultura.cz

IV. CONCLUSION

The quality of construction, the physical environment around us is a synthesis of qualified demand on the client side (the builder, investor, community) and the contractor side (architect, construction companies), but also the quality of spatial planning (2). It reflects the value system of user, inhabitants, self-government and state government. Higher knowledge of all aspects of building culture leads to higher quality of settlements and life within them, sustainability, competitiveness and resilience and ability to withstand the economic, technological, social and environmental changes.

BIBLIOGRAPHY AND SOURCES

[1]   MMR, Politika architektury a stavební kultury České republiky. Ministerstvo pro místní rozvoj, Ústav uzemního rozvoje. Praha, Brno 2015.

[2]   Maier , K. (ed.): Analýza stavební kultury. Ministerstvo pro místní rozvoj, Ústav územniho rozvoje. Praha, Brno 2012.

[3]   Štěpánek, P. (ed.): Rámcové problémy správy města. Analytická část SP. URM. Praha 2013.

[4]   Kol. aut.: Analytická část aktualizace Strategického plánu hl. m. Prahy. IPR, Praha 2015.

[5]   BEZK (ed.): Výzkum vhodných nastrojů na zvyšování stavební kultury (TB030MMR003). BEZK, z.s., Praha 2016.

[6]   Stará, K., Říhová, J., Klíma, P., Sivák, M.: Memorandum Architektura ve vzdělavání. OTTA, Plzeň 2015.

[7]   www.architektuveskole.cz

[8]   www.stavebnikultura.cz

[9]   www.ekolist.cz

---

1   Economic-management; Environmental; Geographic; Historical; Humanitarian; Pedagogical (bonded on specific supervisory certificate); General pedagogical; Technical; Creative technical; Creative arts; Art history; Uncategorized, selected ad hoc

2   H – the results projected in legislative provisions and rule of law, results projected in the non-legislative directives and regulations obligatory within the competence of the relevant provider, results projected in approved strategic and conceptual documents of VaVal of state or public administration organs.

Polytechnic Education Today

Jiří Semrád

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological
Studies
Prague, Czech Republic
jiri.semrad@cvut.cz

Milan Škrabal

Czech Technical University in Prague
Masaryk Institute of Advanced Studies
Department of Pedagogical and Psychological
Studies
Prague, Czech Republic
milan.skrabal@cvut.cz

Abstract — This paper deals with the issue of polytechnic education as a highly topical issue at the current stage of the socio-economic transformation of society. In the diachronic approach, paying attention to the concept of education with regard to the current and future development of society, i.e. the information society, and knowledge society, this article focuses of the transformation of the concept of polytechnic education as a result of the industrialisation and digitalisation of society, the demands on the professionalization and intellectualization of the manufacturing processes and so on. With regard to the problem of social development in cyberspace, this study further considers polytechnic and polymetic education in the context of the application of digital technologies. This article also deals with the issues of supporting the development of a positive relationship to technology, taking into account the terms of readiness of the young generation for productive activities with the support of the creative relationship to reality.

Keywords — *Polytechnic education; polymetic education; industrialisation of society; professionalization and intellectualisation of the manufacturing processes, education and training; socio-economic transformation of society; information society and knowledge society; critical thinking; educational goals; concept of education.*

I. INTRODUCTION

In the past, the question of polytechnic education was occasionally given all too much attention under the banner of bringing closer together education and practice, and life in general. Given the fact that we find ourselves in the era of science, information, and digital technologies, the question arises whether polytechnic education can still be seen as a valid pedagogical problem. The aim of the study presented is to describe the development of the opinions on polytechnic education in its historical context, pointing out its role in the present day, particularly in relation to the use of digital technologies.

II. THE EVOLUTION OF POLYTECHNIC EDUCATION

The question of polytechnic education is closely connected to the problem of updating the relationship between general and vocational education. Although a specific form of polytechnic education, a form shaped by the given historical period as well as by the development of crafts, trade and a newly self-asserting social class, can be found in the works of J. A. Comenius during the late Renaissance, the phenomenon aggressively asserted its importance towards the end of the 19th century in connection with the growing industrialisation (S. Hessen, 1936). The earliest forms of polytechnic education can further be found in the works of J. Pestalozzi and the Philanthropist movement. The question of polytechnic education became even more acute after the First World War, in particular in relation to the reconstruction of national economies, but also in relation to the attempts to establish new economies in the USA and the former USSR (P. P. Blonskij, see Dýma, 1975). Any viable analysis of the work school as a concrete example of implementing the need for polytechnic education must further take into account the conception of Th. Litt (1958; see too F. Singule, 1992) who identifies experiencing, direct living-through, and the expression of real life as the characteristic features of the work school. The ideas of our predecessors concerning the definition of the term polytechnic education, ranging from the inclusion of handicraft activities to the transfer of class instruction to manufacturing facilities, stand much removed from our recent position.

The question of polytechnic education grew in importance in the first half of the 20th century, emerged as a crucial problem in the second half of the 20th century, and became a highly topical problem at the turn of the 20th century, that is, at the time of what has been described as a post-industrial, information society, and/or learning society (Liessmann, 2008), or a knowledge-based society, especially in connection with the increasing number of scientific discoveries and the development of sciences, the close focus on so-called economic growth, the transformation of labour (digital technologies), and a new structuring of society.

As mentioned above, the question of polytechnic education asserted itself hand in hand with the industrialisation of society. The development of machine production led to profound changes not only in the organisation of society but also

in its spiritual life. These changes were reflected in the educational process as a result of external pressures which industrial magnates put on the definition educational aims, as well as on the concept of education in general. A tendency towards conforming education as a whole to the needs of industry and business appeared in American pedagogy at the turn of the 19th century; the same tendencies can be observed slightly later in post-revolution Russia. The result of this tendency was that vocational training was seen as more valuable than general education. Requirements related to the process of industrialisation imposed on the educational process were increasing alongside the increasing division of labour and rationalisation of the manufacturing process. This in turn led to the implementation of specialised education which aimed at developing the predispositions of a child for integration into the manufacturing process at the earliest age possible. However, the decision making process about children's integration into the manufacturing process did not take into consideration their individuality.

As stated above, the crystallisation of polytechnic education in the first half of the 20th century in the then superpowers, i.e. USA and USSR, displays analogical tendencies. This was given first of all by the fact that the pragmatic pedagogy developed in the USA by scholars such as J. Dewey appealed to the foremost Soviet theorists led by N. K. Krupska (Semrád, 1989), P. P. Blonskij and others, who enabled the transformation of some of the pragmatic ideas and their integration into the newly emerging soviet educational conception. Consequently, Blonskij's book *The Work School*[1] (1919) had a decisive influence on the post-revolutionary reform of the Russian and Soviet system of education (Dýma, 1975), in which Blonskij himself took an active part. Blonskij dissociated himself from the conception of the work school based on craft manualism which was put into practice by Kerschensteiner in Germany (see Dýma, 1975), replacing manualism with machine production, craft with industrialisation, and professionalism with multipurpose polytechnicism. Craftwork was accepted only as one of the stages of work education, a stage which would precede the direct engagement of children and youngsters in the productive work for society. In order to make the children as influenced by the process of industrialization of society as possible, the work education took place directly in factories where it was possible to meet the crucial requirement of polytechnism by integrating the students into the body of producers. The students could thereby be in continuous contact with the manufacturing process as well as with factory life. The lessons utilised factory machines as well as factory training methods. Later stages of the Russian and

Soviet pedagogical theory interpreted excessive industrialisation and technicisation of the manufacturing process critically, and saw it as narrowly conceptualised polytechnism which ignored the general fundaments of science and technology. The basis of the Russian and Soviet polytechnic education was then formed by the concept of the so-called complexes, that is, certain types of projects which were dealt with not only on the theoretical level.

Similar ideas were held by a number of German pedagogues of the in the 1920s and 1930s, for example by S. Kaweran and P. Oestereich who preferred the so-called production school (Dýma, 1975; Pařízek, 1977) and understood it as an organisational element in the economic, cultural and social life of adults. P. Oestereich pleads for the integration of the production school into the economic process of society, and for the eventual synthesis of the pedagogical and economic approaches. According to these authors, the polytechnic education represents an ideal and optimal type of education in terms of the degree of interconnectedness between education and economy. According to this approach, production becomes the foundation of human culture; true labour production then becomes the centre of the educational effort. The questions connected with the concept of polytechnic education are thereby articulated on the level of creativity, although in the given concept of production, this represents only its elementary layer.

Polytechnic education has become more topical in relation to the mass dissemination of digital technologies, their impact on human personality and social relations, but also in connection with the growing professionalization and intellectualisation of manufacturing processes, and the widening gap between humans and their physical environment. The digitalisation of society has further changed the traditional conception of industrial production. Traditional producers and working men have become lab technicians, specialised workers, assistants and employees in the sense of white-collar workers. Digitalisation influences socialisation and has thereby introduced a new dimension into social relationships precisely because these relationships can exist primarily as facilitated by digital technologies. On the other hand, digital technologies seem to provide more space for creativity; however, in reality, digital technologies in fact also limit and hinder creativity. Furthermore, this process sidelines physical and mental pre-dispositions for manual skills which in the past constituted the foundation of the ethnographic, folkloristic, and cultural heritage of a given society.

As stated above, the question of polytechnic education is, from the historical perspective, closely related to the discussion of general and vocational education. For example, as J. Skalková (2009) points out, after the culmination of the

---

1   Some sources translate Blonskij's book *Трудовая школа* (1919) as *The Labour School*, this study translates its title more accurately as *The Work School*.

conflict between general and vocational education generated by the unparalleled scientific and technological progress in the 20th century, as well as by the use of modern technologies in everyday lives, an entirely new phase in the development of the relationship between these two types of education has taken place, a phase in which some features of these two types of education come closer to each other, some undergo a change in the function of their content (general becomes vocational and vice versa).

As part of the process of modernisation of the educational content, polytechnic education has become an important factor in dealing with the complex relationship between general and vocational education. Starting in the 1970s, UNESCO has recommended the integration of the subject matter of technological nature into educational content (Skalková, 2009). However, this recommendation was not something entirely new because even the so-called socialist education, under the influence of pragmatic pedagogy, which took the reality of our everyday lives as its starting point, articulated the need for work education which encompassed not only the acquisition of technological foundations, but also the creation of a positive attitude towards work (Blonskij, 1928). Polytechnic education was meant to be implemented in close relation to the general learning content in mathematics and the natural sciences. The purpose of polytechnic education was not only to help students to become familiar with the use of various tools and pieces of equipment, and the development of practical skills, but also to become acquainted with the world of labour, learn how to cooperate, and professionally solve problems resulting from working with the latest technologies and new scientific discoveries. All these activities took place within the context of increasing the effectiveness of the national economy and of the socio-economic transformation of the society.

In addition, the first decades of the 21st century have introduced the need to develop various new concepts of thinking. This need results from the impact of digital technologies which have enabled a previously unimaginable accumulation of vast amounts of information, but at the same time have lead to a situation in which this information is mistaken for knowledge. Further, since at the beginning of the 21st century, knowledge became more and more specialised as a result of increasing specialisation in individual areas of scientific, technological, and economic development, it has become apparent that the future of knowledge lies with the synthesis of thought processes. In addition, the gap between practical and intellectual aspects of life is dangerously widening. Given this situation, polytechnic education should, besides other things, contribute to bridging these gaps, for example the gap between technology-oriented thought and the social sciences. As B.

Suchodolský added, the higher one's vocational education, the deeper should one's general education be. With this being said, it comes as no surprise that the natural sciences today use some of the methodological approaches and methods borrowed from the social sciences (Schwanitz, 2013); as Schwanitz puts it: "At this very moment, the gap between the natural sciences and the humanities seems to be slowly closing because notions such as reflection and self-referentiality, which until recently existed exclusively in the humanities, more and more often determine the problems of natural sciences" (2013).

III. POLYTECHNIC AND POLYMETIC EDUCATION

Polytechnic education offers not only a systematic "step into" the world of technology, but also the incorporation of students' experience into the process systematic knowledge acquisition. One's own experience is very powerful as a motivating factor, but also as a basis for further learning, precisely because it is very concrete. As a result of this, one's experience also has its limits, and young learners need more systematic and compact knowledge, which is brought to him or her through education in the sciences and technology, but also in art, using his or her own experience. Polytechnic education allows students to learn the practical use of acquired scientific and technical knowledge in the context of socio-economic conditions. Work education should become a polytechnic educational subject which would affect aims focused on acquiring the fundamentals of both manual work and digital technologies. The terms "general", "vocational", and "polytechnic" education primarily reflect the extent of education, the concept of educational content, but also express different levels of knowledge of the world. All types of general education should at the same time be polytechnic. A crucial constituent which helps in meeting the requirement of a personality harmonically developed towards polytechnic education in the 21st century is the so-called polymetic education, as defined by O. Chlup in one of his last studies in 1962 (see Pařízek, 1977). After more than 50 years, the opinions of O. Chlup from the 1960s that foresee future development of society in cyberspace seem quite visionary.

The advent of digital technologies is often discussed in relation to the so-called 'second culture' (Schwanitz, 2013). A number of western theoreticians claim that the society is overtly technicised and lacks humanistic dimension. In relation to digital technologies, it is possible to observe a transformation of the nature of interpersonal relationships, in particular in relation to their realization.

One of the most important sociologists, F. Webster, describes an information society as a gateway to a knowledge society (2006, p. 8 - 9), and

introduces six (Webster originally talks about five, only to add the last and most important definition) characteristic definitions of the information society: technological, economic, occupational, spatial, cultural, and finally, theoretical knowledge. The emphasis Webster places on theoretical knowledge is extraordinary. As K. Kolesárová Saková (2016) points out, Webster's point of view might be compared to that of R. Richta (1969) who, in his book *Civilizace na rozcestí* (Civilisation at a Crossroads, 1969), claimed that education in a post-industrial society attains a new quality, and knowledge generates new added value. From the perspective of pedagogy, this means the increase in the importance of general education and its methodological dimension, as well as a transformation of the relationship between general and vocational education. A similar position is also proposed by R. B. Reich (2002), who draws on the work of D. Bell. According to his position, the typical features of an information society understood as a gateway into a knowledge society are the three following occupational categories: common production services, personal services, symbolic and analytical services.

The last of the tree categories is ascribed the least importance from the perspective of future development. This category is currently fulfilled 15 percent whereas it should be the crucial category in future. According to Reich, the mission of this category is to conceptualise tasks and their solutions. In order to achieve this, one must be equipped with abstract as well as critical thinking, the ability to synthesise, experiment, work together and cooperate, the ability to look beyond data, construct meanings and not merely accept them the way it is done in today's schools.

Nevertheless, given their unique nature, digital technologies in a certain sense link physical and mental work. It is O. Chlup who in the 1960s complains about the failing attempts to link physical and mental work into a unified "mutually adherent, labour, intellectual, ethical and emotional-educational whole" (see Pařízek, 1997, p. 195). O. Chlup hailed the fact that applied cybernetics had entered the educational process but at the same time he was acutely aware that all machines used in the process of learning, and digital technologies used during instruction can significantly influence essential aspects that play a role in the acquisition of subject matter by the mechanisms of memory. In this context, O. Chlup spoke of neo-behaviouralism asserting itself in the educational process as a mere reproduction of memorised pieces of knowledge. Polymetic education should therefore represent the means by which it is possible to overcome the deformations of not only polytechnic but also of general education. O. Chlup was also well aware of the fact that the admission of cybernetics into education could strengthen the role of competitive, achievement-based education at the expense of socially oriented education.

O. Chlup sees polymetic education as the second aspect of an activity, be it a physical or a mental activity. The term has its origin in the Greek word "metis", which means wisdom, reason, ingenuity, or thinking. It is expected that polymetic education is accomplished by a productive activity, that is, by various types of creative work. Acquired facts and sub-data represent a mere pre-requisite for further processing based on inner ideas about the acquired phenomenon as well as on the use of different types thinking, including dialectic or relational thinking. Polymetic education represents the a synthesis of knowledge which is a result of deep deliberation on the subject matter, deliberation that is based on inner experiencing, feeling oneself as part of the value of the acquired piece knowledge, enriched by the personality of each individual. O. Chlup thereby considers not only the theoretical heritage of cultural pedagogy, but also anticipates reflective knowledge as it is used by D. Schwanitz (2013, p. 513). Polytechnic education emphasises the necessity for children to develop the ability to think, and for teaching the young generation how to use different types of thinking that would allow them to mould the information provided by digital technologies into real knowledge. Polymetic education at the same time presupposes work with cultural heritage; industrial heritage thus becomes an indispensable part thereof.

IV. POLYTECHNIC EDUCATION TODAY

Concerning the development of thinking in relation to digital technologies, emphasis is first of all placed on critical thinking, which should always go hand in hand with computer literacy. Critical thinking is globally considered as one of the most important educational goals. It is listed among skills which every young person in the 21st century should have. The attention paid to this phenomenon stems first of all from the role digital technologies play in the life of the young generation. A number of teachers and educators argue that the lives of the young generation are primarily consumed through digital technologies that often do not convey objective, true information, but give space to gossip, hoaxes, ungrounded information, etc. The ability to control digital technologies should be accompanied by the ability to critically asses acquired information in order to transform it into a creative, socially acceptable product.

Critical thinking is described by a number of specialists. The problem with the majority of these definitions is that they fail to capture the essence of critical thinking and typically limit themselves to defining the concept by describing only some of its aspects. The study presented relies on the following definition of P. Tittle (2011, p. 5): "Criti-

cal thinking is judgemental. It's thinking carefully about something in order to evaluate it and ultimately decide whether or not it's something you should accept. So critical thinking is a how-not-to-be-gullible kind of thing." A similar definition is provided by R. Ennis who claims that critical thinking is: "reasonable decision-making about what might and what might not be believed" (Johnson 1985).

As part of defining and developing the concept of critical thinking, critical interpretations appear that see it more as a form of lifestyle rather than a matter of education that might be learned (Švarcová, 2010). For these reasons, critical thinking is sometimes seen as affiliated with upbringing rather than education. Given the fact that a number of theorists actually link critical thinking with creative activities, the connection between critical thinking and a creative attitude towards reality comes to mind. This notion designates an attitude framework which presupposes the application of a creative response in all situations, irrespective of the outcome. A creative attitude towards reality is therefore underpinned by the desire to achieve something, to stir the "still waters", not to imitate and not to copy other solutions (Semrád, In. Hlavsa a kol., 1981).

On the other hand, a large number of studies and practically-oriented approaches towards education reduce critical thinking to reading and writing skills, that is, to prevailingly cognitive aspects of the young learner's individuality. An example of this attitude might be seen in a magazine and an internet portal "Kritické listy" that focuses on facilitating the experience to teachers; similar attitude acquires an RWCT program, which is also presented via this portal, called "Čtením a psaním ke kritickému myšlení" (Reading and Writing towards Critical Thinking; see http://www.kritickemysleni.cz/infosit.php). In line with the arguments presented above, the programme website (http://www.kriticke mysleni.cz/oprogramu.php) presents a list of methods that include: mind-mapping, brainstorming, free writing, pair discussion, learning from each other, spider web discussion.

Most of the studies that deal with the problem of critical thinking enumerate elements that constitute the basis of critical thinking or describe what skills an individual has to have in order to be able to think critically (www.criticathinking.org). From the educational point of view, these questions are not formulated in an ideal way because they are very difficult to operationalize. Moreover, the lists presented are very often formulated from an adult perspective. Defining education that should lead towards critical thinking one should, in our opinion, first of all become aware of moments that may hinder the application of critical thinking and focus all attention on overcoming these impediments.

One of the crucial barriers can be the worldview of a given person and the values that are connected to it, as we see for example with fundamentalist Islamists. World view is a key category for every individual and their life since it expresses the position from which they relate themselves to the surrounding world, its perception and evaluation, or a position from which they enter into the world. Naturally, the starting point of critical thinking is problem resolution. With this being said, the crucial barrier might be whether I actually do want to solve these problems, whether I am not a fatalist, or simply so indolent that I prefer going with the flow. All of these questions are questions concerning one's world-view.

From the perspective of education, it is also important to ask when or at what age should a child be allowed to use digital technologies. For instance, a number of theorists from the field of architecture point at the growing number of extremely similar buildings and argue that the reason behind this trend is the fact that future construction engineers and architects simply use various kinds of software that automatically draw pieces of design which in the past had to be laboriously drawn up by architects themselves with the help of tools such as the French curve. In this respect, one should carefully discuss which of the stages of the educational process is ideal for the introduction of architectural software into the class so that the creativity, imagination, and fantasy of the students are not impeded.

In order not to become a critique for its own sake, critical thinking must grow from deep erudition supported by the cultural legacy of the past (Schwanitz, 2013; Eco, 2008). As for example Schwanitz puts it, the essence of erudition inheres within the knowledge of this cultural legacy. Critical thinking of course cannot succeed without the fundamental principles of logical thinking, but at the same time must be nurtured by other types of thinking, for example by connective and relational thinking. Its basis naturally rests with the dialectical thinking developed by Plato, Comenius, Hegel and others (Floss, 1974). Relational thinking has its social and emotional dimension that cannot be ignored. For example, as R. Honzák (Šimůnková, 2016) points out, there is a place in the human brain where emotions and reason meet. Honzák further points out that intelligence alone is not the most important thing, the more important of the two is emotional intelligence because the human world does not rest on the laws of cause and effect but on relationships.

A creative attitude towards reality in particular requires adequate development of emotions, because intuitive thinking, which stands behind the greatest discoveries, relies on emotional intelligence as well as on deep experiences and enjoyment. Experiential education, should it fulfil its function, cannot be reduced to adrenalin-oriented physical education; it must cover a much wid-

er spectrum and facilitate the cultural legacy, for example the aforementioned industrial heritage. As the international experience suggests, critical thinking can be best developed in so-called team learning (Chandrasekaran et al., 2016) that allows students to acquire competencies such as being an outstanding communicator, competent critic and manager (Manzione et al., 2016) by working on given projects.

CONCLUSION

Summing up the presented data, it is possible to conclude that polytechnic education represents a highly topical problem, though only on condition that it meets certain given criteria. Polytechnic education should therefore be understood as a part of general education, and as such should contribute to the development of young students in the unity of the physical, psychical, manual, and spiritual aspects. Polytechnic education should further contribute to establishing a positive attitude towards technology, but also lead to the correct understanding of when technology represents the means and when it represents the ends in people's lives. With respect to the over-technicised society, polytechnic education can be successful only when developed in harmony with that form of polytechnic education which expands and cultivates the thinking of young students by utilising different forms or styles of thinking, including critical thinking, but also by facilitating the link between young students and the cultural and technical heritage. Polytechnic education should be accomplished with a productive activity underpinned by a creative attitude towards reality and creative effort.

REFERENCES

[1] Blonskij, P. P. a Rufin, I. I., ed. *P.P. Blonskij v jego pedagogičeskich vyskazyvanijach: S avtobiografijej P.P. Blonskogo "Kak ja stal pedagogom i imenno takim kakim ja stal"*. Moskva: Rabotnik prosveščenija, 1928. 116 s. Pedagogičesk. dejateli v ich vyskazyvanijach / Pod red. I.M. Deomidova i A.P. Pinkeviča.

[2] Blonskij, P. P. *Trudovaja škola* (The Labour School /The Work School). Trudovaja škola vtoroj stepeni. Učitel' trudovoj školy. Moskva: Gos. izdat., 1919. Serija po teorii i praktike jedinoj trudovoj školy.

[3] Drigas, A. et al. ICTs based Physics Learning. *International Journal of Engineering Pedagogy*. No: 3, 2016. ISSN: 2192-4880

[4] Dýma, M. *P. P. Blonskij: z jeho života a díla* (P. P. Blonskij: his life and work). Praha: Státní pedagogické nakladatelství, 1975. 194 s. Z dějin pedagogiky.

[5] Eco, U. *Poznámky na krabičkách od sirek* (Notes on boxes of matches). Praha: Argo, 2008. 471 s. ISBN 978-80-7203-929-6.

[6] Floss, P. Komenský a Platón (Comenius and Plato). *Studia Comeniana et historica*. Roč. 4, č.8/9 (1974) ISSN 0323-2220.

[7] Hessen (Gessen) S. I. a Patočka, J. *Filosofické základy pedagogiky* (Philosophical Foundations of Education). Praha: Československá grafická unie a.s., 1936.

[8] Hlavsa, J. ed. a kol. *Psychologické problémy výchovy k tvořivosti* (Psychological problems of education for creativity). Praha: SPN, 1981. Knižnice psychologické literatury.

[9] Chandrasekaran, S.; Al-Ameri, R. Assessing Team Learning Practices in Project/Design Based Learning Approach. *International Journal of Engineering Pedagogy*. No: 3, 2016. ISSN: 2192-4880.

[10] Jeretin-Kopf, M.; Wuttke, C. Ch.; Haas, R. & Wiesmüller, Ch. Methods and Tools for Enabling Employees to Contribute to Technological Progress. *International Journal of Engineering Pedagogy*. No: 3, 2016. ISSN: 2192-4880.

[11] Johnson, R. H. Some Observations about Teaching Critical Thinking. *CT News, Critical Thinking Project*. Sacramento: California State University, 1985, roč. 4, č. 1, str. 5-6.

[12] Kolesárová, K. *Životní styl v informační společnosti* (Lifestyle in the Information Society). Praha: Univerzita Jana Amose Komenského, 2016. ISBN 978-80-7452-119-5.

[13] Komenský, J. A. *Vybrané spisy* (Selected writings). Praha: Státní pedagogické nakladatelství, 1969.

[14] Liessmann, K. P. *Teorie nevzdělanosti: omyly společnosti vědění* (Theory of illiteracy: errors knowledge society). Praha: Academia, 2008. XXI. století; sv. 4. ISBN 978-80-200-1677-5.

[15] Litt, Th. *Das Bildungsideal der deutschen Klassik und die moderne Arbeitswelt* (The educational ideal of German classical music and the modern working world). Bonn: Bundeszentrale für Heimatdienst, 1958. 148 s.

[16] Manzione, L. et all. Preparing Engineering Students for the Global Sourcing Environment. *International Journal of Engineering Pedagogy*. No: 3, 2016. ISSN: 2192-4880.

[17] Martincová, Jana. Úroveň kritického myšlení studentů vybrané fakulty humanitních studií: Level of Critical Thinking of Students of Selected Faculty of Humanities. *Lifelong learning = Celoživotní vzdělávání*. Brno: Mendelova univerzita v Brně, Institut celoživotního vzdělávání, 2016, 6(2), 83-105. ISSN 1804-526x.

[18] Pařízek, V. ed. *Otokar Chlup a perspektivy výchovy* (Otokar Chlup and perspectives of education). Praha: Státní pedagogické nakladatelství, 1977. 217 s. Z dějin pedagogiky.

[19] Reich, R. B. *Dílo národů: příprava na kapitalismus 21. století* (The Work of Nations: Preparing for the 21st Century Capitalism). Překlad Miloš Calda. V českém jazyce vyd. 2. Praha: Prostor, 2002. ISBN 80-7260-064-8.

[20] Richta, R. et al. *Civilizace na rozcestí: společenské a lidské souvislosti vědeckotechnické revoluce* (Civilization at the crossroads: social and human context of the scientific revolution). 3. rozš. vyd. Praha: Svoboda, 1969.

[21] Semrád, J. *Tvořivost v systému výchovy N. K. Krupské* (Creativity in the educational system N. K. Krupskaya). Pedagogika, 4/1989. ISSN 0031-3815.

[22] Schwanitz, D. *Vzdělanost jako živý dialog s minulostí: vše, co musíte vědět, chcete-li rozumět přítomnosti* (Education as a lively dialogue with the past: everything you need to know to understand the presence of). Překlad D. Petříčková a M. Petříček. V českém jazyce vyd. 2. Praha: Prostor, 2013. Obzor; sv. 83. ISBN 978-80-7260-273-5.

[23] Singule, F. *Současné pedagogické směry: a jejich psychologické souvislosti* (Current educational guidelines: and their psychological implications). Praha:

Státní pedagogické nakladatelství, 1992. 55 s. ISBN 80-04-26160-4.

[24] Skalková, J. *Společenskovědní poznání v sítích inženýrského vzdělávání* (Social networks of knowledge in engineering education). Brno: Paido, 2009. 85 s. ISBN 978-80-7315-173-7.

[25] Šimůnková, T. Psychiatr Radkin Honzák o LSD, IQ, důvěře a dinosaurech (Psychiatrist Radkin Honzák of LSD, IQ, trust and dinosaurs). *Právo: nezávislé noviny. Příloha Salon*, 22. 9. 2016, s. 3. Praha: BORGIS, 2016.

[26] Švarcová, E. 2010. The Role of Critical Thinking for Well-being of Individual and Society. Jindřichův Hradec 8. 9. 2010 – 10. 9. 2010. In: *IDIMT-2010*. Linz : Trauner Druck GmbH&Co KG, 2010. ISBN 978-3-85499-760.

[27] Švarcová, E. *Výchova ke kritickému myšlení* (Education for Critical Thinking). Praha: VŠE, 2010. Dostupné z: http://kdem.vse.cz/resources/relik10/PDFucastnici/Svarcova.pdf

[28] Tittle, P. *Critical thinking: an appeal to reason*. New York: Routledge, 2011. ISBN 978-0-415-99714-0.

[29] Webster, F. *Theories of the information society*. 3rd ed. London: Routledge, 2006. ISBN 0-415-40633-1.

LARP – a Form of Experiential Education

Pavla Šrůtová

Czech Technical University in Prague
Faculty of Mechanical Engineering
Department of Management and Economics
Prague, Czech Republic
pavla.srutova@cvut.cz

Abstract—**LARP (live action role playing) is a new phenomenon of role playing activities. This article aims at the possibility of using this modern activity for team development as an alternative to classical methods or other known forms of experiential education. The article deals with its definition including typologization, brief history and creation of a LARP scenario which could be used as a team development activity for ten attendants. General setting, timing and script with roles are included in the scenario. The research contains the case study which presents the results of practical activity application.**

Keywords — team building, experiential education, LARP, development, role play, cooperation, communication

I. INTRODUCTION

Companies all over world are under great preassure in these times and above that the demands on them are still growing - they must be competitive, flexible, innovative, and generally able to withstand the unstable economic situation. If an organization wants to handle it, it must abandon traditional linear structure. That is the reason why the process organization formed: the creation of interdisciplinary cooperation and therefore diverse groups / teams created possibilities for people to handle more ideas, though it brings higher demands.

The phenomenon of the working teams is appearing across organizations in all sectors, so it is not surprising that psychology and related disciplines pay attention to it. Working with teams becomes part of specialization of management, human resources department and even specialized agencies.

The social psychology found other reasons why more attention within the business education should be payed to the processes in teams. Most people are familiar with the term synergy in a team: the result of the team is much better than the simple sum of the activities of its members.[1] But besides synergy in group dynamics run other processes, such as interactions, group ideology cohesion, various functions or also development.

II. TEAM DEVELOPMENT AND BUILDING

As mentioned at the beginning, the general public tends to use the word "teambuilding" for virtually any team activity, human resources experts see teambuilding as focused and structured team working with team relations: efforts to deepen trust in the team, a reminder of the principles of teamwork, communication development or improvement of creative techniques.[2] The lectors are during these activities working with Tuckman's theories of group dynamics and with Belbin's determination of team roles. Their effort is to streamline synergy and shift the functioning of a team to other level.

So the term teambuilding is in this article used for the original meaning of the word – as a sequence of activities aimed at effective cooperation, the functioning of the group or coping. It is therefore clear that teambuilding the working group can not be applied because it do not work processes characteristic of the team.

There is a great potential of the synergy, creativity and overall effectiveness of the team. Team options are almost limitless, the problem is to help teams so they can show off their best. When helping teams reach their peak as the main strategy teambuilding is used. One team development action cannot be an end and every teambuilding must meet the cycle determining needs, gaining commitment, assessing needs, course management, implementation of results and assessment of impacts.[3]

III. EXPERIENTIAL EDUCATION

In studying the educational literature in relation to teams we will sooner or later discover the term experiential learning. No wonder, everyone as a child understood the benefits of own experiences - whether adults told him anything, you would't believe it until you've tried it, experienced it. Even when children grow up in intelligent adults, our own enjoyment or experience remains the most effective teaching method.

The results of Kolb's research state that a full 80% of knowledge that we gain comes from our personal experience. Kolb's cycle (or spiral) includes four phases: (1) the experience of a partic-

ular situation; (2) reverse observation/reflection (looking back what actually happened); (3) generalization/ forming abstract concept and (4) active experimentation with identified knowledge. It is clear that last point is the same as the first, so the cycle can start again. As a result, we souhld bw rather talking about a spiral, because every experience takes us a little further than we were at start of it.[2]

The history of Czech experiential school was quite rich: the Czech Scout Movement Junák, Foglar's boyish adventure novels or Vacation School Lipnice (camping, natural athletic sport and especially use of great range of games). Thanks to the "iron curtain" (isolation of the Czech republic from western Europe) experiential learning in our countrie developed very specifically, but certainly not inefficiently. Thanks to the unique environment of this background in the Czech lands an original concept of adventure education developed.

IV. PHENOMENON LARP

LARP is an acronym for the four English words: live action role playing. In recent years, LARP community is consolidated using the acronym as shorthand - like this before occurred with words radar or laser. For a LARP player word "larper" is used and "LARP" (in capital letters) is used only when stressed that it is a shortcut.

Four words, of which the acronym is composed, accurately define the main features of this activity, ie from the base:

- "Playing" = gaming: larps are based on drama (theater) activities - game story, contact with players.
- "Role" = character: in a LARP players portray a certain fictional character with given characteristics (which can be different from their actual merits).
- "Action" = happening: in LARP (unlike computer or board game), players can really play their role - the character of the activity doesn't come from some dice roll, but the real (physical) player's actions.
- "Live" = real: larps take place in real time an place.

Larps are a type of role playing - as in the classic RPG player takes on his person a fictional character. It is defined by certain characteristics of the game world, as well as through a fictitious personality and a story that defines character's past. LARP, however, does not take place at the table as classic RPG games. They use physical space, players move and interact with each other – they theatrically portray their characters' actions in real time. Most larps involves social interaction - the players will communicate with other characters, create plans, follow the story of intrigue against their enemies in the game. [4]

LARP can be seen similar to the theater, but the players are not professional actors, there is no audience and none given scenario. They usually receive introductory information about the world and the story and than they improvise, so the end of the game can be different, even if repeating the "same" LARP. Players participate for fun, special moments, a break from everyday life and spending time with friends.

A. LARP history

Talking about the beginnings of the LARP in world history is not easy, because of the mentioned thin line between it and improvised theater. One of the first larping action we can find in role games in Middle Age, where aristocrats and their servants reconstructed mythological scenes, tournaments or historical battles.[5] These games were organized for the entertainment of the Sovereign – so we can say for the audience, which larps not.

When talking about LARP as we have defined above, we can finds its origins in the early 80s of the 20th century - all sorts of games emerged independently in North America, Europe and Australia, mostly drawing inspiration from table role playing games (such as famous Dungeons & Dragons). They were rather oriented to representation of fights. Other fundamental root of LARP were group of history lovers who studied in detail their favourite historical event or period and tried to faithfully portray it.[6]

Larps found inspiration in desktop RPGs, historical reconstructions, improvisational theater, literature, movies, etc. In the 90s the growing popularity of new film genres emerged and new larps began to rise from the classic fantasy, history or science fiction and larps with the motive of horror, gothic or cyberpunk appeared. With new themes also the era of real acting role rised, not only performing fights.

LARP came to the Czech lands (as well as many other modern trends) after the change of political regime. Yet we can not say that the Czech larpers started from scratch - LARP in the Czech Republic has similar roots as a whole experiential pedagogy. After the revolution in 1989 a wave of western entertainment rised – the boom of fantasy literature inspired hundreds people. At this moment the real Czech LARP starts ant it copies (slightly accelerated) the development of larping world history.

In the second half of the 90s the internet starts to spread in the Czech Republic which expanded the possibility of better communication between players - starting to emerge more events and their duration and the number of players increases. Nowadays the Czech larp organizers follow international trends, there are shops with larp facilities, university students are beginning to write academic thesis about LARP and solve the inter-

connection with improvised theater and experiential learning.

B. LARP typology

In the Czech larping enviroment the most used division of LARP types copies its historical development. So larps division according to its form can be defined as:

- Small bands larping,
- Battles,
- City larps,
- Larps called "the world" (sometimes divided into a post-apocalyptic and fantasy),
- "Chamber" larps.

Small bands larps try to copy en experience form PC games or fantasy stories (eg. Tolkien's The Hobbit). Battles are quite similar to mentioned representation of historical events – they most often choose some fantasy enviromen. City larps can last months and the players play them in their free time every time they meet each other. The true larping events are the world and chamber larps. The main differences between them are duration and location. World larps are situated in surrounding visually similar to their story and they last a weekend or even a week, players wear beautiful costumes often close to film quality and they live great adventures of their character lifes. In the contraty chamber larp players usually wear normal clothes and their games last only few hours – the game takes place inside them in feelings, decisions an experience.[7]

C. C. Similarities between LARP and other methods

There are several activities similar to larp method which use the experience of being in diferente situation, role or character that the real one is. For example slightly structured games are used in experiential education. In this games lecturers prepare different situations, simulation where participants have the script of the situation an they have to react, form a decision to solve it. These games work with immersing participants to make an imaginary world and can also use costumes props to illustrate the atmosphere. We could say that many slightly differente games or role-playing activities exist. The rate of input into the role is either none (then it is a simulation - the participant remains himself), social (the game in the role) or total (characterization), where the player takes the role not only beer and character specific figures.[2] Dramatic play with a full characterization can be considered equivalent to LARP method.

For developing management practical skills a role-playing training is also used.[1] Participants take on a certain role in which they recognize the nature of interpersonal conflicts in negotiations.

Scenario can give them more or less space for the completion of the role, however, it is always necessary to have a particular situation to be able to explain correct behavior in it.

LARP method in education might not be complete new, but it has been used so far only marginally - primarily because of their demands for preparation and execution. There is also a big inconsistence in names used for this method (dramatic games, management games, Q-method, Galli method, etc).

V. LARP SCENARIO

This article uses the term "scenario" for showing the initial larp situation and few moments (or inputs), which the organizer adds new information to players. Conclusion or termination of the larp is not pre-fabricated - it all depends on the players, their ideas and initiatives, as the game develops. From the larp typology mentioned above the "chamber" larp is used becouse it allowes the best to work with information in small group of people (a team).

A. The opening performance

The players are the team which organizes a great two-day conference - this is the biggest event they ever arranged. The game itself will begin after the first day of the conference - the players are at scheduled team meeting. Roles and their main traits are: (1) parental boss, (2) and (3) two experts on foreign guests (one European - very enthusiastic and innovative, the other American - reliable, conservative), (4) helpful accountant, (5) scatterbrained person responsible for the background of the conference, (6) another person responsible for accommodation (he's friend of everyone) and (7) the third person for catering (warm positivist), (8) person responsible for accompanying program (creative slacker), (9) strong-willed translator and (10) irascible PR expert (who has under him two helpers - they do not play in the game).

Their relational hierarchy in the team is that above all stands the boss. Under him are two experts and the accountant, follows a man through background along with accommodation, accompanying program and PR and just below them are the translator (he's new in the team) and catering (stable contracter, from a private company).

Participants should ideally choose a role that is not exactly the same as what you hold in real life, on the other hand they must be able to play it (so it should also not be exactly the opposite). Roles can be played by men and women as well, in the game aren't amorous relationships between the characters.

There is the eleventh character in the game - a secretary, played by the organizer. Player characters can interact with him/her, but can't expect

some "solution" or help. Organizer is playing for streamlining the game – he/she brings new information, helps players to put themselves into the role and resolves nongaming conflicts and uncertainties.

B. Role characters

Each character has a particular position, name, characteristics and errors that he/she have made within the organization of the conference. Every character knows something about another member of the team but all desire to to cover up their mistakes and if it's impossible to hide it, minimize the consequences. Such information each player knows only for his character – he/she doesn't not know that everyone has some culpability. The game secret are designed in the way that one character's mistake is known by two other players. This should guarantee that all the secrets gradually come into play.

Common information for all players (the conference schedule):

- Thursday night / Friday morning - arrival of guests (picked up at the airport by the experts)

- Friday - trip to Karlštejn

- Saturday-Sunday - a two-day conference program (in the Saturday evening the teem meeting takes plase, that is the story of the larp game itself)

- Monday - individual tour of Prague / guests departure

C. LARP program

The game itself starts by secretary entering, who announces that the first day it became clear that the conference is a total desaster, guests are angry and disgusted, some even didn't arrived and others left the conference. It is necessary to find out three things:

- What went wrong, where is the mistake.

- Who is to blame – do we have among us perhaps a spoiler from the competitor company?

- Figure out a way to at least the second day of the conference was successful.

The expected course of the game is that the players will firstly try to get to know each other character better, speculate on possible causes of the failure of the conference and possibly begin to blame each other. If this does not occur in the first phase of the game, it should start when the secretary brings a letter with complain from one guest.

At the time of the largest argue the secretary should remind to players that solving the current problem is more important than to blame each

other. At the end of the game (approximately after two hours of playing), participants should know that the disastrous situation has arisen due to lots of misconducts of every team member, although at first glance looked not so dangerous.

Players during the larp will probably want to find out different information or communicate with the "outside game world" (communicate with guests, suppliers of various services, etc.). In the game, this communication will happen through the organizer - the player who asks for information can be provided directly with the information or the organizer will take him/her aside and play a scene of a phone call.

The game itself will run up to two hours - an explanation for players is that team meeting takes place in the evening between ten and twelve o'clock and later would be difficult to concentrate or solve things. Time pressure sould lead to effective communication style, the basics of time management - especially determining the importance and urgency of the problems. This exposure to stressors is used to improve players own work with their stress, self-knowledge and self-development.

After the game follows a briefing, where the participants discuss their feelings - both positive and negative, from the game itself and the manner of interpretation of the characters. It is important to warn players that the game ended with the end of the conflicts between their characters. It is essential to identify stressful factors and the players managed them. Players should also be allowed to comment the quality of the game and put proposals for its improvement.

Ideally, the game should take place in the afternoon or weekend, so that participants could after the larp go out together and informally evaluate the experience, which empoweres to effect cohesion of the team, and so the effect of experiential learning.

VI. RESEARCH

The main objective of the research was to find out whether the method LARP, precisely the "chamber" form using design of proposed above, is suitable for use on team development. The result should be an evaluation on how the participants experienced the game, if it was beneficial for them and why yes or no. These elements will be further investigated and subsequently determined which elements should be further developed and on the contrary which sould be changed or omitted entirely.

A. Research questions

The main questions were:

Q1: What experience did participants learned of this particular game LARP?

Q2: How sould this game be adjusted to be more effective?

Answer to this key research questions should lead to the fulfillment of the main goal of the article: if this particular game design was suitable fot team development effect, or what is it to be improved.

B. Research methods

Because game design used in this article is very specific, its results cannot be applied on whole larp method. The research looks at this larp design as at limited case study. Tle game was played with full number of players (ten) and due to this number of respondents it eas decided to use a moderated group interview with all players simultaneously.

Other used methods were direct unstructured observation (during the contact with the participants in the game), and two additional individual interviews with experts on the development teams - the coach and lecturer Dr. Montag and Mr. Pouchlý, managing director of company Court of Moravia (company offering larp games for team development).

Thematic areas of structured group interview were as follows:

- Demographic data (age and gender), respondents experience with LARP method.

- The evaluation fo the game from larp perspective (experience, overall believability of the story, quality of prepared characters, support from organizers, etc).

- Game ratings in terms of skills development (if it was necessary to involve communications at a higher rate, if the players were under stress, how they worked with time pressure, etc.).

- Strengths and weaknesses of the game in relation to its purpose.

- Subjective opinions regarding the use of the method LARP for developing teams.

Analysis of group interview and two additional interviews with experts was based on grounded theory method. This method is one of the ways the analysis of qualitative data – it doesn't focus on confirming or disproving hypotheses, but exploring the area without prior assumptions, making the research process gradually discover important areas. The grounded theory is a tool to create a balance between theory using criticality, creativity, perseverance and theoretical sensitivity. Qualitative analysis here consists of three encoding types: open, axial and selective that run in this order, but also partly in parallel (with subsequent encoding types is the ability to continually return to the previous ones). [8]

Characteristics of the research group were as follows:

- Among the participants were 7 men and 3 women.

- Age of participants ranged from 21 to 34 years. The average age was 26.5 years.

- Time of participants' experience with the LARP were in the range from zero to 18 years of playing.

VII. PLAYERS' EVALUATION

After analyzing the interviews using the grounded theory four main categories crystallized. This categories that emerged during the research are: the advantages of the game, time as a stressor, game mechanics and ideas for improvements. Table no. 1 below shows the concepts which were identified into each category selected within processes of axial and selective coding.

TABLE I.
THE RESULT OF SELECTIVE CODING

Category	Concepts
Game highlights	Brevity of characters and input information, accessibility and believability of the game archetypes, neutrality of roles, repeatability of the game, players affect on the plot, the short playing time, satisfaction of players
Time as a stressor	progressive targets / milestones, shareholder, emphasis on time constraints, visual stimuli, adding more filling, usage of calls for time restrictions
Game mechanics	combat system, telephoning, influencing plot through the objectives of characters, bringing new information into the games, the financial system, gaming resources
Suggestions for improvements	increase stress level, motivate playert to be more active, realistic props, clarifying the objectives and style of LARP, focus on providing feedback, increasing the number of organizers, more attractive theme

Categories parcially overlap or have influences between each other. Despite the fact that the game players have found many things to improve further, the satisfaction prevailed between them overall. As one of the participants said at the end of the group interview: "I have a feeling that it wasn't mentioned yet - that I really enjoyed it, yeah … there is some kind of direction, where it could be improved, but as whole larp it was good." Or other player said: "Otherwise, as well, super larp. I was pleasantly surprised."

There were several ideas on how to improve the game, mostly related to the increase of stress level of the game, time management or certain game mechanics. Perhaps the most fundamental point was to improve the performance of the feedback that was partialy omitted due to time constraints and inexperience of the author.

As the main positives of the game saw players easy believability - both overall background story and the characters. One of players commented it: "So in the context of this game was like so realistic and simulating that I had no problem. Including information about how sould I behave, why other characters behave against me, such as other things. I looked at given information and I knew who my character was and what he wanted. Which was just fine."

A. Research questions are answered

Q1: What experience did participants learned of this particular game LARP?

The answer to the first main research question is that the participants in the game especially interesting leisure activities. Compared with other usual larps this game paradoxically brought participants also a slightly unusual experience, because most contemporary chamber larps are addressing profound issues that relate to personal choices and relationships, but this game had purely a job theme.

Besides the effect of entertainment, development elements appeared expectedly – players had to interact in the group and solve problems in a limited time, which led them into situations and experience useful in real life. The game had the strongest experiential experience impact on the participant who got the role of a team leader – after end of the larp he knew that he shloud solve many problems in different way and he was convinced that in future he would.

Q2: How sould this game be adjusted to be more effective?

The answer to the second main question is largely overlaping with the category "suggestions for improvements" (described in the Table no. 1 above). The game should give more emphasis primarily on the time factor - for example, by increasing the number of problems and their severity, reducing the overall time of the game, adding successive milestones or introducing visual stimuli.

Furthermore, the functioning of some game mechanics (real phones, the motivation of the players to act or the concept of secretaries - for example, adding the company owner) should be rethought.

The larp background should also contain its accurate description – who is made for, what skills it shoul develop, how to work in feedback with team, etc. It's important to realize that this game design is suitable only for specific woring teams (eg. for manufacturing companies and especially on the lower level it's inappropriate).

VIII. CONCLUSION

Larps very easily provide an interesting and unusual experience, and their use for teamspirit can be unlimited. If there is created a suitable larp scenario, it can be used for training and skills development, but creating such game desing is more complicated than if it's made only for entertaining purpose. Generally, for usage of the LARP method in team development further research should focus primarily on the category of building relations in a team. It would require close cooperation with organizations that offer larps for this purpose. The larp method isn't very widespread in the Czech Republic yet, so further research should also focus more on the countries where this phenomenon is known among the general public and organizators (eg. Nordic countries).

REFERENCES

[1]   Armstrong, Michael. *A handbook of human resource management practice*. 10th ed. Philadelphia: Kogan Page, 2006. ISBN 0749446315.

[2]   Svatoš, Vladimír a Petr Lebeda. *Outdoor training for managers and business teams* [in Czech]. 1. vyd. Pra-ha: Grada, 2005, 192 s., [8] s. ISBN 80-247-0318-1.

[3]   Payne, Vivette. *The team-building workshop: trainer's guide*. New York: AMACOM, c2001. Trainer's work-shop series. ISBN 0814470793.

[4]   Salen, Katie a Eric Zimmerman. *Rules of play: game design fundamentals*. Cambridge, Mass.: MIT Press, 2003. ISBN 0262240459.

[5]   Tychsen, A. Live Action Role-Playing Games: Control, Communication, Storytelling, and MMORPG Similarities. In: *Games and Culture*. 2006-07-01, vol. 1, issue 3. s. 252-275. DOI: 10.1177/1555412006290445. Available form: http://gac.sagepub.com/cgi/doi/10.1177/1555412006290445

[6]   Söderberg, Jonas and Waern, Annika and Åkesson, Karl-Petter *Enhanced reality live role playing*. In: Work-shop on Gaming Applications in Pervasive Computing Environments, Second International Conference on Pervasive Computing: Pervasive 2004, 21-23 Apr 2004, Vienna, Austria

[7]   Vaněk, Jakub. *The analysis and familiarization with the area of LARP games* [in Czech]. Olomouc, 2010. 110 s. Diploma thesis. Palacky's University in Olomouc

[8]   Strauss, Anselm L. a Juliet M. Corbin. *Basics of qualitative research: techniques and procedures for developing grounded theory*. 2nd ed. Thousand Oaks: SAGE Publications, c1998. ISBN 0803959400.

CLIL Diversity and its Potential for Internationalization of Higher Education

Ľudmila Hurajová

Slovak University of Technology

Faculty of Materials Science and Technology in Trnava

Department of Languages and Humanities

ludmila.hurajova@stuba.sk

Gabriela Chmelíková

Slovak University of Technology

Faculty of Materials Science and Technology in Trnava

Department of Languages and Humanities

gabriela.chmelikova@stuba.sk

Abstract— Internationalization process of higher education is" a must " for preparing young generations for current and future labor markets. Learning new things, sharing ideas, debating present issues in different professional fields and working on various projects are often taking place in international and multicultural environments these days. Universities and other Higher Education Institutions should provide such international environment for learning-teaching process to keep their competitiveness on the education market as well as their openness for new ideas, concepts, etc. The contribution aims at discussing CLIL as an integrated and interdisciplinary approach that can go off the process of internationalization of higher education in the context of Europe. Diverse CLIL forms are presented as they were observed within a running ERASMUS + project on Primary and Secondary levels of education. Finally, some ideas of CLIL application on Tertiary level of education, that will be a part of new ERASMUS+ project currently being prepared for submission as one of the dissemination activities, are provided.

Keywords— *internationalization of higher education, CLIL, interdisciplinary approach, teacher training, CLIL diversity*

I. INTRODUCTION

Considering the term *internationalization of Higher Education* we should identify what the term exactly means. We can see *internationalization* in several perspectives such as:

- To set curricular standards at universities in selected subjects/courses

- To share ideas, knowledge, research findings at conferences, workshops or via scientific contributions

- To build an international learning environment for students

- To build an international teacher team at universities

In this contribution we understand *internationalization of Higher Education* as building an international learning environment for students. This case requires courses taught in English both by non-native teachers and English speaking teachers. To build an effective international learning environment is demanding process especially at universities with teachers and /or students that command low level of English. World-known universities provide natural international environment for students and teachers as well. Those ones in the UK and the USA require students to demonstrate high level of English competence that must be proved by recognized language certificates. Usually B2 or C1 level of English (according to CEFR) is requested. Teachers who give lectures in such universities are supposed to command English close to native speakers (C1/C2 levels). Different context we can find in European countries where English is not an official language. In some of them students can choose some courses taught in English, however, most courses are taught in the official country language. The whole study programs taught in English are provided mostly for Master /Engineer students. Concerning internationalization of Higher Education we should view on level of utilizing English and roles of university teachers in this process. [1]

II. INTERNATIONALIZATION OF HIGHER EDUCATION

A. Utilizing English

Utilizing English within the internationalization process should match the process objectives. EAP / ESP is usually taught at universities to allow students to study resources in English, to provide their contributions in English and after graduation to present their first research results at conferences etc. University teachers are also supposed to present their research work in English either in the passive way (contributions to journals or proceedings) or in the active way – verbal presentations at conferences, workshops or giving lectures. The deepest integration of English into education is represented by bilingual environment where students and teachers communicate in English debating professional issues and subject courses are taught only in English. This type of learning environment at Tertiary is natural in English speaking countries and at world- known

universities where English is utilized as a "bridge" language for communicating and transmitting knowledge, competences in such a multilingual community of students, lectures and researchers. [2]

B. Setting international learning environment

To set fully international learning environment is a great pressure both on teachers and students mainly at universities where all courses are delivered only or mainly in the official state language even where a few foreign students study. In these cases the process of internationalization can be also used to attract foreign students to choose the particular university for gaining degrees. The more foreign students at a university the more natural international environment can be provided. The more courses are taught in English the higher potential to attract foreign students to come and enroll on the courses delivered in English. In context of technical universities Internationalization is a big challenge, as subject teachers likely students have not been linguistically well - prepared for such environment. We think, that CLIL would be that approach that might help to set up dual learning environment where a foreign language competence as well as subject knowledge are developed. Proficiency level of English is not required in CLIL application neither from teachers nor from students. As far as teachers/lecturers are concerned knowledge from English Didactics is requested to allow them to set up effective dual learning environment. Various CLIL forms can be implemented into lectures, seminars according the university context and conditions. [3]

III. CLIL DIVERSITY

As it has been mentioned above, we find CLIL a useful tool/approach to set up international learning environment at technical/non linguistic universities / faculties. Content and language integrated learning might help students at the beginning of internationalization process to develop their foreign language competence simultaneously with gaining subject knowledge and competence. This calls for subject teacher preparedness and/or for close cooperation among ESP teachers and subject teachers at universities.

A. Project observations

In the ERASMUS+ project *"Transnational exchange of good CLIL practice among European Educational Institutions,"* (2015-2017), we observed CLIL lessons at schools on Primary and Secondary level of education in 4 different countries. It seems to us that diverse context in education system, language competences of students / teachers, external support, education policy etc. make CLIL forms vary.

B. Lithuania

The project partner from Lithuania joined the project as the partner with no or less CLIL experience. We observed a CLIL lesson in French at Primary school. CLIL was implemented into Music lesson. There was a Music teacher who commanded French language. She used switch code during the lesson when it was needed to ensure pupils they understood the instructions well. Some pupils were confused what to do, but their peers help them participate in the group work. Their main task was to make a melody and play it. Our view was that most pupils found the lesson interesting and they were able to follow the teacher's instruction in French. From building professional vocabulary aspect, the pupils gained some new words from Music concerning melody, rhythm etc.

C. Latvia

During the project stay in Daugavpils, Latvia we have observed three lessons, one at primary school and two at secondary schools. Latvian project partner is a local Education Institution that coordinates schools in the region. The project members from Latvia are teachers who work also for this institution and deal with supporting CLIL implementation into education within the schools in their responsibility.

Geography, Russian Secondary School-Lyceum. Topic of the lesson: Japan. Age of students: 12-13 yrs. The lesson had two teachers – a language teacher and a geography teacher. It is necessary to add that attendance in CLIL lessons is voluntary at this school, nevertheless, very popular, and that the students' native language is Russian, however, they have to speak and study in Latvian language as well. We appreciated the eagerness of students as they had to study this specific subject in English and in case of misunderstanding they were given instructions in Russian (or sometimes also in Latvian). The lesson was organised well and appropriately, the students learnt the basic geographical data, what the basic symbols of Japan are as well as some intercultural issues (for example the differences in non-verbal communication). In the end of the lesson they tried to make a simple origami. The involvement of Russian teacher was quite rare, the instructions were given in English, and so the switch-code was used at minimum. The new topic was introduced on the knowledge the students had, they had no obligation to study the topic in advance. The students worked in groups as well as individually.

Science at Saskaņas Basic School. Topic of the lesson: Washing liquids vs acidity and alkalinity. Age of pupils: 9-10 yrs. The lesson had again two teachers, a subject-specific one and a language teacher. The input (delivered by a song and a hand-out) was very difficult to understand even for the observers. Then the pupils were shown as well as encouraged to do some basic reac-

CLIL Diversity and its Potential for Internationalization of Higher Education

tions based on using common detergents, so that they had better illustration of acidity and alkalinity. However, this lesson was quite disorganised as the pupils, in my opinion, did not quite catch the objective of the lesson. The teacher prepared too many materials for experiments, then couple of tasks that the pupils were not able to accomplish within the lesson. Nevertheless, they learnt which of the washing liquids they used were the least harmful to humans and environment. The pupils seemed to be interested, however, the final knowledge acquisition was, we suppose, quite smaller than the teacher intended. The overall impression of the lesson was a bit confused. The involvement of the language teacher was almost none, the subject-specific teacher tried to deliver all the knowledge and instructions in English by herself, nevertheless, with lower impact than in the previous lesson observed. The switch code was used again at minimum

Biology at State Gymnasium. Topic of the lesson: Breathing. Age of students: 15-16 yrs. The lesson had only one teacher who was originally an English teacher, but not a subject-specific teacher, however she used to teach biology at the school for about ten years (and often consulted the subject matter with subject-specific teachers). The lesson was started with the presentation by one of the students who prepared it in advance. It is a good practice at the school that the teacher usually consults the presentation with the student to avoid having inappropriate information in the presentation. The students are also encouraged to include some interesting points to make the presentation delivery more attractive. The lesson was very well organised, interactive (the student was a very good presenter), in the last third of the lesson the students were given hand-outs and asked to do some exercises (filling in the new words related to breathing, some of them funny but edifying), the switch code from English to Latvian was again at minimum. [4]

D. Italy

Italian project partner is considered likely Latvian one as CLIL- experienced partner. What is more, CLIL context in Italy varies. CLIL implementation into education is compulsory on Secondary level of education and it will be even on Primary level of education from next school year 2017/2018. Teachers are supposed to study CLIL theory and trained how to set up CLIL environment at their schools.

The lessons we observed were taught in English, the switch code was used at minimum level. Some lessons were lead by one teacher, another ones by two teachers (subject Italian and foreign subject teachers). As we observed in Latvia, Lithuania teachers applied CLIL in full lessons.

E. Sweden

Our Swedish project partners declared their skeptic view on CLIL application into education at their school during several project meetings we had. However, the CLIL lessons we observed were found perfectly done. They chose also to implement CLIL into whole lessons. In the case where the subject teacher was not confident enough on her language competence, the lessons were taught by two teachers an English and a subject one.

IV. COOPERATION AT TERTIARY

From the observations we have conducted within the project so far, we could say that CLIL application into education might have diverse forms as education context varies from country to country, from region to region, from school to school, from class to class.

What we found the most important is cooperation, the close one among teachers within the school where CLIL is implemented into lessons. The great impact on teacher competence on CLIL can also come from international projects as experience, knowledge are shared and debated. Both the international as well as the local cooperation among teachers and education professionals might be a big inspiration for CLIL implementation process. Those findings can be applied on Tertiary level of education too. Before CLIL application into lectures or seminars close cooperation among ESP teachers, subject teachers and CLIL experts are highly recommended for ensuring that CLIL environment will be fruitful learning environment for students and the teachers involved in the process will not be overburden. [5] The university management should also consider some benefits for CLIL teachers. The return of this "investment" might be visible in the higher amount of foreign students who will be attracted by this new learning environment provided by the university.

V. CONCLUSION

Considering a particular CLIL form implementation into HEIs (Higher Education Institutions) several aspects should be taken into account such as:

- Policy and level of internationalization of HEI
- social, historical and cultural context
- home students'level of English
- subject teachers'level of English and their confidence
- subject teachers ' level of English Didactics
- capacity of ESP teachers
- curriculum of a particular study program
- budget of HEI

ACKNOWLEDGMENT

Erasmus+

REFERENCES

[1]   I. Fortanet-Goméz, "CLIL in Higher Education, Towards a Multilingual Language Policy," Short Run Press Ltd., UK, 285p, 2013

[2]   Ľ. Hurajová, "Tertiary CLIL," pp85−98, in Pokrivčáková,S. et.al. "CLIL in Foreign Language Education: e-textbook for foreign language teachers," Constantine the Philosopher University, Nitra, 282p, 2015.

[3]   E. Kovačiková, K. Gajdáčová Veselá, " Základy didaktiky cudzích jazykov" PFA UKF, Nitra, 2016

[4]   G. Chmelíková, "CLIL lesson from the point of an ESP teacher," Conference proceedings CLEaR 2016, Nitra, SlovakEdu, pp 69-75

[5]   P.Lang, " CLIL experiences in secondary and tertiary education," Linguistic Insights Studies in Language and Communication, Volume 2016.

Humanization as a Way of Increasing the Quality of Education in Technical Disciplines

Martin Adamovič

DTI University
Department of School Didactics
Dubnica n/V, Slovakia
adamovic@dti.sk

Daniel Lajčin

DTI University
Department of Management
Dubnica n/V, Slovakia
lajcin@dti.sk

Abstract— **Long-term priority for the education process in economically developed countries is focus on needs of society, with an emphasis on the requirements of the labour market.Slovakia became in last two decades car production lider and came closer to the border of exhaustion of technically educated workers. Immediate supplement of the labour market by skilled workers require a new systemic measures in education and training These focus on the update for career growth especially for teachers of technical subjects and provide a balanced theoretical and practical training of students in accordance with social order, as well as with the needs and requirements of the industry. This demanding process cannot be handled without changes in the minds of both teachers as well as students. It is necessary to focus the efforts of the teachers to overcome the indifference of students to technical disciplines by humanization of education, modernization of teaching methods to increase the motivation and enjoyment of students of cognition and learning.**

Keywords— *Education— technical disciplines – humanization – motivation - ethics.*

I. I .INTRODUCTION

The current situation of the Slovak education can be characterized as a period of decades of submission of new and cancellation of previously submitted reform initiatives. That is why today are different views on the ideal form of education on-line from strictly „classical" technical, authoritarian schools, to various forms of alternative education. Living standards of the society depends on quality of educational marketing and management in education. Endless discussions of experts, as well as the public opinion regarding the focus and quality of educational programs, learning alignment, offer new branches according to the needs and requirements of the current labor market often remind „never ending story". Due to the changing situation on the labor market must school also respond flexibly and extend its range of learning to new fields and further training programs adapted accordingly by new technologies and adapt them to the needs of the re-

gion too. Currently, there is a gradual reduction in the total number of students and mainly students who have applied to study at technical vocational courses offered by secondary schools. Therefore, the propagation of secondary schools in this difficult time, very topical. A logical continuation of is the creation of a strong competitive environment in secondary schools, the ability to succeed with quality education and engage the target group, ie students last year of primary school. Actively discussed is the need for teaching technical subjects and foreign languages, it need to be focused on practical applications and improve the communication skills of students. An important area of activity of secondary schools is their ability to cope with education of adult students, who want to complete their education. According to the prepared draft National Program for Education Development foresees the extension of compulsory education to 12 years.

II. II.TRANSFORMATION OF SCHOOL CURRICULUM AT SECONDARY SCHOOLS

The basic function of schools is to provide education to students by educational programs, but also to participate in education itself, that is to prepare students for the comprehensive development of personality. This includes a balanced curriculum in vocational training and educational component that includes ethical and moral principles of existence of a man. Kmeť in its' current document "School current curriculum transformation in Slovakia", states: "It is now generally accepted view that the school has an impact on man and the fulfillment of educational, protective, respectively. re-socialization functions. All school functions has its own purpose. By their implementation school affects each individual ontogenesis. Thanks to the school were met the needs of personalities, while the biological entity gradually become more or less well-developed social person. " [1]. Although marketing activities need to focus on all of these functions. The role of school marketing followed, [2]. The author has summarized in the following six areas: 1. Strategic

management of schools (analysis of strengths, weaknesses, opportunities and threats, on the basis of which is determined by long-term objectives and the methods to achieve them), 2. rapid response to unforeseen changes and the implementation of changes to the work of the whole school, 3. efficiency that supports school development strategy, 4.internal personnel marketing (motivation of employees, promote teamwork, improve interpersonal relationships, creating a positive atmosphere in the workplace, etc.) 5. relational marketing (taking part in school activities), 6 constantly evaluating the results of school work. The author defines school marketing as management process that results in influencing and meeting the needs and wishes of customers of school by an efficient manner that ensures the fulfillment of the objectives of the school. At the same time it is necessary to apply marketing in all levels of schools. An important step is the creation of curricula and choice of forms and methods of teaching, access to pupils, students, communicate with others, cultivation of culture and school climate. Every staff from the director to janitor have an impact on the development of attitudes towards school clients.

III. QUALITY, LEVEL AND EDUCATIONAL EXCELLENCE OF SCHOOL

Blaško defines the quality of the school as follows: „The quality of the school is optimum functioning of process at schools, mainly teaching process with which they are satisfied partners of school. The quality of schools is objectively measured and evaluated. The quality of schools is associated with the term of school level and potential of school. It is necessary to distinguish the level and quality. Level focuses more on results, quality more on processes to achieve results [3] .

Průcha defines the quality of educational processes, educational institutions, educational systems as an optimal level of functioning or producing a institution which may be regulated by certain conditions (eg. Educational standards) and can also be objectively measured and evaluated [4] . Quality can thus be defined as a process in which the school demonstrates its expertise and capabilities to the satisfaction of students and their parents. This also applies to higher-level schools, employers and participating organizations that are linked to this process.

The total quality management in schools (TQM - Total Quality Management) is a demanding process that must be based on personal conviction, based on trust, respect human content and ethical principles of education and schooling. According Trubíniová et al. humanization of education has a systemic nature. It includes level of education - current and target, structure of the education system, the relationship between the individual elements and dynamics between reality and finality of education [5].

IV. HUMANIZATION OF EDUCATION IN SECONDARY SCHOOLS

Humanization of education is focused on less violent, manipulative and non-directive education that prefer informal human relationships. The attention is drawn to the positive atmosphere for teaching and learning activities. Humanistic education is based on trust in the strength and ability of the pupil, to respect for his personality, to recognize its value as a person, regardless of its current status, the partnership involving teacher and pupil. Emphasizes the intrinsic activity, self-education, self-evaluation, self-regulation and self-realization of man. This does not reduce neither purposeful guidance from the teacher care that is here in the role of facilitator or the application of social needs in the process. The road to full-fledged personality can not be based on the revaluation of societal needs in education. Democratic society in its objectives and needs expressed desire to bring schools and the educational process to their needs and interests of the young generation.[6] .The school is considered to be an important means of socialization of the child, bringing him an extension of his social roles of role student, classmates, schoolboy. This increase in the role also requires the formation of self-knowledge that would bring together all partial tasks within a coherent personality [7] .Sometimes the requirements of schools on a pupil is too demanding. As a result, pupils' failure can occur during fulfillment. As long as this situation lasts longer, it may result in pupils a decrease in motivation, efforts and activities. Under the influence of low confidence in their abilities, negative expectations and a lack of motivation can lead to inefficient learning of the learning strategies. As reported Vágnerová [8], those characters are characteristic effects of learned helplessness, who also lives evidenced by reduced self-esteem. The mentioned school load may not be the only student such a negative impact. It is also an opportunity to learn how to overcome obstacles, to cope with failure [9] , or that adopted the strategy of coping with difficult situations . To achieve this target, it is important to have transparently built and functioning NGOs (school, company), which has mastered the quality management system.

V. TOTAL QUALITY MANAGEMENT IN TECHNICAL EDUCATION

The quality must be defined clearly and specifically so as to be measurable at every stage. The aim of TQM in the school environment is to help and encourage teachers and other educational staff continuously improve their work. By this we understand the processes, methods, forms, inspection and evaluation of students, but

also self-esteem and self-education and under. The characteristic feature of total quality management is a new way of thinking and identification of all the staff of the school with its objectives and with quality. It should be emphasized that this is a long-term process for which it is necessary to prepare all school staff. The management of schools consist of teaching personnel, economic and economic-administrative and regional authorities. The spatial, material, technical and financial conditions - an important component for determining the quality of schools, but that does not mean that expensive above standard equipment will give us immediate quality. Do no harm when space and material-technical support schools have a higher level and if this level is appropriate requirements of the target group, the requirements of future employers, partners and conditions, which brings the current time. Important role in the selection of school by pupils - parents play school location, the access, traffic, aesthetics school and its premises, outdoor area and an environment in which the school is located. Learning process - significantly increase the interest of students, studying in the school by pupils and parents, or attempt to be employed in such a school is a certain sign of prestige and confirming that the school administration is doing its job properly. Quality schools largely determines the high level of the educational process, which is given not only the expertise of teaching staff and their approach to pupils, using new methods, but also other components of school, including parents, state and private institutions involved in the process. Of course this process is not only to meet the needs of education - knowledge acquisition, skills and habits of students, but also creating a positive environment with human and emotional approach, an expression of respect, concern, care, trust and respect. Such positive action of the teacher should be reflected in the atmosphere of learning.

VI. THE EVALUATION OF SHOOLS IN TERMS OF LEVEL OF EDUCATION

Evaluation of school - school evaluation may be seen from two aspects of evaluator. When the assessment falls within the competence of the responsible authority for that school or have local, regional or central and refers to external evaluation of quality of school education. Such an assessment is usually performed by a person who is not directly involved in the activities of the school being evaluated. When school evaluation carried out by persons who directly work in this school, then we are talking about internal quality assessment of schools. At an external access for the evaluation of education in Slovakia is the responsibility of the State School Inspection. Unless the school itself begins to set their own goals and strive for them, then is pushed into position to conceal problems before who has it checked.

Competition, mutual competition and rivalry of schools in our country has historical roots. For objective comparison and graduation of secondary schools need to have suitable selection clusters for comparison. Should take account focus, target group, clients and customers graduates. At present, is characteristic an increasing demand for secondary schools of technical orientation. Part of the school marketing has become the preferred argument of labor market placement. The most important product of schools is an offer a quality education program, which should be adapted to the client's needs, so pupils, students an parents. This is a particular type of service. It is necessary that new educational programs have been practically usable also for adults who want to supplement their school education in terms of their applicability in the labor market. Variability of offered training programs can very flexibly and effectively respond to the real needs of adult learners - students and the labor market. In the field of lifelong learning, particularly in the case of adult learners is much more indicative of the need for interconnection of school and practice. An adult, entering voluntarily in education, is very aware of the specific needs and thus has a clearly formulated expectations.

VII. CONCLUSION

The level of educational services in the school system depends on who, when and where it provides[10] . The basic decision to be made by each educational institution is to decide what a quality education program, or what other services are offered to pupils and students. Each school should use its new educational program consists of a variety, which is not an easy task. In communication with its environment, schools use the tool to achieve the objectives of promotion. In addition, the school sends signals from school to the outside, it is also used to obtain feedback and to building relationships - with parents, businesses, students, NGOs and the like [11] .Success, progress for the wider community can fulfill deep a man. Only by entering into deep human relationships that bring progress and success for the widest possible community of man indeed deeply fulfilling. Features such as self-esteem, personal confidence, communication skills, problem solving creative work always has a direct relationship to the community. In conclusion we can say that for the priority issues of education consider to recognize right from wrong, and thus take responsibility for their actions and use their own freedom. Educate with adept morally oriented person who can control himself, for which common interests are above their personal interests.

REFERENCES

[1] Kmeť, P. 2011. Súčasné premeny školského kurikula na Slovensku. [online].[cit. 2011-11-04].

[2] Světlík, J. 2006. Marketingové řízení školy. Praha: ASPI, a.s., 2006. 18 s. ISBN 80-7357-176-5

[3] Světlík, J. 2006. Marketingové řízení školy. Praha: ASPI, a.s., 2006. 110 s. ISBN 80-7357-176-5

[4] Blaško, M. Úvod do modernej didaktiky II. Košice: KIP TU, 2009. ISBN 978-80-553-0051-1

[5] Průcha J., 1996. Pedagogická evaluace. Brno: Masarykova univerzita. Centrum pro další vzdělávání učitelů, 1996.

[6] (TQM – Total Quality Management) Turek, Ivan Albert, Sándor Kvalita školy, Bratislava: Slovenská technická univerzita, 2005, ISBN 80-227-2274-X

[7] Švec, V. 1994. Auto diagnostika pedagogické činnosti učitele - možnosť nebo potřeba, In: Pedagogika 1994, roč. XLIV, č. 2. 105-112. ISSN 3330-3815

[8] Čačka, O. 1998. Psychologie vrstev duševního dění osobnosti a jejich autodiagnostika. Brno: Doplněk, 384 s. ISBN 80-7239-010-4.

[9] Vágnerová, M. 2000. Vývojová psychologie. Praha: Portál, ISBN 80-7178308-0.

[10] Říčan, P. 2007. Cesta životem. Praha: Portál, ISBN: 80-7367-124-7.

[11] Říčan P., Krejčířová., 2006. Dětská klinická psychologie. Praha: Grada. ISBN-10: 80-247-1049-8

[12] Cimbánik, T. – Grenár, J. 2010. Základy marketingu s aplikací do školního prostredí: Studijní texty pro distanční vzdělávání. Olomouc : Univerzita Palackého v Olomouci, 2010. 85 s. ISBN 978-80-244-2575-7.

[13] IRVS. Marketing školy. Progresívna forma riadenia v školstve. [online]. Bratislava, 2007.[cit. 2015-12-3]. Dostupné na internete: http://www.noveskolstvo.sk/upload/pdf/Marketing__skoly.pdf

Humanization as a Way of Increasing the Quality of Education in Technical Disciplines

Spatial Orientation of Blind – Acquisition and Processing of Information

Brigita Albertová

Rehabilitation Center for the Visually Impaired
Catholic University in Ružomberok
Levoča, Slovakia
brigita.albertova@gmail.com

Abstract— **With the loss of vision a person loses a large part of their ability to use in your life. The process of regaining the original or replacement of skills and habits is very long, difficult and painful. Also, it is also mentally challenging. He will not admit that it has lost sight completely or almost completely.**

In his next life, must move on from the visual to the tactile synthetic thinking analytical perception.

That article focuses on selected issues recovery options spatial orientation through physical activities. Us important is the process by developing the use of the elements in the development of micro and macro orientation. In our contribution, we focus on the structuring some micro orientation and technical resources to enable it to use. Knowledge, habits and skills gained from micro orientation is then used in the development of the movement in the building, on the street and so on

Regaining a sense of orientation in space helps in improving life activities, as reflected in a greater interest in the job title. Proof of this is to improve work activities, manufacturing and consuming objects, etc.

Keywords vision loss; obtain original or replacement skills; technical resources for micro orientation of the blind; micro orientation - improving spatial orientation; lifelong learning; macro orientation; stereopsis

I. INTRODUCTION

Loss of vision, particularly in adulthood due to an accident, illness or other reasons, can change everyone's life.

I cannot see - what's next. Life has ended for me. I cannot do it, to what I was used to. Lose their jobs lose his surroundings, do not know to perform tasks, lose all for that has be lived and enjoyed. After the loss of vision, they are losing zest for life. Is to looking inwards, is passive, slowly deteriorating is, not only mentally but also physically.

Analysis of the possibility of using active movement, improve or increase their sporting activity may result in increased confidence handicapped person. Thanks to the development of sports activities is increasing person's communication with his near and distant surroundings. One of the main aspects of improving the quality of life of blind people is difficult to maintain a healthy psyche, overall mental and physical health.

Currently, there are many ways to integrate the visually impaired into life. For example, to give them a sense of achievement from having achieved the results that they would be the envy of the many healthy peers.

RSZP Levoča in providing not only education but also practical skills for partially sighted and blind people. Their work is based on the use of existing experience and knowledge. Blind people can participate not only in everyday life but also to many of sporting activities.

This specific area helps you understand how people may also be subject to certain restrictions given not only sports but mainly active life with us. They are not a burden, but in many cases the model of perseverance, courage, innovation. Let us and we support the theme: *"together we see more"* will enrich the new experiences not only them but also to us ..

II. NOTIONS OF SPACE AND EDUCATION

In that part of the analysis is an essential precondition for improving living conditions for the visually impaired. This is mainly to create a spatial ideas visually impaired people. A second aspect of the basic elements of education of visually impaired persons. A third aspect is the use of selected devices to improve the quality of life.

A. Spatial imagination

In the brain of a blind man from birth are poorer spatial concepts, but very specific. Blind person acquires notions of space touch and hearing. Tactile perception is analytical and process until visual perception is synthetic and immediate.

Tactile and visual space

Tactile and muscular origins are in the perception of space in close relation to the visual. Sight and touch to speak the same language of consciousness. Note well interpreted by both, so a blind person and a sighted when using the

usual word for distance vision, size and shape can understand. Often the word that elicits an objective vision, finds support in what we might call subjective notion. Featuring a shaped gear and is easy to enter the consciousness. Subjects unusual shapes or complex are oversimplified idea of regular geometric shapes. Even so, many blind people can imagine and shapes that are not completely geometric. When teaching a blind man, however, it must begin with simpler shapes.

The importance of spatial vision

Blind feels on all sides by a concrete space that is accessible under it. Blind man's horizon becomes wider and more definite when clamped attention to new feel. Blind person thus empowering their surroundings, thus becoming able to navigate in it. This fact is confirmed by all blind people who are agile enough to walk alone in the streets.

The importance of spatial orientation and independent movement is not just about mastering physical culture visually handicapped person. The basic assumption of independent life the visually handicapped person's mobility, thus tackle the problem of spatial orientation and independent movement. Every movement required for spatial orientation, which takes place automatically sighted, visually impaired done purposefully and with concentration. Each movement in space, and in known areas requires constant concentricity and constant confrontation with an idea perceived reality. Prerequisite for the development process of spatial orientation is sufficient to have an overall vision of the area and the deployment of the landmarks in the area.

B. Education visually impaired

Education is a lifelong process. In the case of vision, knowledge, processing and use in practical life is for this group of people is limited and more difficult. The flow of information is thus implemented using a wide range of compensation and teaching aids that are trying to convey through proper knowledge of the outside world. This multifunctional technical means about the reading of tactile spatial elements of the plans can be evaluated as an indispensable audio-visual teaching aids.

Tyflografics devices that are primarily intended to eliminate barriers to the world of the visually impaired sighted. Therefore, it is important to apply these technologies and use in communicating macro space visually impaired. Lead the visually impaired to independence in movement and support its orientation known but also less known places.

Tyflografic specific importance lies in the fact that in extremely ZP activates the process of perception, creating ideas and thinking. Very simple printmaking techniques - relief line or low relief

scenes achieve a torque that is to a significant term for the blind.

C. Description of basic aids

The basis of effective education of visually impaired people is the use of various technical devices which assist in reducing the adverse impacts of their disability. The aids are aimed at providing additional information on the surrounding area. Based on these sight-impaired can get the idea of space around. They can learn to know not only the surroundings, or even foreign cities and the like.

Zy – fuser

When the paper passes Füzéri (Figure 1) this microcapsule paper on which the original is a special infra-red illumination at what black contours, surfaces are heated and come to the surface of paper, to create quality and relatively durable positive relief, read by touch.

PenFried

Handling Penfriend (Figure 2) is meaningful and motivating. It is a device that is used for marking and finding objects marked adhesive labels. On the label in the form of a small sticker can record audio recording verbal description of the object or place you want to mark something. This audio recording is then simply play. This information is stored in the device

Fig. 1. Fuzer

Fig. 2. PenFried

Elements micro orientation
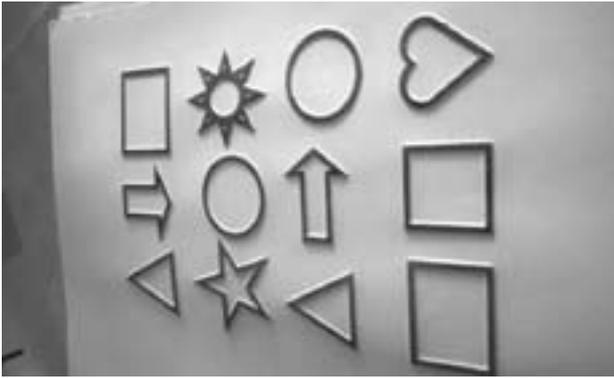
Fig. 3.   The basic elements of micro orientation

The image (Figure 3) contains the basic elements of micro orientation underlying the progressive development of habits of orientation on the table and in micro-environments around blind. They are also the basis for the read spatial maps. In addition to the elements, for which a model is shown (Figure 3) in the training of spatial orientation is also developing spatial orientation through various relief model (Figure 4). In addition, those using mock-ups we can through various relief elements and especially information technology to teach blind and distinguish colors (Figure 5) and direction.

Fig. 4.   Relief dummies

In addition of devices to improve education in the field of spatial orientation it is also possible to use modern information technology. Their task is not only communication via telephone as well as orientation in the street. It prepares the device for spatial orientation and reading text-based smartphones.

Fig. 5.   Relief maps for teaching space

III. ORIENTEERING, OFF-ROAD

One of the new elements of training spatial orientation orienteering is blind. It sounds unbelievable, but precisely in this way it is possible to teach the visually impaired to navigate the terrain. For this we use the elements listed above and many other technologies that will be presented in other contributions.

The terrain is trying to collect as not too dangerous. Blind running technique is different while running in the stadium or on a plain. Indeed, he is proven hand in hand. It is not enough merely rubber band because the contact is remote and the blind can step down to draw the attention falsely TRASER. TRASER and blind - the ball should look like one body. Differences in running blind. Running in the woods is quite different than in the plains. Blind people are very focused on the completion of his neck and beginners sometimes forget to breathe. In the field, the blind must be more prepared for any inequality. Orienteering is running around wherever space is mapped and the map is created. The most commonly in nature, forest, park and housing estates. So space is predetermined. Prior to running in the field is important:

- fitness training (year-round)
- Endurance-speed strength exercises,
- Learn the economic run.
- perception of curvature routes
- improve hearing

During endurance training we do not avoid rugged terrain. Endurance training must be varied. In the training process, we are being inserted various obstacles, such as. groveling, certain distance, fartlek, walking. The sport is not enough just to have quick feet, but plays an important role psyche

Objective: increase physical activity, improve presentation by relief maps and audio signals.

Facilities: relief map, pen, gavel for the blind, sites and technical aids.

Route description: before the start of competition racer gets a relief map of the entire route familiarization. Furthermore, this map can be used throughout the journey. Estimated route is 2 km long or 2 x 1 km, and the track is divided into 3 parts. Blind runs with traser (hand or with rubber band). Run some distance away, where the rider must continue in certain bands track itself based on the audio signals, which will be divided into two parts, so that the sound was clear and distract the space. The launch of the first signal is muted and started another that he is heading directly at the checkpoint. You check mark and continues to his traser. Blind accompanies the tape in this area the referee for safety reasons. After finishing tape traser zones are attached to competitors. Gradu-

ally, the track can extend and complement stations.

In this part of the chapter describes a methodology selected type of physical activity on spatial orientation. Based on our proposed format orienteering and its several variants, we point to the possibility of direct development of space activities. Said part is a direct example of the connection of physical activity and spatial orientation

Evaluation: The winner is the competitor with the fastest cross-country time and all inspections.

Conclusion: The competition is aimed at developing physical and mental health. Disabilities can participate in the daily life, but also new sporting activities based on modern technologies.

The basic objective of all activities conducted jointly with the blind is to improve their spatial orientation. The name of the discipline assumes that it is precisely to improve the properties of the blind. Unlike conventional orientation runs, which were organized in the past, in the present case it offers greater autonomy for the athlete.

In this part of the chapter describes a methodology selected type of physical activity on spatial orientation. Based on our proposed format orienteering and its several variants, we point to the possibility of direct development of space activities. Said part is a direct example of the connection of physical activity and spatial orientation.

IV. RSZP - SPATIAL ORIENTATION AND JOB TITLE

The basic mission of rehabilitation centers visually impaired (RSZP) is preparing adults to visually impaired for employment. Preparation for employment takes the form of courses and basic - social rehabilitation in the context of which it was difficult to visually impaired adapt to changed environmental conditions in order to achieve the highest possible degree of autonomy in spatial orientation and independent movement, means of written communication, daily living activities and control various compensation and re-education aids, to create good conditions for successful completion of courses of education and training for the labor market and establish and job placement.

An important part of rehabilitation is the formation of habits of effective use of leisure time (Figure 6) through the different skills, interests and hobbies, to create conditions of autonomy and independence in the various activities necessary practical life.
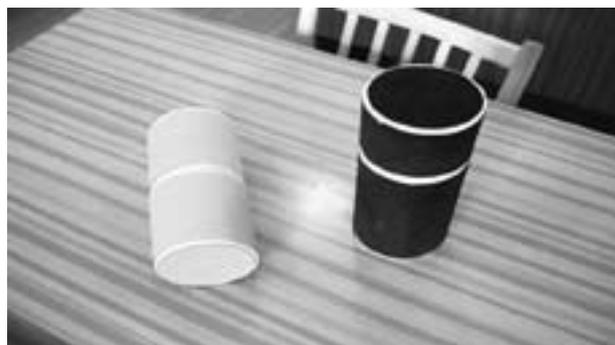

Fig. 6.   Products made of carton

Fig. 7.   Cardboard products made by blind

Expert to work with cardboard

The course is aimed at mastering working methods and procedures of production technology making differences products - boxes, cassettes, packages, and bushings. The aim of the course is to manage working methods and procedures, production technology, working with relevant instruments and devices, acquisition of appropriate knowledge of production materials, consistent implementation of labor discipline, rules and principles of protection and safety at work.

Fig. 8.   Blind people in employment

The aim of that course in the broad sense is a reliable handle work tasks and the production of various products (Figure 7) such as boxes of different sizes for jewelry products, cosmetics, cut glass, food, dry goods and various gift items and when making a simple spiral binding so that visually impaired graduates of the course for the resistors could work independently at the required quality level

Haberdashery cardboard:

The role of 5-month course haberdashery cardboard is to improve the field and learn cardboard are made cardboard products different kinds of products to its characteristics closer to art products. This is a different kind of products are manufactured by combining cardboard, paper, textile (silk, plush, velvet), wool and leather When making these products can and severely visually impaired (Figure 8) to apply their imagination, imagination, skill, and creativity.

CONCLUSION

In the present paper presents the fundamental aspects of education of people with visual impairment. Training of these people is very difficult and demanding blind imagination. Since one can not only read, see images and objects but also found it difficult to find them placed on the table or in the apartment. The big problem is the relocation within the city. All these problems can be partially eliminated by using different tools. Benefits of the paper is to design orienteering as a form of improving spatial orientation. Improving quality navigation skills, improving learning opportunities can be blind to prepare well for the continuing professional development. An example of such training is also carried out in activity RSZP Levoča led by specialists in education, spatial orientation, etc.

ACKNOWLEDGMENT

REFERENCES

[1]   Albertova B., Information technology in the world visually impaired proceedings, Fifth International Scientific Videoconference of Scientists and PhD. students or candidates, „Trends and Innovations E- business, Education and Security", November 18, 2015 ISBN 978-80-225-4191-6

[2]   Peter Nedorost, Brigita Albertova, Priestorová orientácia a IT. DidInfo 2016, 22. ROČNÍK NÁRODNEJ KONFERENCIE, BANSKÁ BYSTRICA, 2016 ISBN: 978-80-557-1082-2, Recenzovaný zborník

[3]   Albertova B., Optimalizácia vyučovania bežeckého lyžovania zrakovo postihnutých, Univerzita Komenského, Diplomová práca 2000

[4]   Vančurová J. - Náuka o zraku Brno 2002 80 -7013 – 362 – 7

[5]   Čajka, J., Úvod do pedagogiky zrakovo postihnutých Ružomberok 2007 978 – 80 – 8084 – 245 – 1

[6]   Wiener, P. Prostorová orientace zrakovo postižených Praha: Marcom, 2006.ISBN 80 – 239 – 6775 – 4

[7]   Kultan J., Serik, M., Alzhanov, A., Informacionnyje technologii objekt sredstvo i instrument obučenija. In Information technology applications = aplikácie informačných technológií. - Bratislava : Paneurópska vysoká škola : Občianske združenie VZDELÁVANIE - VEDA - VÝSKUM, 2012. - ISSN 1338-6468. - Č. 1 (2012), s. 55-69.

[8]   Driensky, Dušan – Hrmo, Roman. 2004. Materiálne didaktické prostriedky [citované 20.1.2015] dostupné na internete: http://web.tuke.sk/kip/download/mate-rialnedidaktickeprostriedky.pdf

[9]   Kultan J., Serik M., Rozličný pohľad na informačné technológie = Different perspective on information technology /.In Inovačný proces v e-learningu [elektronický zdroj] : recenzovaný zborník príspevkov z medzinárodnej vedeckej konferencie : 18. 4. 2012, Bratislava : pod záštitou rektora EU v Bratislave Dr. h. c. prof. Ing. Rudolfa Siváka, PhD. = Innovative processes in e-learning : the sixth international scientific conference / Zostavili: Eva Rakovská, Alžbeta Kanáliková, Miroslav Kršjak, Martin Blahušiak, Janette Brixová. - Bratislava : Vydavateľstvo EKONÓM, 2012. - ISBN 978-80-225-3397-3. - S. [1-11].

Collaboration Between Employees when Assuring Quality for Schools

Alexander Bilčík

DTI University
Department of Didactics
Dubnica n/V, Slovakia
bilcik@dti.sk

Abstract— **The contribution underlines the assumption of mutual communication and collaboration between employees when assuring quality for educational organisations. It explains the fundamentals of quality management at the Dubnica Institute of Technology in Dubnica nad Váhom. Furthermore, it clarifies the 5W+1H method, as well as three types of processes which are realisable by every school**

Keywords — *organization; process; quality management system; types of processes; process improvement; school*

I. INTRODUCTION

The management of the Dubnica Institute of Technology in Dubnica nad Váhom (further DTI) applies Quality Policies in accordance with the law of the Slovak Republic, particularly with the Act no. 131/2002 on Higher Education. The inner-quality-system of this educational organization regulates a Quality Guide. Hence part of the DTI's management is management of institute's quality, which however should not be seen as a primary commitment, but rather as a tool which allows to set, evaluate, and improve processes implemented by this educational organization.

The quality targets aim to improve the quality of school's processes in accordance with the requirement of the Bologna Process and the Lisbon Strategy, which are accepted by all member states of the European Union.

II. PROCESSES IN EDUCATIONAL ORGANIZATIONS

Processes supplied by schools differ by content, structure, duration, repetition frequency, importance, as well as purpose. A mutual communication and cooperation between the owners of these processes becomes an assumption for systematic improvement.

According to [2], the task of the management (leadership) of a particular school is to understand own employees, and know how to apply their skills when achieving aims and fulfilling commitment of a specific school.

Seeing that a communication process at schools goes in several directions, the author of

this contribution emphasizes that the achievement of effectiveness in communication equally depends on the approach of all involved parties.

The employees of the Dubnica Institute of Technology in Dubnica nad Váhom engage the method 5W+1H to ensure an effective communication in a process based approach. This method is depicted by the Figure 1.
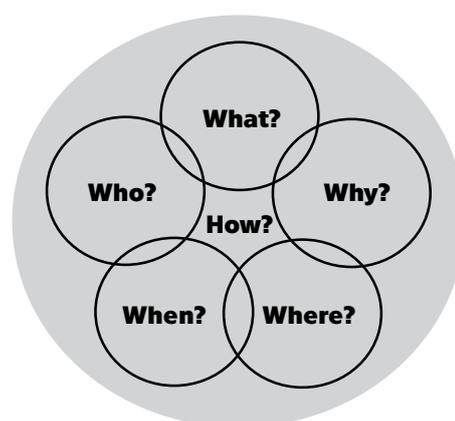

Fig. 1.   5W+ 1H, Hekelová (2008).

The practice at the DTI confirms that when the school employees know the answers to the questions from the mentioned method, they are able to deliver quality achievements and fulfil the targets of quality.

Processes in educational organisations are in general multidisciplinary, they include administrative services and further kinds of support. I Paulová (2009) states the following services as related to appraisal:

- Strategic process, which has to determine the task of an educational organisation in a social-economic environment,

- Provision of pedagogic competence,

- Preservation of work environment,

- Development, investigation, and actualization of educational programs,

- Recruitment and selection of candidates,

- Use of absolvents after completion and their assessment,
- Final assessment regarding absolved study (diploma, certificate, report)
- Satisfactory assurance and supporting services of educational process until completing an educational activity,
- Internal and external communication,
- Measurement of educational processes.

According to [1] 2015, the processes at schools are devisable into 3 categories, as depicted on the Figure 2.
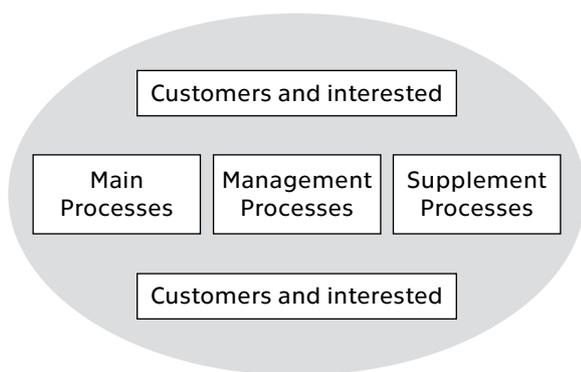

Fig. 2.   Types of processes, Bilčík (2015)

Main Processes at schools are the reason of their existence. They contribute to the creation of the product (provisioning of a service) and produce an added value (provided level of knowledge to pupils). It is about a directly provable and visible added value, which a customer appreciate (high school, university, business practice). They create a value represented by a service for an external customer, contribute towards the fulfilment of organisation's commitment. The most important, educational process in itself includes creation, research and actualization of educational programmes, selection of pupils and recruitment process, planning, preparation for a teaching unit, realization of teaching and assessment of pupils.

Management Processes define and secure development and function of an educational organisation, support main processes and create conditions for function of other processes. Processes that belong to this category are related to strategic planning, establishment of targets, assurance of communication, management of human resources, establishment of strategy, school development conception, planning of school-management meetings, pedagogical meetings, selection and recruitment of employees, development of human resources.

Supplement Processes influence the creation of the product indirectly, but their inputs are crucial for the successful realisation of main processes. They contain processes targeted on the measurement and collection of data, which are used to analyse performance and improvement of processes. They are related to management of documentation, entries, control of topic plans, etc. (I. Paulová, 2009). Management and supplement processes serve employees of an organization, internal customers.

The Dubnica Institute of Technology in Dubnica nad Váhom has implemented and maintained system of quality management based on the standard STN EN ISO 9001:2015.

III. CONCLUSION

Assurance of quality at any organisation requires creation of appropriate conditions. To ensure future of a school and satisfaction of interested parties, its management has to create a culture which can actively engage employees in the search for opportunities that can be used to improve the performance of the process of activities and of the provision of the educational service. As emphasized by I. Paulová (2008): "In order to involve employees, the main management has to create an environment in which responsibilities are delegated in such a way, that employees are authorized and takeover responsibility for identification of opportunities by which an organization can improve its performance." The experiences of employees of The Dubnica Institute of Technology in Dubnica nad Váhom confirm the stated idea.

It is obvious, that success of educational organisations in a concurrent environment influences the quality of the services they provide. Quality should be a target for all employees. Quality requires a truthfully engagement and active cooperation, which results in creative innovations, extraordinary service, and in fulfilment of partners' perceptions. The key factors of a successful school thus are: public image, competency of employees, mutual confidence, and cooperation, which subsequently leads towards satisfaction of all interested parties. The author gratefully acknowledges the contribution of the KEGA Grant Agency of the Slovak Republic under the KEGA Project 006DTI-4/2016 Model of assessment and quality improvement of the educational process at secondary vocational schools.

REFERENCES

[1]   A. Bilčík, R. Hrmo, Orientácia na procesný prístup k manažérstvu vo vzdelávacích orgaizáciách, 9. Didaktická konferencia s medzinárodnou účasťou, Masarykova univerzita, Brno 2015.

[2]   R. Hrmo, A. Bilčík, L. Krištofiaková, Úloha ľudského faktora v manažérstve kvality vzdelávacej organizácie. 21. Mezinárodní vědecká konference, Univerzita Hradec Králové 2016

[3]   I. Paulová, E. Hekelová, A. Šatanová, J. Šalgovičová, Metódy zlepšovania efektívnosti a účinnosti TQM, STU Bratislava, 2008, pp.100, 142.

[4]   I. Paulová, Prístupy k manažérstvu kvality vo vzdelávacích organizáciách, Bratislava: MPC v Bratislave, 2009, pp.60-61.

Monitoring the Impact Factors of the Working Environment in Education in Technical Subjects

Jana Depešová

Constantine the Philosopher University in Nitra

Faculty of Education

Department of Technology and Information Technologies

Nitra, Slovakia

jdepesova@ukf.sk

Abstract— **The educational process will include specific requirements for the efficiency of the educational process, active and creative activity of students in witch micro-climatic conditions have an important role. Microclimate is determined by the temperature, air flow, humidity, oxygen concentration and carbon dioxide if necessary and other chemical agents. Monitoring the impact of the above factors on the quality of the working environment for each factor separately rather simple, but any combination of these may be times when there is a burden of the organism. The paper deals with objectification of the individual factors of the working environment in education in technical subjects.**

Keywords— *Technical training - Monitoring - working environment factors - climatic conditions Introduction*

I. INTRODUCTION

Our society underwent many social-economic changes in the past years – changes in ownership relations, working and family environment, as well as changes in the system of social values, which brought many people to situations requiring different way of thinking and different procedures than those common before. The importance of creative thinking and practice in all spheres of human activities still increases. But it is also clear at the time of scientific and technical development that further society development will be directed towards complicated and demanding creative activities in almost all of us.

The education of students in primary and secondary schools is a part of lifelong learning, these two levels of education are considered to be extremely important for the professional orientation of students and their success in life. The interest of students in the study at secondary vocational schools has been declining in recent years. It is important to find out whether the students with the most suitable type of personality for technical professions really decide for technical profession at their career choice.

Nowadays society expects from school to respect and reflect its needs and respond to the challenges connected with demands for preparation of educated citizens as a human source of the prosperous society. The school should provide education that cannot be replaced by any other institution, ensure the acquiring of knowledge and skills important for future lifelong learning and for fulfilling life in a changing social and cultural environment. The school should teach students to orientate in the accelerating growth of knowledge produced by science and technology, to develop skills important for life in the modern world and highly organized society, to support cohesion and solidarity in the multicultural and individualized global world and at the same time to ensure the sustaining of cultural and national heritage by new generations. The school should reflect the current and perspective needs of the scientific society and prepare pupils of primary schools as a future generation that performs skilled labour in the fields of economy, which are required by the market and where the pupil will be successful.

II. PROFESIONAL ORIENTATION IN TECHNICAL EDUCATION

Learning, education and improvement of qualification of human has become a prerequisite, addition or part of of business activities and free time due to civilizational and cultural changes. Lifelong learning is understood as a process of education covering the whole life of a man and view on the development of education is seen as a strategy for solution of economic and social changes. The states of the European Union place great emphasis on the interaction among education, training and employment and also on the question of employment. The post talks about the context in which the professional practice is an important part of preparation for the profession. The rapid development trends in information and communication technologies offer new challenges also for the field of professional practice. The professional practice itself should reflect on this

trend by application of the innovative methods of education [1, 3].

The work is an important part of human life. The profession affects the social position of the individual, his social prestige, lifestyle coupled with favoring certain values, interests and orientations. It is a life path in which an individual acquires new skills and pursue his personal potential. The aim of the education of pupils in primary schools is their preparation for life in the society to which relates the preparation for their career choice. The report presents the results of analyzes designed to determine the factors that influenced students in their decisions about their future careers, mainly technically oriented professional studies.

Preparation of pupils at primary school and high school and the following directions for technically oriented professional studies has a considerable impact on their success in the labor market. In a situation where there is a high level of unemployment, it is impossible to expect improvement of the employment situation of graduates, without upgrading the education system, which may affect the future success of graduates on the labor market. The decision of the Council of the European Union for training and work suggests that the educational institutions and the world of work are complementary forums for the acquisition of general, technical and social knowledge and skills. Professional training associated with work contributes to more effective social and professional integration of young people in the job and the labor market.

The educational process will include specific requirements for the efficiency of the educational process, active and creative activity of students in witch micro-climatic conditions have an important role. Microclimate is determined by the temperature, air flow, humidity, oxygen concentration and carbon dioxide if necessary and other chemical agents.

According to researches done by the US Agency for Environmental Protection (EPA Environmental Protection Agency) [4] plays indoor environment of schools a very important role in health and achieving good study results. It was found that the pollution of the internal environment is in average by 2 to 5 times higher than the values shown outside. This fact causes not only the pupil absenteeism, but also reduces its performance and internal comfort. Also, for the practical work of students (professional teaching experience) it is necessary to ensure the optimum learning environment conditions such as temperature, humidity and air flow.

Classification of the indoor environment can be based on the design criteria of the individual parameters of the calculation or measurement of relevant parameters on which we include heat and humidity conditions. These are defined by temperature, relative humidity and air velocity and directly decide on thermal comfort or discomfort to humans. Furthermore, here we can include noise, light, chemical and biological factors. These factors must achieve a minimum level even in their interactions [2].

III. SPECIFIC GOALS OF THE EDUCATION

Innovation of methods, forms and means of education has followed the school reform in Slovakia that influenced the change in the higher institution preparation of future teachers. This is why we are now facing the demand on creation and development of new educational and methodological materials. In connection to the above-mentioned the education goals were defined as follows:

- Provision of vocational literature and methodological materials as a source of information needed,
- Provision of technical equipment needed to obtain both material and non-material goals of the project,
- Selection of forms for selected school subjects,
- Analysis of the State educational programme in Slovakia with an emphasis on technical education,
- Verification of the project intentions in the real educational environment,
- Application of obtained experiences and outcomes from the real experiment,
- Creation of the textual materials, electronic materials, combined materials,
- Print of vocational educational materials,
- Creation of educational and methodological materials in the electronic form,
- Making educational materials available on the web portals of the Department of Technology and Information Technologies,
- Publication of professional contributions in specialized pedagogical journals,
- Publication of the project outcomes,
- Consultations with the tutors at participating schools involved in the videoconference system project,
- Workshop on pedagogical practice organised for universities and faculties of education [3].

Learning, education and improvement of qualification of human has become a prerequisite, addition or part of of business activities and free time due to civilizational and cultural changes. Lifelong learning is understood as a process of education covering the whole life of a man and view on the development of education is seen

as a strategy for solution of economic and social changes. The states of the European Union place great emphasis on the interaction among education, training and employment and also on the question of employment.

The rapid development trends in information and communication technologies offer new challenges also for the field of professional practice. The professional practice is an important part of preparation for the profession. The professional practice itself should reflect on this trend by application of the innovative methods of education.

The achievement of positive results in education is currently closely related to the modernization and efficiency of the educational process. Multimedia application into the training of specialists brings significant changes in the quality of education in the praxis. Introducing innovative methods and forms into the education with the application of multimedia affects the modernization of education on the required level.

Meaningful connection of new information and communication technologies with conventional forms of education by using high-quality educational content and interconnection of students and teachers in a shared digital space appears to be the appropriate means to positive effect on the quality of the education process. Information technologies with their didactic possibilities are the resources that can be very successfully and effectively used in acquiring the necessary educational skills [11, 15].

Indoor environment educational space is the part of the environment, where the learners, or students are influenced immediately by all acts of factors of the internal environment. Comfortable indoor environment is essential to the productivity needs of people who work in the environment.

IV. ENVIRONMENTAL FACTORS

Comfort, performance and tiredness whilst working is to a high degree influenced by the microclimate of the environment. That imparts air and its physical and chemical features, dust, disease-producing germs, smoke, chemical matters etc. [5, 6].

The most commonly used indicator of thermal comfort is air temperature – it is easy to use and most people can relate to it. However, air temperature alone is not a valid or accurate indicator of thermal comfort or thermal stress. It should always be considered in relation to other environmental and personal factors. The six factors affecting thermal comfort are both environmental and personal. These factors may be independent of each other, but together contribute to employees' thermal comfort (Fig 1).
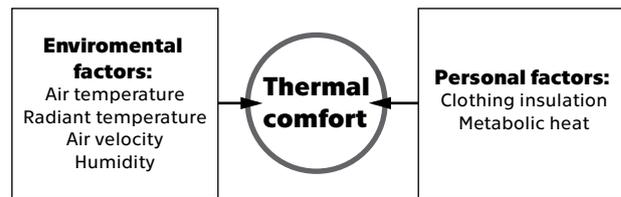

Fig. 1. Figure 1 Factors influencing thermal comfort [7, 10]

An adult need about 15 kg of air daily. At optimal air pressure, the lack of oxygen causes various complications when the concentration decreases to 10 - 12 %. If the concentration decreases to 7 % unconsciousness occurs. Contrastively, if the CO_2 concentration increases to 2 %, loss of focus and decision making skills occur. The concentration of 4 - 6 % results in rapid breathing, headache, apathy. At 10 % death occurs. CO_2 content is also used as the indicator of room air pollution and is closely related to oxygen content [10].

Classroom is the basic functional space where students move during the educational process. It needs to be designed in a way that meets the hygienic and pedagogical requirements. One student corresponds to a floor area of l,65 m² and 4,5 - 6 m³ air content. Most commonly, the shape of the classroom is a rectangle 6,6 m wide, 9 m long and 3,3 m high. Parameters of the classroom cannot be arbitrarily changes. Its length depends on visual and audible skills of the students. This means that the length is conditioned by the ability of students' eye to recognize the text on the board and their ability to hear the speech of the teacher even from the most distant points of the classroom. The width of the classroom is conditioned by suitable lighting in places which are quite distant from the windows. The whiteboard ought not to reflect when reading and students at corner desks should look at it at the angle of 30°. The first row of the work desks should be placed at a distance of 2,20 m from the whiteboard [8].

Thermal comfort is the result of microclimate components in interaction with organism thermoregulation elements. While working, the microclimate evinces itself by means of two mechanisms:

- it determines the laboriousness of physical actions,

- it disrupts the learning feedback and therefore becomes a determining factor for the efficiency of creating new movement skills and habits.

It is important to ensure optimal thermal comfort in schools' buildings. Thermal comfort in educational spaces positively contributes to maintenance the students' performance. Table 1 shows the thermal and humidity requirements for schools in SR [8, 9].

TABLE 1
PARAMETER EXAMPLES OF THERMAL AND HUMIDITY
MICROCLIMATE FOR SPACES WITH PARTICULAR REQUIREMENTS
[10]

Space	t [°C]	j [%]	n [h⁻¹]
study rooms, social rooms	22 – 24	30 – 70	3 – 6
classrooms, playrooms, day rooms (for schools and educational institutions)	20 – 24	30 – 70	3 – 8
corridors and stairways	15 – 18	–	2 – 3
entrance halls	18 – 20	–	–

Temperature and humidity highly affect the performance of the individual. At 20 °C there is 100% performance. As the temperature rises, the performance decreases. At 24 °C the performance is only 85%. As the humidity decreases the mucous membrane of the upper air passages dries out and as a result the immunity against infections weakens. At temperatures above 24 °C the 60 % humidity is too high and may lead to hyperthermia, as sweat evaporates from the body and cooling decreases. Staying in a warm environment leads to exerted blood circulation, increase in sweating and loss of mineral salts.

ACKNOWLEDGMENT

Monitoring the impact of the above factors on the quality of the working environment for each factor separately rather simple, but any combination of these may be times when there is a burden of the organism. The microclimate conditions issue in school buildings has an indirect impact on the ability of concentration and attention of students and teachers in the educational process. Indoor air quality indicators consist of the internal temperature, air quality, lighting, dust levels, as well as chemical and biological factors. Research shows that inside of education and administration buildings there is quality of the environment perceived far below the acceptable level.

REFERENCES

[1]   J. Depešová, at al, "Pedagogical Practice with the support of information and communication technologies", Nitra: UKF, 2010, 165, ISBN 978-80-8094-827-6.

[2]   M. Begeni, V. Zmrhal, „Dotazníkový průzkum stavu školských budov," ČVUT, Praha, Fakulta strojní, Ústav techniky prostředí. In: http://vetrani.tzb-info.cz/vnitrni-prostredi/12873-dotaznikovy-pruzkum-stavu-skolskych-budov

[3]   T. Kozik, J. Depešová, J. ,"Technical Education in the Slovak Republic in the context of education in the European Union," Nitra: Faculty of UKF. 2007. 140 p. ISBN 80-8050-745-7.

[4]   https://www.epa.gov/iaq-schools

[5]   A. Popovičová, "Látky nežiaduce vo vnútornom prostredí, Zdroje a afaktory ovplyvňujúce ich množstvo a zloženie", in. Chemické listy, pp 92, 1998.

[6]   A. P. Jones, "Indoor air quility and health", Atmospheric Environment, 1999.

[7]   HSE, Sixfactors, 2015. http://www.hse.gov.uk/temperature/thermal/factors.htm

[8]   D. Katunský, P Oravec, "Subjektívne pocity zamestnancov v priemyselných prevádzkach," EUROSTAV, 2003, pp. 44 – 45, ISSN 1335-1249.

[9]   Vyhláška MZ SR č. 259/2008 Z. z. o podrobnostiach o požiadavkách na vnútorné prostredie budov a o minimálnych požiadavkách na byty nižšieho štandardu.

[10]   I. Tureková, et al., "Evaluation of Microclimate Conditions in Classroom during Learning Process", in: SGEM 2016 : Proceedings from 3rd International Multidisciplinary Scientific Conference on Social Sciences and Arts. Psychology and Psychiatry, Sociology and Healthcare, Education, Albena, Bulgaria 24 - 30 August 2016. - Sofia : STEF92 Technology Ltd., 2016. - ISBN 978-619-7105-71-1, P. 491-498.

[11]   T. Kozík at al, "Virtual Collaboration and e-learning", Nitra, PF UKF Nitra, 2006, 120 pp., ISBN 978-80-8094-053-9.

[12]   Noga, H. ,"Sociometric methods in the chronological and information technology education", in Trends in education 2009. Olomouc: Votobia, 2009. ISBN 978-80-7220-316-1, pp. 169.

[13]   I. Turek, "Didaktika", Bratislava: Ekonómia, 2008. 595 pp. ISBN 978-80-8078-198-9.

[14]   D. Lukáčová, "Education reform in the Slovak Republic and the preparation of teachers of technical subjects for practice", in Pedagogical Practice with the support of information and communication technologies. Nitra: UKF, 2010, pp. 165, ISBN 978-80-8094-827-6.

[15]   G. Bánesz, "Communication university department of teaching experience in the digital information environment", in Cywilizacyjne wyzwania edukacji zawodowej. - pod redakcja Tadeusza Piatka: Rzeszów, 2010, pp. 161, ISBN 978-83-61483-72-4.

Quality Label for Technical Study Programs is Closer

Accreditation Centre ZSVTS, Slovakia

Martina Džubáková

University of Economics in Bratislava
Faculty of Business Management
Department of Production Management and Logistics
Bratislava, Slovakia

Abstract—**Quality of higher education is topic of many discussions and meetings in Slovak and Czech Republic in last few years. Current accreditation system can't ensure and guarantee competitiveness of our higher education. The article offers new possible contribution to the independent accreditation system supported by ENQA.**

Keywords—*Accreditation, Quality of Higher Education, EUR-ACE®, Certification.*

I. NEW SITUATION IN ACCREDITATION OF HIGHER EDUCATION

Higher education in Slovakia and in Czech Republic stands before new challenges connected with accreditation process. There are significant indications that the legal base for providing quality higher education and assessing this quality will change [5]. Independent accreditation and evaluation of institutions or study programs will be the basis of External Quality Assurance System [6].

Accreditation as a formal acknowledgement, that an Institution of higher education and its programs fulfils internationally recognized quality standards will be in HEI hands. The HEI will choose the appropriate accreditation body, national Accreditation Agency or any other accreditation body which, in the European Area of Higher Education (EHEA) is in current member of the European Association for Quality Assurance in Higher Education (ENQA). The European Quality Assurance Register for Higher Education (EQAR) is a register of such agencies, listing those agencies that have demonstrated their substantial compliance with a common set of principles for quality assurance in Europe. Register included 43 quality assurance agencies from 22 countries by the October of 2016.
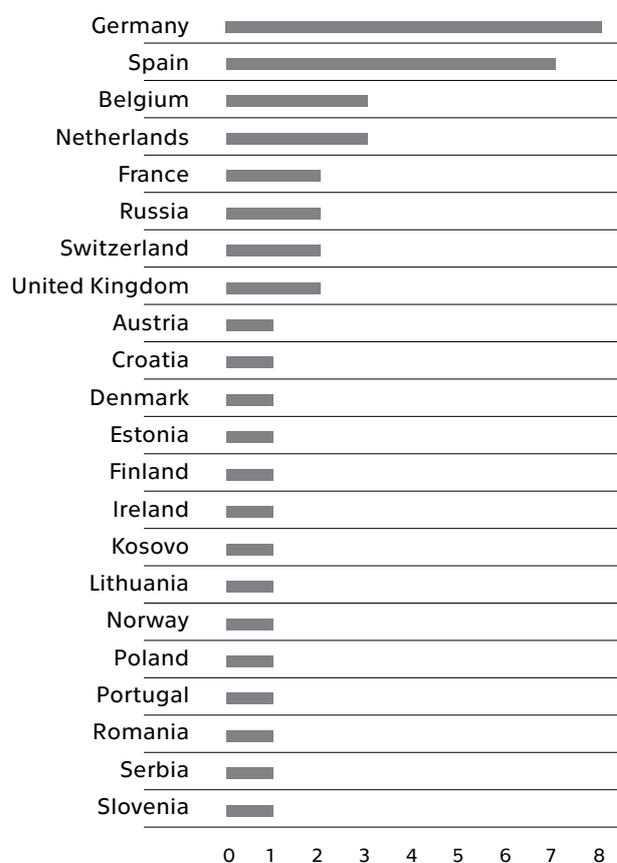
Fig. 1. Number of agencies Registered on EQAR [1].

This days there are no agencies form Slovak or Czech Republic registered in EQAR. Accreditation Commission of the Czech Republic was a member of ENQA until September 2016 and Accreditation Commission of the Slovak Republic is affiliate organization ENQA from September 2013.

EQAR and ENQA work with accordance to the Standards and guidelines for quality assurance in the European Higher Education Area (ESG). ESG were adopted by the Ministers responsible for higher education in 2005 following a proposal prepared by ENQA in co-operation with the European Students' Union, the European Association of Institutions in Higher Education (EURASHE) and the European University Association (EUA).

II. THE EUR-ACE® LABEL STORY

In 2006th 14 European Associations concerned with engineering education founded ENAEE (European Network for Engineering Accreditation). The idea came from ESOEPE project (European Standing Observatory for the Engineering Profession and Education) with the purposes to develop a European standards for competency requirements of graduate engineers. In 2007th the EUR-ACE® standard implementation started, with the award of the first EUR-ACE® labels.

ENAEE is the European body responsible for awarding authorization to accreditation agencies to award the EUR-ACE® label at first and second cycle to engineering programs which they have accredited.

EUR-ACE® is a framework and accreditation system that provides a set of standards that identifies high quality engineering degree programs in Europe and abroad. The EUR-ACE® label is a certificate awarded by an authorized agency to a HEI (Higher Education Institution) in respect of each engineering degree program which it has accredited.

Since 2006, was awarded by EUR-ACE® label over 2200 engineer's study programs, at more than 300 universities, in 28 countries (Fig. 2). Currently the process of internationalization of education and the development of joint study programs supports expansion of the EUR - ACE brand outside the EU (Fig. 3).
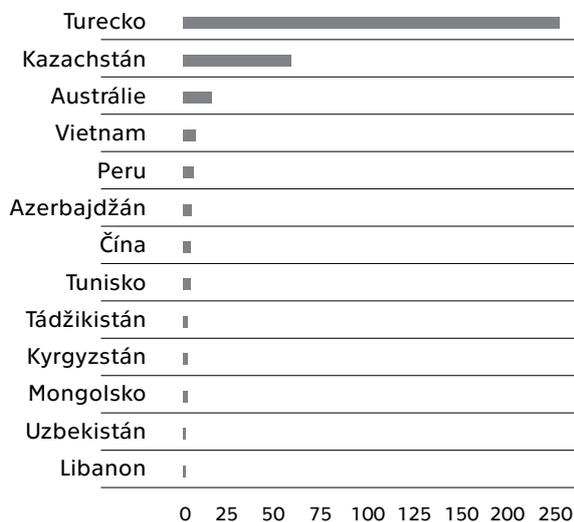

Fig. 2.   Numbers of accredited study program in Europe.
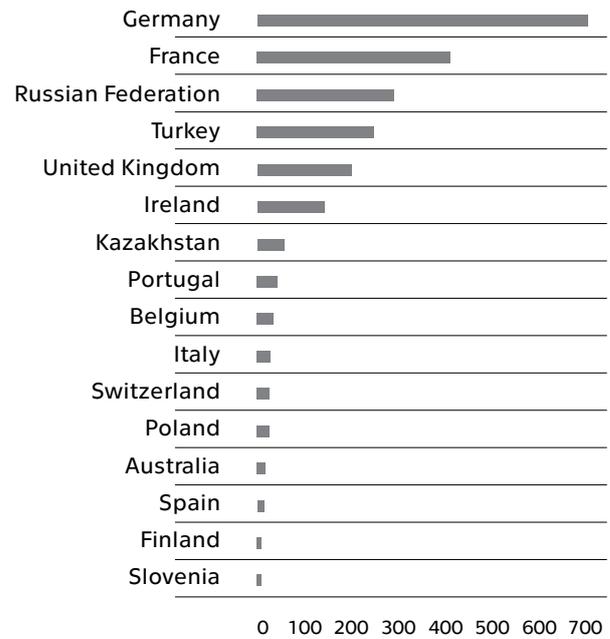
Fig. 3.   Numbers of accredited study program outside the Europe.

A. EUR-ACE® Standards and Guidelines for Accreditation of Engineering Programmes

The EUR-ACE® Standards and Guidelines for Accreditation of Engineering Programs have tree basic:

• Student Workload Requirements.

• Program Outcomes Requirements.

• Program Management Requirements.

The workload requirements are described using ECTS credits (bachelor programs - minimum of 180 ECTS credits, master programs - minimum of 90 ECTS credits (60 in some educational systems).

Program outcomes have to compline with the Framework of Qualifications for the European Higher Education Area and the Program Management have to consist with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). The standard describe the Program Outcomes that accredited programs must meet, but do not prescribe how they are realized. Outcomes are described separately for Bachelor and Master Degree programs with reference to the eight learning areas: *Knowledge and understanding; Engineering Analysis; Engineering Design; Investigations; Engineering Practice; Making Judgements; Communication and Team-working; Lifelong Learning*. For example in learning area Investigation the learning process should enable master student to demonstrate ability to identify, locate and obtain required data; ability to conduct searches of literature, to consult and critically use databases and other sources of information, to carry out simulation in order to pursue detailed investigations and research of complex technical issues; ability to consult and apply codes of prac-

tice and safety regulations; ability to advanced laboratory/workshop skills and ability to design and conduct experimental investigations, etc. [2].
3. By Program management requirements the Accreditation agencies should confirm that engineering degree programs are managed to achieve the program aims; provide a teaching and learning process that enables students to demonstrate achievement of Program Outcomes; provide adequate resources; monitor the rules for student admission, transfer, progression and graduation and comply with internal quality assurance procedures.

B. Accreditation process

The EUR-ACE® label is a certificate awarded by an authorized agency to a HEI (Higher Education Institution) in respect of each engineering degree program which it has accredited. Each accreditation agency is authorized by ENAEE for five years to award the EUR-ACE® label together with its own accreditation [2].

EUR-ACE Accreditation is a process resulting in a decision whether a certain engineering study program meets requirements for awarding EUR-ACE quality label to the program [3].

Accreditation process covers 4 steps:

• Accreditation Request.

• Orientation meeting with the HEI representatives.

• Preparation of the application and self-assessment.

• Evaluation of the application in accreditation body and signing the contract about the accreditation.

• Meeting preparatory to the accreditation audit.

• Accreditation audit.

• Accreditation Audit Results - Preparation of the report.

• Making Decision about Awarding EUR-ACE Label.

• EUR-ACE Certificate.

The study programs awarded by the EUR-ACE label and having valid EUR-ACE certificate are listed in the Database of EUR-ACE accredited study programs.

C. Accreditation center ZSVTS - Slovak independent accreditation agency.

AC ZSVTS is since 2016th recognized by the European Network of Accreditation Engineering Education (ENAEE) and is authorized to award EUR-ACE label of quality to the study programs that meet the standards the EUR-ACE label acknowledges that the study program meets Eu-

ropean standards of education quality in engineering studies [4]. The Accreditation Centre ZSVTS (AC ZSVTS) was established as one of the organizational units of the Association of Slovak Scientific and Technological Societies (ZSVTS) with the purpose to fulfil its mission in the field of technical and engineering education in Slovakia. ZSVTS is a not-for-profit, non-governmental organization embracing 45 societies in different fields of science and technology [8]. The main goal of the AC ZSVTS is to promote European standards of quality in technological and engineering studies in accordance with the mission of ZSVTS aimed at enhancement of quality of engineering studies in Slovakia and other east European countries.

III. WHY EUR-ACE® LABEL

ENAEE provides the benefits for Higher Education Institutions (HEIs), for students, engineering graduates, for employers, for professional engineering organizations and for accreditation agencies. The most important role of whole EUR-RACE system is to enhance international academic and professional mobility. EUR-ACE label guarantees, that the program meets high European and International standards and is recognized by universities and employers in Europe.

REFERENCES

[1]   EQAR, "Quality Assurance Agencies Registered on EQAR", On line: https://www.eqar.eu/register/map.html, [accessed 1.10. 2016].

[2]   ENAEE, "EUR-ACE® Label Authorisation Process", 2013, On line: https://www.minedu.sk/data/files/2545.pdf, [accessed 1.10. 2016].

[3]   ENAEE, "EUR-ACE® Framework Standards and Guidelines", 2015, On line: http://www.enaee.eu/eur-ace-system/eur-ace-framework-standards/, [accessed 15.10. 2016].

[4]   ENAEE, "Standards and Guidelines for Accreditation Agencies", 2015, On line: http://www.enaee.eu/eur-ace-system/eur-ace-framework-standards/standards-and-guidelines-for-accreditation-agencies/, [accessed 15.10. 2016].

[5]   MŠVVaŠ SR, "Kritériá akreditácie študijných programov vysokoškolského vzdelávania", 2013.

[6]   MŠVVŠ SR, UČIACE SA SLOVENSKO, Národný program rozvoja výchovy a vzdelávania, Návrh cieľov v oblasti vysokého školstva, 2016, On line: https://www.minedu.sk/data/att/10640.pdf, [accessed 12.11. 2016].

[7]   Zákon č. 131/2002 Z. z. o vysokých školách a o zmene a doplnení niektorých zákonov.

[8]   ZSVTS, "Statute of the Accreditation Centre of the ZSVTS", On line: http://www.eurace.sk/uploads/media/Statute_of_the_Accreditation_Centre_of_the___ZSVTS.doc, [accessed 15.10. 2016].

Mathematical Literacy as a Fundamental Strategy of Effective Learning

Lívia Hasajová

DTI University
Department of Didactics
Dubnica n/V, Slovakia
hasajova@dti.sk

Abstract— **Personality development is determined by several factors, we have focused on the effect of mathematical literacy. Gaining new knowledge and skills not only from mathematics is influenced by class climate and environment in which the educational process takes place.**

Keywords— *effective education, mathematical literacy, class climate, functional literacy*

I. INTRODUCTION

Mathematics is one of the most difficult sciences, with respect to skills necessary to cope with it. Logic, logical thinking, spatial perception, exact thinking, accuracy and concentration are not always a matter of course in students with mathematical literacy. Therefore, the focus is on the question of primary and secondary school students' level of knowledge of mathematics. Within the professional circles, the difficulty of the A-level in mathematics and even its change to a compulsory graduation subject is discussed vividly. Understanding the mathematical skills is a prerequisite for study in technical fields.

 Mathematics is regarded to be the language of technique. The problem of the decreasing level of mathematical knowledge is transferred not only into higher level of education but also into practice. Weakened mathematical and scientific literacy lately arise as one of the principal obstacles in technical fields' development. The above mentioned trends are also confirmed by the PISA, TIMSS international research. The specific ability to learn certain activities necessary to human life is regarded to be the general definition of literacy by professionals. Among professionals, this term is often replaced by the term "functional literacy", whereas the term refers not only to acquire certain skills and knowledge developing personality of an individual, but also the ability to practically use that knowledge and skills in real life. According to various theoretical perspectives and views, we distinguish between several kinds of literacy, e.g. financial, numerical, mathematical, reading, health, scientific literacy etc. Mathematical literacy can also be found under the term numeracy between the components of functional literacy. The definition of mathematical literacy, according to J.

Prucha, E Walterová and J. Mareš (2009, p.147), is based on OECD PISA sources and it is formulated as "the ability of an individual to identify and understand the role of mathematics in the world, to make well-founded mathematical judgments and deal with mathematics in a way that will meet the needs of the present and future life of the individual". According to an older definition it is "the ability to recognise and understand mathematical problems, deal with them and use mathematics in private life, in the employment and in the company of friends and relatives as a constructively involved and thoughtful citizen"(Straková, 2002, p. 11). The most frequently used definition is a formulation laid down for the OECD PISA international research: "Mathematical literacy is an ability of an individual to recognise and understand the role of mathematics in the world, to make well-founded judgements and to penetrate into mathematics so that it helps meet living needs of the individual as a creative, interested and thoughtful citizen." (Learning for Live – OECD PISA 2003 Research Result). The essence of mathematical literacy is, therefore, to understand the surrounding world and to be able to solve various social issues through mathematics.

II. A POSITIVE CLIMATE AND LEARNING MOTIVATION OF PUPILS

Then term climate comes from Greek and means "prevailing weather conditions". The term climate is not used only in this context. We use this term also to describe the particular environment, "prevailing conditions" of the environment. In pedagogy, the terms class climate, school climate and school environment climate are often used (Petlák, 2006, p. 15). The notions of school and class climate are very closely related to the terms of school and class environment and atmosphere. The learning environment is beyond the social-psychological aspect and refers to the physical environment as well (class lightning, class equipment, wall colours and other), whilst the class atmosphere is current, it is a short-term condition in the class, often changing, sometimes even during a teaching unit (Gavora, 1999, p.239). There are various factors affecting school or the class climate (teachers, students, parents,

environment and others) but also interactions between teachers and students or between the students themselves. Just because school or class climate are affected by several factors, we cannot talk about universal climate. The group of students in a class can, however, act differently with different teachers. The experience shows that whilst one teacher experiences a rather negative class climate, another teacher perceives it as non-problematic. It means that a variety of factors participate in the class climate (Petlák, 2006, p. 18). Teacher acts as a co-creator of the climate in the classroom. In the beginning of the compulsory school attendance, he carries it and he plays a fundamental role in social climate shaping in the classroom. He supports socio-moral development of children through:

1. adoption and acceptance of basic psycho – social values, which are necessary for human co-existence. This includes:

- *Self-determination of a person* – it is possible only based on freedom from fear, coercion and control,

- *Respect* – relationship to mental and physical integrity. Respect and equality of people,

- *Mental and physical functioning support* – it is expressed in the mediation of relevant knowledge. It includes help and individualization of approaches for the benefit of learning,

- *Social order* – it is built based on social life and social cooperation.

2. meeting the needs of pupils related to motivation and learning:

- Pupils in the learning process have a possibility of a choice and possibility of a free creative space allowing them to do a self-controlled learning.

- They have a possibility to gain information feedback about their learning.

- Teachers accept them, there is a friendly atmosphere in the class.

3. discipline survey in the classroom, identifying various forms of frequency and severity of symptoms of inappropriate behaviour. Systematic management of prevention and correction of undesirable behaviour in the classroom.

Pupils perceive the climate in the classroom as supportive, when the teacher can focus on the issues, whether he is fair, honest, fair but also whether he can respond positively to pupils. Various researches aimed at determining signs of a good class climate and good results achieving say that the emphasis should be put on:

- *Support* – a pupil has positive feelings in the classroom, he enjoys searching and finding new things, is not afraid of mistakes, he is happy when being successful.

- *Order* – there are sensible rules in the class connected to the way of behaviour of pupils and observance of these rules.

- *Participation* – pupil has an opportunity to communicate, is engaged in activities in class and can decide on his own.

- *Standards* – a pupil's collection of norms is clearly defined, what aim should be reached, not only by execution, but also by his attitude

- *Sensibleness* – it is important to emphasize sensibleness, meaningfulness of the curriculum and learning activities.

- *Responsibility* – sense of responsibility for his own learning, fulfilling hiss tasks, participation in school tasks, achieving success.

- *Interest in learning*

- *Success expectation* – the pupil can solve tasks, to go beyond his limits of publicly declared expectation.

- *Impartiality* – partiality and injustice, to emphasize absence of favouritism, reward for a well-done job.

- *Safety* – it is a testimony about the absence of mental or physical violence. Removing of stressful factors and knowledge of procedures that are necessary to deal with these situations and how to fix them.

The features defined by pupils mentioned above are prerequisites for a positive change under the influence of a teacher that with its increased efforts can affect educational activities, evaluation and management of educational activities the most, as well as communication with students, but mainly positive attitude towards students. Good relationship between teachers and students is characterized by understanding the social point of view of each child. The teacher must understand individual opinions of students in the group and consequences of these must be respected in its proceedings and in the learning process. The quality of the relationship is expressed by the fact that the teacher prefers in his actions, reflection and permanent interaction such values that are to be communicated to pupils and to be expected from them. His relationship with the students and all his qualities are expressed through good and sensible communication.

III. INFLUENCING OF SOCIAL CLIMATE IN THE CLASSROOM

Using the interventions in the classroom, the teacher can affect its social climate. Every day he cooperates with pupils, encouraging them to participate in the life of the class. He seeks to pro-

mote cooperation between pupils and stimulate their skills in solving social problems. The teacher supports their emotional balance, facilitates their mutual understanding. He accompanies them in discovering the world as their friend, advisor and confidant. Fairly evaluates pupils and provides diagnostics. He cooperates with pupils, teach them about respect, equality of all pupils in their rights and obligations. The teacher does not try to control pupils in their personal problems and does not manipulate them, but tries to understand them and tries to regulate them without enforcing his own ideas and practices. They are committed by him to co-decision and responsibility. The teacher influences the social climate through his effecting with the help of guidance of social interaction, emotional state of mind of students and social relations in the classroom.

The teacher his relationship with pupils, his social and cultural models, helps to constitute the social interaction and social relations between them. At the beginning of school pupils accept the authority of the teacher in completely other way, moreover, they even accept their classmates depending on how the teacher accepts and evaluates them. The interpersonal and peer relationships between classmates are still quite volatile. They can become stronger and more positive in case that the teacher cares about all pupils, is receptive to them and has a positive attitude. Pupils come into the daily social interaction with peers, either voluntarily or involuntarily. Their basic social needs are satisfied by sharing their experiences. They experience positive emotions and in situations with a negative tension they are involved in disputes. Often, they can be very hard, ruthless and merciless to others just because they are different. It comes to behaviours that reflect the quality of relations between them We can observe in the classroom:

- *Sharing* – desire to share common things, desks, water colours, common books, textbooks, etc.
- *Mutual support and assistance* – students help each other with simple tasks, borrow things stood a friend, cooperation among pupils.
- *Imitating* – their example is many times a teacher, as well as a popular classmate because of their positive, but also of their negative qualities.
- *Vaunting and cheating* – it appears by pupils in the case if they want to be the same as the others or if they want to exalt over them. Such a behaviour is used by the pupils to get noticed by the others, because this way is the only one to attract the attention of them.
- *Rivalry and competition* – this is typical for the pupils who yearn for awards, seek for

success and want to highlight the mistakes of the others.
- *Sneaking* – this behaviour is typical for younger pupils. They want to attract the attention of the teacher.
- *Taunting* – this expression tends to achieve the degradation of the student, to focus attention to the fact that I am a better now. Sometimes it may also be irony or joking. The pupil should learn to respond appropriately to adulterants behaviours of the classmates.
- *Toadying and obtrusion* – this behaviour is usually chosen by an unsuccessful child who has it as a way of attracting the attention, as integration into a smaller group.
- *Enforcement and an aggressive behaviour* – typical for the pupils who lack a behaviour model.

The emotional state of mind of pupils is greatly influenced by teacher's actions. It depends not only on the learning environment, other factors also to extend to it. It is influenced by family, from which attitude towards learning and to the school itself derive. Each pupil has his life story. How he/she feels and behaves at school, with what courage or concern he/she access to education and the way of building the position in the classroom. Everything has its cause, whether the experiences they gained from home or that from another setting. Many pupils have a lack of courage and they do not trust their skills and have a sense of inferiority. However, from empirical research we know that emotions have a big impact on the learning process. They can block it, support it, but, on the other hand, thinking and action of a good quality focused on the solving of various problems can release it. The teacher knows very well that the emotional issue of their pupils cannot be neglected. It is very difficult for him to examine the emotional processes of pupils. Emotions can be verbalized, but only a small part of it proceeds consciously. Often not even a pupil can say what is happening to him. In the case that his emotion is well-hidden, it can result in reduction of emotional expressions. Perceived mental stress, need to escape and fear of failure are very difficult to identify. The teacher watches them only in the form of expression or physiological symptoms such as sweating, facial expressions etc. Inconsistent treatment of parents and teachers has a decisive influence on the social climate in the classroom. Communication with authoritarian manifestations, excessive overloading on the part of parents and teachers. Pupils evaluate and perceive situations and deal with them in the classroom based on their previous experience. Communication with authoritarian manifestations, excessive overloading on the part of parents and teachers. We can observe the expression of sadness, fear, helplessness, loss of interest in learning, avoidance of certain activities,

underestimating themselves, pessimism, expectation of punishment. A consequence of neglect to accumulated anger, hostility, loneliness is created in the class room for the creation of situations in which pupils are concluded together. If anxiety or depression appears by the pupils it is often accompanied by a deterioration in school performance. Victims of bullying have the characteristics of low self-esteem, anxiety or shyness.

If social climate in the classroom is neglected and it often comes to worsening of pupil behaviour or aggressive expressions. If relationships are not based on values such as empathy, understanding, solidarity, acceptance, then there is room for bullying, aggressive behaviour, in other words for the consequences of failure of social relations. Such a negative behaviour affects the role of pupil's method of communication, interaction, cooperation between pupils and between pupils and teachers. If there are more holders of aggressive behaviour in the environment, good atmosphere, positive expectations, openness decrease in the classroom, and there is a predominance of a disruptive behaviour. The teacher must influence the social climate deliberately so that it contributes to forming an emotionally safe environment in which every student will feel safe. If the pupil is in an environment where trust to the teacher and classmates survives, the teacher has acceptance in the classroom, there is not disparaging, but experiencing a sense of belonging, community and influence. It is very important for the teacher to increase the quality of classroom climate, well-being to be in the classroom humour, laughter, good mood, praises and compliments. The teacher encourages atmosphere safe environment by observing the students as they come to class. He sees signs of trouble before he starts teaching. If the teacher notices a stormy debate or conflict between students, he should attempt to solve the problem immediately. Nowadays, when there is rising incidence of aggression in the school environment, teachers must deal with communication difficulties in the classroom. When communicating with verbally aggressive students, following principles must be applied:

• To be calm when communicating with an angry student. Do not act authoritatively, cannot react to a verbal attack in the same way. At first the teacher should leave the pupil to talk about his problems without being interrupted.

• To listen the pupil carefully and to accept his behaviour. Acceptance does not mean agreement with it, it should only mean accepting the message of aggressive pupil. The teacher accepts what the pupil says as notifications that are important to him subjectively, from his perspective are true, although the educator may not always agree with it. He orients himself by using supplementary questions in a situation and at the same time he should show personal interest in the issue.

• With active listening and empathy, the teacher tries to realize how exactly the pupils mean the words he says. The teacher must find out the cause of aggression and how the pupil experiences it. It is appropriate to paraphrase shorter sections ending with the question of whether he accurately understands the pupil and after longer sections to summary of what he has said. The teacher indicates so that he reflects the student, and that he tries to understand and understands the reasons which led to his behaviour

• If it is possible, the teacher should strive to meet the pupil. If not, he would still have to explain his position together with an understanding of his disappointment. The teacher should have to give space to answer his questions and help him to look for solutions.

• The teacher should verbalize feelings of the pupil he communicates with. „I see that this question excites you. Could you say more about that?"

• We should support the pupil to debate about the subject of his interest. The teacher must find out what it is and why is the pupil focused on it. To check pupils' interest. What he wants, why he wants it, it is very important for his understanding and communication, then for the negotiations he wants to reach an agreement with.

• If possible, the teacher tries to cope with aggression using assertive communication. If the attacker tries to provoke the teacher with the aggression and use his failure in his favour. „I understand your excitement. I would perhaps also react similarly. What about talking about everything in peace?"

• We try to change human relations. Problems are solved better and agreements are stronger when it comes to communication between teachers and pupils, in which they at least partially, if not completely perceive as partners.

Aggression, whether it is at school or in a company exists in manifold forms. From the socially tolerated to the sanctioned ones. Aggression is a departure from the usual social behaviours. Communication with feelings of anger, annoyance, irritation with motivation to hurt someone or to punish someone. The source of aggression are harmful stimuli. It arises and may be transmitted, as well as inhibited. It is often negatively, but also positively socially evaluated. The definition of aggression in the diversity of its expressions is quite varied. Each one definition is beneficial with

something. Many times, it determines the important aspect.

REFERENCES

[1] Baluchová, Ľ. *Učiteľ ako tvorca pozitívnej edukačnej klímy triedy a školy.* Pedagogické rozhľady, odborno-metodický časopis, január 2010, roč. 19, č.1 s.20. ISSN 1335-0404.

[2] Beňo, M., 1997. *Slovenská škola na prahu 3. tisícročia.* Bratislava: ÚIaPŠ. 392s. ISBN 80-7098-149-0.

[3] Brunclíková, Z., 2008. *Úloha riaditeľa pri vytváraní priaznivej sociálnej klímy. Výchova v pedagogickom výskume a praxi.* In: Zborník z medzinárodnej vedeckej konferencie z 31.1.2008 v Trnave. Trnava: Katedra pedagogiky FF UCM, SPS pri SAV. 730 s. ISBN 978-80-8105-007-7.

[4] Čermák, I. 1999. Lidská agrese a její souvislosti. Žďár nad Sázavou: Fakta, 1999. 204 s. ISBN 80-902614-1-8.

[5] Ďurič, L. – Grác, J. – Štefanovič, J. 1991. *Pedagogická psychológia.* Bratislava: JASPIS, 1991. ISBN 80-900477-6-9.

[6] Flešková, M. 2001. *Problémy šikanovania na strednej škole.* In: Zborník príspevkov „Psychologické dni". Psychológia pre bezpečný svet. Bratislava, 2001, s.181-184.

[7] Gajdošová, E., - Herényiová, G. *Škola rozvíjania emocionálnej inteligencie žiakov.* Bratislava: Príroda, 2002. 293 s. ISBN 80-07-01177-3.

[8] Gajdošová, E., 2000. *Poznávanie sociálnych vzťahov v triede: práca so sociometricko-ratingovým dotazníkom.* Bratislava: Metodicko-pedagogické centrum. 49 s. ISBN 80-7164-268-1.

[9] Gavora, P., 1999. *Akí sú moji žiaci?: pedagogická diagnostika žiaka.* Bratislava: PRÁCA. 239 s. ISBN 80-7094-335-1.

[10] Gavora, P., 2007. *Učiteľ a žiak v komunikácii.* Bratislava: Univerzita Komenského. 205 s. ISBN 978-80-223-2327-7. 77

[11] Hanuliaková, J., 2008. *Klíma tiredy a jej význam v tvorivo-humanistickej výchove.* In: Výchova v pedagogickom výskume a praxi: zborník z medzinárodnej vedeckej konferencie z 31.1.2008 v Trnave: Univerzita sv. Cyrila a Metoda. ISBN 978-80-8105-007-7, s. 119

[12] Hudáková, A. *Strach zo školy.* Pedagogické rozhľady odborno-metodický časopis, marec 2003, roč. 12, č. 3, s.7. ISSN 1335-0404.

[13] Jechová, K. *Tvorbou třídniho časopisu k pozitivnímu klimatu třídy.* In Kasáčova, L.,Bencová, K., Klíma školy 21. storočia. Zvolen: Pedagogická fakulta Univerzity Mateja Bela a Centrum vzdelávania doktorandov pri PF UMB, 2008. s. 72-74, ISBN 978-80-8083-586-6.

[14] Kačáni, V. a kol. *Základy učiteľskej psychológie,* Bratislava: SPN – Mladé letá, 2004. 230s. ISBN 80-10-00429-4.

[15] Kalhous, Z., Obst, O. a kol. *Školní didaktika.* Praha: Nakladatelství Portál s.r.o., 2002. 448 s. ISBN 80-7178-253-X.

[16] Kariková, S. 2005. *Základy patopsychológie detí a mládeže.* Žilina: Kálov, 2005. 146 s. ISBN 80-8070-377-9.

[17] Kopčanová, D. *Význam prevencie agresívneho správania u detí a mladistvých.* In Vychovávateľ. 2004, roč. L (50). č 6, s. 6.

[18] Kollárik, T., 1993. *Sociálna psychológia.* Bratislava: SPN. 194 s. ISBN 80-08-01828-3.

[19] Lovaš, L. 1997. *Agresivita.* In Výrost, J. – Slaměník, I. et. al. Sociálna psychológia. Praha: ISV, 1997. ISBN 80-5886-20-X.

[20] Mareš, J., Křivohlavý, J. *Komunikace ve škole.* Brno: CDVU MU, 1995. 210 s. ISBN 80-210-1070-3.

[21] Matoušek, O. – Kroftová, A. 2003. *Mládež a delikvence.* Praha: Portál, 2003. 340 s. ISBN 978-80-224-1074-8.

[22] Obst, O. *Didaktika sekundárního vzdělávání.* Olomouc: Univerzita Palackého, 2006. 195 s. ISBN 80-244-1360-4. 78.

[23] Petlák, E. *Klíma školy a klíma triedy.* Bratislava: IRIS, 2006. 119 s. ISBN 80-89018-97-1.

[24] Petty, G. 1996. Moderní vyučováni. Praha: Portál 1996

[25] Potašová, J., 2011. *Sociálno-psychologické aspekty pedagogickej interakcie. Vzťah učiteľ – žiak* (online). Prešov: Filozofická fakulta PU. 286 s. Dostupné z internetu: www.pulib.sk/web/kniznica/elpub/dokument/Istvan1/.../Potasova.pdf.

[26] Průcha, J., Walterová, E., Mareš, J. *Pedagogický slovník.* Praha: Portál, 2008. 261 s. ISBN 978-80-7367-416-8.

[27] Průcha, J., Walterová, E., Mareš, J. *Pedagogický slovník.* Praha: Portál. 1998. 293 s. ISBN 80-7178-029-4.

[28] Sejčová, Ľ. 2001. *Deti a mládež ako obete násilia.* Bratislava: Album, 2001. 208 s. ISBN 80-968667-0-2.

[29] Vágnerová, M., 2005 *Vývojová psychologie I: dětství a dospívání.* Praha: Karolinum, 2005. 467 s. ISBN 80-246-0956-8.

[30] Vašutová, J. *Být učitelem. Co by měl učitel vědět o své profesi.* Praha: PFUK, 2007. 77s. ISBN 978-80-7290-325-2.

[31] Vykopalová, H., 1992. *Sociální klima školní třídy a možnosti jeho ovlivňování.* Olomouc: UP.ISBN 80-7067-161-0.

[32] Wardová, A., 1994. *Učiteľovo meranie klímy vo vlastnej triede.* In: Pedagogická revue. ISSN 1335-1982, 1994, roč. 46, č.9 – 10.

[33] Zelina, M., Zelinová, M. *Rozvoj tvorivosti detí a mládeže.* Bratislava: SPN, 1990. 136 s. ISBN 80-08-00442-8.

[34] Zemanová, M. *Ako sa cítim v škole?* In: Rodina a škola, 2006, č.9. G. Eason, B. Noble, and I.N. Sneddon, "On certain integrals of Lipschitz-Hankel type involving products of Bessel functions," Phil. Trans. Roy. Soc. London, vol. A247, pp. 529-551, April 1955. *(references)*

Gender Aspects of Education

Markéta Janíková

VŠB – Technical University Ostrava

Department of Social Sciences

Ostrava, Czech Republic

marketa.janikova@vsb.cz

Petra Kowalíková

VŠB – Technical University Ostrava

Department of Social Sciences

Ostrava, Czech Republic

petra.kowalikova@vsb.cz

Abstract— **In direct proportion to the oversupply of graduates of the humanities and social sciences, there is a growing demand for specialists in the field of natural sciences, mechanical engineering, industry and construction. This paper focuses on the identification and interpretation of the specifics of technical training both within the education system, or within tertiary education, and with regard to the opportunities for graduates on the labour market. These problems are viewed from a gender perspective. We proceed from the international comparison of the proportion of men and women among graduates in various fields of tertiary education. Through the concepts of gender stereotypes and gender equity index, we seek, on the basis of a secondary analysis of quantitative data, to identify the causes of asymmetric gender representation and the implications the chosen field of study has, not only with respect to the position of graduates on the labour market, but also to the potential social risks that may pose a threat to them. Our reasoning is based on statistical data and demographic indicators, which reflect the current status of the issue in the Czech Republic.**

Key words—gender; education; labour market; social risks

I. INTRODUCTION

Education is one of the most effective tools of vertical social mobility, and thus a key aspect of the social status of the participant. Formulation of educational strategies is influenced by many factors. Besides the socio-economic background, abilities, skills and interests, it also depends on gender of the individual.

The influence of gender stereotypes– simplistic ideas of feminine women and masculine men – can be seen not only in the choice of field of study and subsequent professional focus on the part of the participant, but also in evaluation of the participant in the educational system environment. Evaluation of a pupil and a student is not only based on his or her performance, but also on ascriptive features that the participant in education cannot control; e.g. gender.

Currently, the education strategy of Czech men and women is becoming balanced; in secondary and tertiary education, there is a higher number of women. While within the older age groups (55-64 and 65+), higher education was acquired especially by men, in younger categories, women are prevalent among university degree holders; in the category 25-34 years, the difference between both genders is 10% in favour of women [1].

However, a simple statistical description does not provide a sufficiently complex view of the issue of in/equality in education and its consequences. Therefore, in this article, we will focus on various aspects of education that are directly related to the gender structure of the society. Gender means a socially constructed category including "socially shaped attitudes and behaviour patterns, usually dichotomically divided into male or female." [2]

II. EDUCATION AS A TOOL OF EMANCIPATION AND DICCRIMINATION

The distribution of educational opportunities in the population is uneven. Among other things, different opportunities for women and men in the educational system are caused by innate characteristics, or the different nature of cognitive processes. According to the authors of the project Effective and Socially Equal Secondary School Leaving Examination, boys/men are disadvantaged by their more "systemizing" thinking not only within formal education, but also subsequently, in the labour market. Women, whose way of thinking is rather "emphatic" and who are better in verbal and communication skills than men, have been able to cope with the growing trend in the past decade better in terms of the labour market on the so-called soft skills. [3]

The above-mentioned skills of girls, accompanied by a higher degree of conformity, naturally have an impact on their more positive evaluation already in primary education. Even if specific intellectual abilities, i.e. verbal and numerical intelligence, are the same, the evaluation of the boys' performance is worse, which negatively affects their motivation for further study. At the same time, lower assessment creates a distorted impression with respect to the knowledge and skills of boys, who are not consequently sufficiently

supported by their parents in achieving higher education and the boys finish their education, often of technical specialization, at the secondary level. On the other hand, after elementary school, girls – partly due to the better assessment, partly due to a stronger motivation to study –often go on to grammar school, whose emphasis on general knowledge and the development of study skills prepare girls better for entrance exams to a higher education institution. [4]

The authors of the project add: "With some exaggeration, one can say that although the state-supported inflation of formal education is increasing intergenerational educational mobility, the state disadvantages boys in motivations and chances of acquiring higher education by a strong focus of this mobility on 'female' subjects." [4]

The downside of this assertion is the fact that for graduates of those "female" subjects (humanities, teaching etc.) it is more difficult to find employment and their average monthly gross earnings is significantly lower than that of engineering graduates. The table below shows that unemployment of graduates in humanities five years after graduation is 6.6% and their average monthly gross earnings are 27,071.00 CZK (for graduates of faculties of education, the unemployment rate in that period is 4.4% and the average monthly gross earnings are 25,667.00 CZK). While in the case of graduates of "male" mechanical engineering faculties, the unemployment rate is 3.0% and the gross monthly earnings are 36,510.00 CZK (in the case of faculties of informatics and electrical engineering, the unemployment rate is 2.5% and the gross monthly earnings are 40,356.00 CZK), see Table 1. [5]

TABLE 1
THE UNEMPLOYMENT RATE AND GROSS MONTHLY EARNINGS OF GRADUATES BY TYPE OF FACULTY IN ACADEMIC YEAR 2013/2014

The unemployment rate and gross monthly earnings of graduates by type of faculty in academic year 2013/2014		
Type of faculty	*Unemployment rate*	*Gross monthly earnings*
Natural sciences	4.7%	31,791
Computer science and electrical engineering	2.5%	40,356
Mechanical engineering	3.0%	36,510
Civil engineering and architecture	4.1%	31,955
Chemical technology	5.3%	32,042
Other technical	6.4%	32,509
Agriculture	8.8%	25,218
Medical and Pharmaceutical	1.6%	36,708
Health care	2.5%	24,195
Economics	4.9%	34,315
Humanities	6.6%	27,071
Theological	6.2%	22,302
Law	2.2%	33,203
Pedagogical	4.4%	25,667
Physical education	6.6%	25,429

With regard to the above mentioned data, it is not easy to sum up who is actually disadvantaged and why. For completeness, we add data reflecting the study field structure of university students by gender. It indicates that women predominate among students of all groups of study fields with the exception of natural sciences (42.5 % of women) and technical sciences (31.3% of women), see Table 2. [1]

TABLE 2
STUDENTS AT UNIVERSITIES BY FIELDS OF STUDY IN THE ACADEMIC YEAR 2014/2015

Students at universities by fields of study in the academic year 2014/2015		
University Faculty Fields of study	*Women*	*Men*
Universities, total	56.1	43.9
Natural sciences	42.5	57.5
Technology	31.3	68.7
Agriculture, forestry and veterinary medicine	60.7	39.3
Health services, medicine and pharmacy	72	28
Humanities and social science	65.1	34.9
Economic sciences	59.3	40.7
Law and legal science	54	46
Pedagogy, tutorship and social care	82.1	17.9
Culture and art	62.7	37.3

We add that the above mentioned distribution is common in all European Union countries, where women significantly prevail among stu-

dents of pedagogy (the scattering boundaries are represented by Greece with 64% and Romania with 93.5%). Conversely, men are very dominant among students of engineering, industry and civil engineering sectors (the scattering boundaries are represented by Poland with 66.6% and Ireland with 84.5%). [1]

III. LOW INTEREST IN TECHNICAL EDUCATION?

The research of the Ministry of Education Youth and Sports [6] reflected individual interests and aspirations: individual evaluation of self-fulfilment opportunities and asserting their own abilities as the major factor in choosing a study programme for students in secondary schools. The pragmatic criterion of employability only came after these factors. The respondents classified studying humanities as theoretical, female, simpler, something that can be learned. The study of science and technology was considered practical, male, with good prospects, but also more difficult. [6]

The fields of study without mathematics are considered as degree courses suitable for women; it is mostly the case of fields of studies in humanities and art. It is based on the assumption of different cognitive abilities of girls and boys (see above). According to the study by Fennema and Sherman from 1977 [7], the difference between men and women in mathematics does not consist in mathematical skills, but in the frequency in which both genders encounter this issue. The authors base their reasoning on different situations in primary and secondary education; while primary school pupils have the same range of mathematics regardless of gender, and test results in mathematics are minimal, at higher levels, mathematics beyond the curriculum is selected by boys rather than girls (the current example is an optional part of the Czech state school-leaving examination, where boys prefer mathematics, while girls give priority to a foreign language). This phenomenon is explained by the effect of social influences, i.e. supporting math skills in boys and a systematic effort on the part of parents and teachers to focus the girls' attention on other fields of study – those more appropriate for girls, according to gender stereotypes. [8] Thus, math skills can act as a filter preventing women' access to study fields, and subsequently to the professions based on logic and mathematics. [2]

With regard to the structure of the labour market, the demand for skilled, technically educated people outweighs the supply. The easiest solution seems to increase the number of candidates to study at technical schools, however… In 2014, 57 % out of the total number of students who successfully passed the secondary school leaving examination enrolled for higher studies, 42 % of boys and 13 % of girls selected the study of engineering. Out of the total number of 35,600 students enrolled at the university, 32% chose engineering subjects. According to Matějů, the problem is not the low interest in technical fields, but, among others, also higher dropout rates at technical universities, which amounts to 11%. [9]

Increasing the interest in technical education was also the purpose of the project of the Ministry Education, Youth and Sports. The Year of industry and technical education implemented in the year [10], aimed at supporting and promoting technical study fields in secondary and tertiary education. [10]

However, the probable cause of the slump between the supply of graduates and employers' demand is not a lack of promotion (one third of university students study at technical universities), but rather the nature of technical education. The problem is the lack of practical focus of the study that does not correspond to the requirements of employers. Technical universities offer more academic curriculum with an emphasis on theoretical knowledge of natural sciences [9].

It should also be added that a number of technical colleges respond to labour market demands and strive to alleviate the "technicians' handicap" by offering training courses focused on soft skills (in the introduction, we mentioned that mainly boys – mostly engineering students –have a lower level of communication skills, collaboration skills and willingness to adapt). [11]

IV. EDUCATION AND LABOUR MARKET

The educational structure of the society is changing towards a higher proportion of people with secondary and especially tertiary education. Over the last twenty years, the number of university graduates has almost tripled. [1] The negative aspect of this change, especially for university graduates, is the fact that education has ceased to be a valuable asset and it does not automatically represent a "lift" to the upper levels of the system of social stratification [12].

Graduating from humanities and pedagogic disciplines, studied mostly by women, is associated with a higher risk of unemployment and lower average earnings. Generally, the average salary of women in 2014 amounted to 23,421.00 CZK (wages median was 20,888.00 CZK), the average salary of men in the same year was 29,858.00 CZK (wages median was 24,904.00 CZK). University educated women gain the average monthly gross earnings in the amount of 70.5% of the average monthly gross earnings of men with the same education. [1]

The higher the education, the bigger the gap between men's and women's earnings. Paradoxically, in this respect, women are rather disadvantaged by university education. [13]

Not only with respect to the preferred field of study, there is a prevalence of women among the

employees in services. Statistical data show that as employees, there are three times more women than men in education and health and social care. Working positions in services are associated with lower average wages. While the average monthly gross earnings of technical and professional workers are 29,877.00 CZK, the average earnings of workers in services and sales amount to 17,204.00 CZK. [1]

Obviously, different monthly gross earnings of men and women do not only reflect a different study specialization, but also the position in the organizational hierarchy. An important factor is the position in the main employment. 1.6 % out of the economically active women are in the position of employers (the percentage of male employers is 4.8%). [1]

Following the above-mentioned problems of disadvantaged men in the education system, it should be added that if men find their career opportunities in tertiary education, they achieve academic degrees or scientific degrees significantly more often than women. There are 59.4 % of male Assistant Professors, 74.9% of male Associate Professors and as many as 85.7% of male Professors, see Table 3. [1]

TABLE 3
ACADEMIC WORKERS ACCORDING THEIR POSITION AT PUBLIC UNIVERSITIES IN THE ACADEMIC YEAR 2014/2015

Academic workers according their position at public universities in the academic year 2014/2015		
	women	*men*
Academic workers	35.7	64.3
R&D teaching staff	34.7	65.3
Professors	14.3	85.7
Associate Professors	25.1	74.9
Assistant Professors	40.6	59.4
Assistants	48.3	51.7
Lecturers	56.8	43.2

The international indicator of applying the principles of equality between genders is he *Gender Equity Index (GEI)*. Besides the socio-economic status and a share of power, education is the third component of the index. The data in this paper are based on the survey GEI (2008), which took place in 157 countries around the world. The highest value of the index is 100 (zero gender inequality in the particular area). Within the education component, the evaluated factors included the difference in overall literacy rate for men and women, their participation in primary, secondary and higher education. In the area of education, the Czech Republic received 97 points out of 100, which reflects the minimal difference between literacy and access to education for both genders. However, in general, the Czech Republic with a total value of 69 (along with Cyprus, China, Peru, Honduras and Brazil) belonged to countries that are characterized by increasing disproportion in gender inequalities. The reasons can be found mainly in the results of the social influence of women in their under-representation in politics, managerial positions and in technical fields, which are indicators monitored in the area of power-sharing, where the Czech Republic achieved only 43 points. [14] In the context of economic activity, the last of the evaluated components, the Czech Republic achieved 64 points. The results correspond with data obtained in the Czech Republic, describing the current state in the area of education and subsequent employment opportunities. Women dominate in secondary and tertiary education, which in turn does not correspond to their representation in higher positions, nor with the amount of their earnings.

V. SOCIO-ECONOMICAL SECURITY AND SOCIAL RISKS

The distribution of average wages between genders is directly correlated with higher levels of threat to women, the so-called new social risks. [15] Lower income means a lower level of financial security and the provision of basic necessities of life, not only during the economically active life, but also in old age. Analogous to the average wages, women receive a lower pension. In 2014, for women it amounted to 10,046.00 CZK and for men to 12,258.00 CZK. [1]

The usual assumption of employers is that women share household with economically active men who represent the main source of financial security of the family. Even from this reasoning it follows that it is mainly women who are threatened by the existence of single-parent families in a situation with an increasing number of alternatives of marital life, where the divorce rate is around fifty percent, and the post-divorce childcare remains a women's issue to a significantly higher extent.

Macro-structural changes in the economy that occurred in the last third of the twentieth century, multiplied this threat. The gradual shifting of emphasis from industry to the sector of services, which is characterized by a lower average wage and, moreover, it is more the domain of women, has deprived men of their dominant role in household with respect to financial security. According to surveys, three quarters of men would prefer if the woman was a housewife, while, at the same time, 80% of households also depend on the woman's income. [16] Along with the changing nature of employment relationships toward inad-

equate labour contracts (casualization of work), these changes profiled a new social risk of insufficient household financial security even if both partners are economically active. [15]

Risk of income poverty among women is growing – even within marriage – with age, which is, among other things, connected with their higher life expectancy. Securing women after the death of a partner is dependent on the amount of retirement pension, or on savings during the economic activity. However, both funds are burdened by the above-mentioned facts (choice of field of study, or employment opportunities, lower average monthly gross earnings and consequently, lower retirement pensions). As a result, at older age, women are at risk of poverty and material deprivation.

CONCLUSION

Selecting technical university currently probably represents the most effective education strategy. Engineering graduates have good opportunities on the job market, they are less at risk of unemployment due to high demand from employers, and the average monthly gross earnings are above the national average. Selecting the focus of the study, however, does not only depend on the above mentioned objective criteria. Besides the personal preferences, knowledge, skills and abilities, it is also affected by gender of the participant in education. It is based on gender and physiological characteristics (different cognitive processes), as well as on the socially constructed characteristics that the participants take over during gender socialization ("female" and "male" study fields) and that determine their own behaviour, attitude and evaluation on the part of the education system. This system reflects the inequalities that are an inherent part of the social structure. Inequalities are often presented as natural and inevitable, which leads to their permanent reproduction. Nevertheless, acquiring – preferably higher – education is one of the successful strategies of defence against new social risks [15].

REFERENCES

[1]   Český statistický úřad, „Zaostřeno na ženy a muže 2015". [Internet resource]: https://www.czso.cz/csu/czso/zaostreno-na-zeny-a-muze-2015 (at: 24. 10. 2016)

[2]   D. J. Curran, „Ženy, muži a společnost", 1. vyd. Praha, Czech Republic: Karolinum, 2003.

[3]   P. Matějů, „Překážky na cestě k technickému vzdělávání, část 1. Problém začíná již na základní", in MM Průmyslové spektrum, vol. 9, pp. 28-32, September 2015.

[4]   P. Matějů, „Překážky na cestě k technickému vzdělávání, část 3. Tradice jako závaží", in MM Průmyslové spektrum, vol. 11, pp. 100-104, November 2015.

[5]   J. Koucký, R. Ryška, M. Zelenka, „Reflexe vzdělání a uplatnění absolventů vysokých škol", Praha, Czech Republic: UK, 2014doplnit

[6]   MŠMT, „Důvody nezájmu žáků o přírodovědné a technické obory".[Internet resource]: http://vzdelavani.unas.cz/duvody_nezajmu_obory.pdf (at: 21. 10. 2016)

[7]   E. Fennema, J. Sherman, „Sex-related differences in mathematics achievemnt, spatial ability, and affective factors", in American Educational Research journal, vol. 14, pp. 51-71, 1977.

[8]   K. Crawford, „Girl and computer. Refractory girl", pp. 21-26, May 1990.

[9]   P. Matějů, „Překážky na cestě k technickému vzdělávání, část 5. Hlavní překážkou je český vzdělávací systém", in MM Průmyslové spektrum, vol. 1, pp. 15-19, February 2016.

[10]   MŠMT, „Vláda zahájila rok technického vzdělávání". [Internet resource]: http://www.msmt.cz/ministerstvo/novinar/vlada-zahajila-rok-technickeho-vzdelavani (at: 24. 10. 2016)

[11]   P. Kowaliková, „Výsledky realizace projektu Firemní kultura jako integrující prvek kurikula společenskovědních předmětů na VŠB-TU Ostrava", in: Člověk - kultura – media, vol. II, M. Schneiderová and L. Skříšovská, Ostrava, Czech Republic: VŠB-TUO, 2013, pp. 223-225.

[12]   J. Keller, L. Hruška Tvrdý, „Vzdělanostní společnost: výtah, chrám a pojišťovna", 1. vyd, Praha, Czech Republic: SLON, 2008.

[13]   L. Jarkovská, K. Lišková, Genderové aspekty českého školství", in Czech Sociological Review, vol. 44, no. 4., pp. 683-701, 2008. [Internet resource]:http://sreview.soc.cas.cz/uploads/02c86f73cf4e2848979710541c3a7261a8b6847d_513_2008-4JarkovskaLiskova.pdf (at: 29. 10. 2016)

[14]   V. Urbánek, K. Maršíková, P. Řehořová, „Terciální vzdělávání jako složka indexu genderové spravedlnosti", in Economics and Management, vol 1., pp. 37-46, 2010. [Internet resource]: http://www.ekonomie-emanagement.cz/download/1331826762_af60/03_urbanek.pdf (at: 26. 10. 2016)

[15]   J. Keller, „Nová sociální rizika a proč se jim nevyhneme", Praha, Czech Republic: Sociologické nakladatelství, 2011.

[16]   MŠMT, „Národní zpráva o rodině".[Internet resource]: http://www.mpsv.cz/cs/898 (at: 21. 10. 2016).

Identifying the Difficult Thematic Units for Increasing the Specific IT Competences and Skills in the Field Algorithmization and Programming

Jana Jurinová

University of Ss. Cyril and Methodius
Faculty of Natural Sciences
Department of Applied Informatics and Mathematics
Trnava, Slovakia
jana.jurinova@ucm.sk

Abstract—In the paper, we analyse the current state of education in the framework of the profile course "Algorithimization and Programming" for students of informatics. The impulse for the analysis is continually decreasing percentage of students, despite the measures that were proved to be effective. Since their effectiveness is not satisfactory, our aim is to support the teaching methods and forms by creating interactive applications on the basis of animation-simulation modelling, in order to easier understand problematic parts and issues revealed by the analysis.

Keywords—*algorithm; algorithmization; programming; cognitive knowledge; interactive visual application.component)*

I. INTRODUCTION

From various studies [1, 2, 3, 4], as well as from own experience and the carried out research [5, 6], we have found out that the more diversified and entertaining forms of learning by using interactive multimedia applications developed with the purpose to influence the specific knowledge and skills, have positive impact on learning. Students can better remember the subject matter and are more motivated to study the topic and improve knowledge. Basics of algorithmization and programming are the basis and the fundamental subject for students of IT subjects and for students in the field of Applied Informatics. The research presented in this paper was oriented for this type of students and carried out at the author's workplace. Despite the efforts and activities of teachers to increase the efficiency of education and acquisition of required knowledge and skills, the percentage of failed students has still increasing character. Fear of the programming, lack of interest from students, abstract nature of learned concepts, required analytical thinking, are the main causes of this failure. In addition, other institutions in the world face similar problems on a global scale. Similarly like us, they are trying to create various applications [4, 7, 8, 9, 10, 11], which would facilitate the process of understanding and acquiring the required knowledge and skills. After verifying their effectiveness, the aim is to incorporate these into the broader concept of e-learning courses.

II. ANALYSIS OF THE CURRENT STATE, BASIS AND ASSUMPTIONS

The main impulse for the applied research is the mentioned decreasing fruitfulness of students of Bachelor's degree in both full-time and part-time forms of study in the study programme "Applied Informatics" within the course of "Algorithms and Programming". This course is taught with time allotment of 2 hours of lectures and 2 hours of exercise per week in the first semester of the first year. By the end of the course, the students will acquire the basics of algorithmization and will become familiar with the basic computer programming concepts, principles and features of procedural programming languages. They will know, understand and use basic data structures and work with the basic control commands. They will learn how to analyse and design algorithms and write programs in C programming language. They will gain an understanding of the principles of testing and debugging computer programs. They will acquire technical terminology of algorithmization and programming in Slovak, but also in English, syntax and semantics of C programming language at the level sufficient to create and implement basic algorithms. They will know, create and analyse selected problems and the basic algorithms for sorting and searching. The students will learn how to create program documentation, present and defend the results of the problems solved.

Complexity of the course, as well as broad based objectives that is difficult to successfully develop, especially for programmers-beginners

with lack of previous experience, results from the above mentioned course content. Without an active independent work of students, it would be quite impossible. In respect to the wide scope of the course, the steps to divide the issue into two mutually cooperating subjects were performed: "Algorithms and data structures" and "Programming" with the time allotment of 2 hours of lectures and 2 hours of exercise per week for each of them. This change was conditional on the complex accreditation and submitting of the modified study programme. Today they full-time students can study according to the modified curriculum, as opposed to the part-time students who perform their studies according to the former, above mentioned model. With respect to the expected results of the accreditation commission and the transitional period of the effectiveness of their decisions, it was necessary to begin to tackle the situation. For this reason, it was necessary to reconsider the organization of individual activities within the course "Algorithms and Programming" and set them so that to implement gradual acquisition of the required knowledge and skills. The course evaluation therefore consists of interim and final evaluations. During the semester, the full-time students are required to elaborate two midterm test, two assignments, and at least six assessed homework assignment. Also activities at seminars are evaluated, as well as the tasks processed beyond the scope of expectations or assigned tasks. The student can obtain 40 points + bonus points (awarded for above-average activity). Twenty points are sufficient evaluation to approach the final assessment. The final assessment takes the form of non-standardized didactic test that is processed in order to test the students' knowledge and skills of at all four levels of significance according to Niemierko's taxonomy. The time provided to students for completing the test is 90 minutes. The test for full-time students is configured to 60 points, and for successful completion of this course it is necessary to obtain at least 56 % of the total score, what is represented by 56 points. Teaching the course to external students is carried out in blocks (12 hours lectures, 6 + 6 hours of seminars); therefore it was necessary to slightly modify those conditions for evaluation. The content of the course have remained unchanged. During the semester, the part-time student can obtain 20 points for processing of assignments and homework assignments and 80 points from the final didactic test that is designed exactly in the same way as for full-time students. The difference lies only in the increase in scoring of the same tasks.

Fig. 1 provides the percentage data of success/failure rate at the continuous assessment of students over the monitored last three academic years. The graph shows the rising failure rate of students. Unfortunately, we cannot significantly affect the number of students, who drop out studies during the first semester. These figures are only given for completeness. However, the most common reasons for leaving the study in the first weeks of the study are transfers to other programs of study, more or less of the arts and humanities orientation. An interesting question would be to monitor whether students who have difficulty with the course subject matter at the beginning and consider prematurely terminate the study, are the ones who will ultimately fail to successfully complete the course. This idea is related to the fact that in the academic year 2014/2015, the number of students who completed their studies decreased, but the number of students that were not granted credits from the course increased. However, we have not dealt with examining these facts yet. Nevertheless, we believe that the efforts of teachers to motivate students for successful completion of the course until the last moment, is the reason.

Number of granted credits in full time study
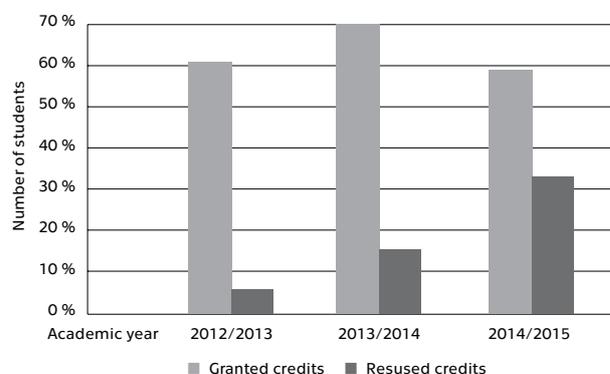
Fig. 1. Data of success/failure rate at the continuous assessment of students

The number of students who not completed studies
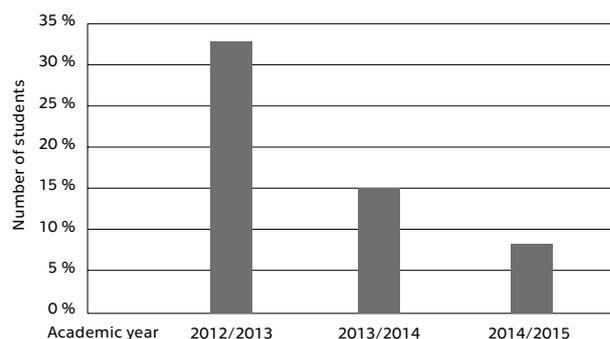
Fig. 2. Data representing the number of students who completed their studies

Fig. 3 shows the completed final evaluations of students, which indicates that it do not copy the Gaussian curve, as we might expect. The positive phenomenon that can be observed from this graph is, that in the academic year 2014/2015, all students who have been granted credits, successfully passed the exams. This fact can be explained by an exact defining, monitoring and compliance with the rules of continuous assessment of stu-

dents that we specified above, compared to the academic years 2012/2013 and 2013/2014.

The results of the evaluation of the studies results in the course "Algorithmization and Programming" – full-time students
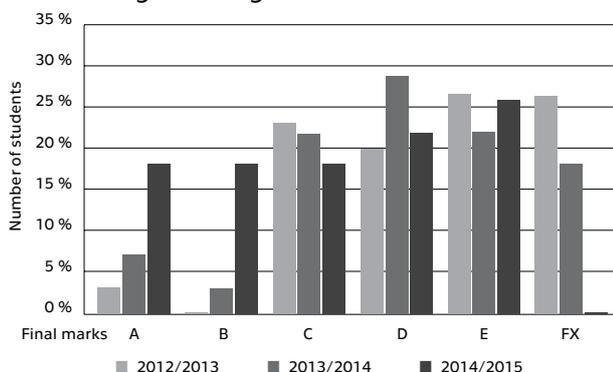
Fig. 3. Data of the success/failure rate at the final assessment of students

We are fully aware that presented results may be affected by various factors, which may somewhat distort the presented results, but at this point, their detailed investigation is not decisive for us. Our goal is to just the clear demonstration of existing problems. The most misrepresenting factors for the comparison of results in every year is an annual heterogeneity among students (influenced by their prior education, as well as their practical experience in the field), their motivation to deal with the field issues and achieve the best evaluation, as well as genetic preconditions for successful acquisition of algorithmic thinking and programming. These results are slightly distorted even by voluntarily outgoing students because of the failure from other subjects during their studies. Many factors were recorded incorporated into the results during monitoring, but as we have already indicated, they occur in them. Given the objective, we do not consider them as relevant. These claims, we specify on the basis of analytical and critical investigation and assessment carried out by using unstructured interview with students in each of the monitored years.

III. MATERIAL AND METHODS

Based on these defined areas, it is necessary to subject them to a more detailed examination, and process interactive animations and applications for these areas at the application of animation-simulation modelling to improve efficiency of acquiring the studied issues or skills.

As mentioned above, the final evaluation takes the form of non-standardized didactic test, that is processed in order to test the students' knowledge and skills at all four levels of significance according to the Niemierko s taxonomy. The test covers all the issues studied within the framework of the course. It consists of four categories:

Category A - consists of 25 questions with an option of one correct answer. The questions are primarily focused on verification of the first and second level according to Niemierko.

Category B - consists of 5 different kinds of questions (multiple choice questions, categorization questions, open-ended questions, graphical questions, etc.). The questions are primarily focused on verification of the second, third and fourth levels according to Niemierko.

Category C - is practically and complexly oriented task, the aim of which is to design the algorithms with all related matters for the specified problem. This task is used to verify primarily the third and fourth levels according to Niemierko.

Category D - is practically and complexly oriented task, the aim of which is to verify the knowledge within the key area of sorting algorithms. This task is used to verify primarily the third and fourth levels according to Niemierko.

We evaluated five variants of didactic tests that differed in an order, as well as questions and tasks. Representation of individual thematic units, however, was maintained. The aim is currently to assess problem areas, and not to evaluate the success of each student at the basis of those tests. Fifty-seven respondents took part in the evaluation. Each category was subjected to a detailed assessment. In A category, we considered a very critical the tasks, where the percentage reached a value in the range 0 % - 40 %. As the insufficiently handled tasks we considered those, the percentage of which ranged from 40 % - 60 %. The tasks worked out with more than 60 % success rate, were considered as being adequately solved. A similar classification was used even in case of B category. Categories C and D were assessed somewhat differently, given the fact that we expected from students the acquisition of complex issues and application of the acquired knowledge in dealing with previously unknown tasks and problems. In addition, we expected from students also the independent writing of solutions. Category "critical" was represented by the task which was treated in the range of 0% - 30%, insufficiently solved task reached 30 % - 60 %. The tasks worked out with greater than 60% success rate, we considered to be sufficiently handled.

IV. RESULTS AND DISCUSSION

Each version of the test was subjected to detailed analysis. Based on the results presented in Fig. 4, we can exactly specify, which questions of A and B categories may be considered the most critical - marked in red, questions that are not solved/answered in a satisfactory manner - marked in green, and questions worked out in satisfactory success rate - marked in blue.

Questions to the Test No.1 identified as "critical" cover the following areas: methods of repre-

The success rate of students – test No. 1
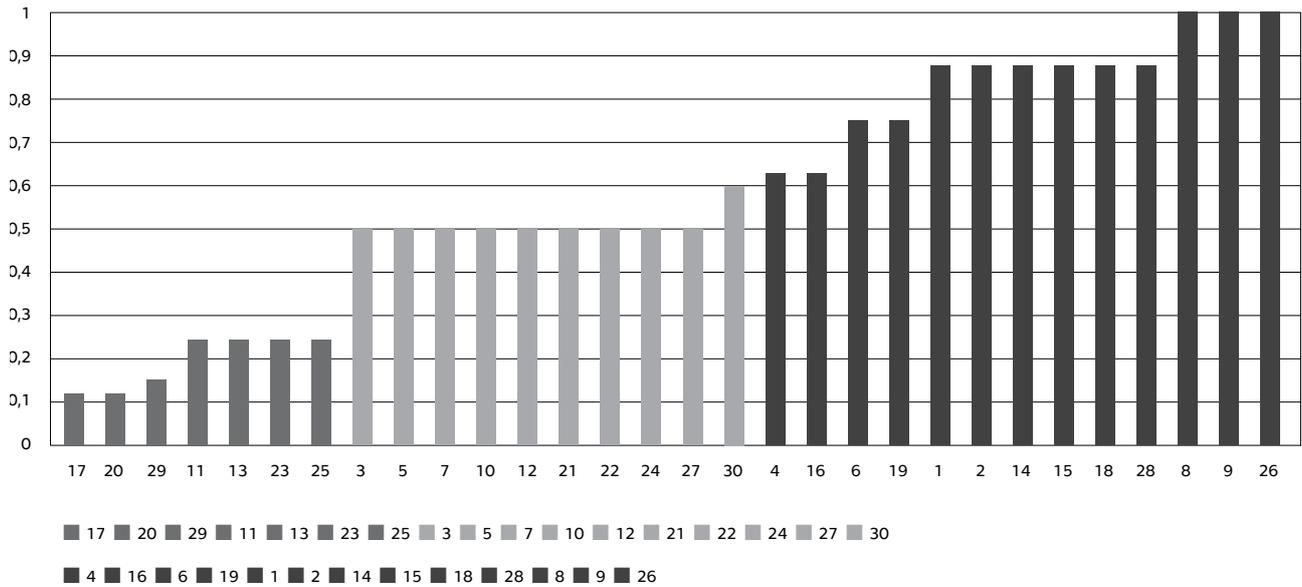
Fig. 4.   The success rate of students in categories A and B, Test No.1

senting algorithms; files; pointers; strings; properties of sorting algorithms and sorting arrays and improved sorting methods.

Questions to the Test No.1 identified as "insufficiently solved" cover the following areas: statements and control flow; variables, basic data types and operators; implicit type conversion; structured data types; files; improved sorting methods and sorting files.

We will not deal with the test questions that were evaluated as "worked out in satisfactory success rate".

Category C, which expects students to make a comprehensive solution of algorithmic problem and its assessment, was mastered at 48.96 %.

Category D, which again expects students to make a comprehensive solution, but in this case of sorting algorithm. This task was mastered with 36.88 % success rate.

For purposes of representation of particular data, we decided to introduce abbreviations for individual thematic units, which are discussed within the course, and were monitored as a part of the analysis (Table 1).

TABLE I.
ABBREVIATIONS OF ASSESSED THEMATIC UNITS

Abbreviation	Thematic units
BA	The basics of algorithmization
PSS	Problem solving strategies of algorithms
PA	Properties of algorithms

VBDTO	Variables, basic data types and operators
ITC	Implicit type conversion
MRA	Methods of representing algorithms
SCF	Statements and control flow
SDT	Structured data types
F	Files
P	Pointers
S	Strings
DDS	Dynamic data structures
SA	Properties of sorting algorithms and sorting arrays
ISM	Improved sorting methods
SF	Sorting files
SA	Searching algorithms
C	The complexity of the algorithms (time and space complexity)

A similar philosophy was applied to evaluate all other variations of the tests. The data are not represented by a graph description as mentioned above, but summarily in Table 2.

TABLE 2.
EVALUATION OF DATA FOR TESTS NO. 2-5

		Test No. 2	Topics
Category A	Critical tasks	8, 18, 25	SDT, P
	Insufficiently handled tasks	3, 10, 15, 16, 19, 20, 21	VBDTO, SDT, S, DDS, SA, SA, ISM
	Adequately solved tasks	1, 2, 4, 5, 6, 7, 9, 11, 12, 13, 14, 17, 22, 23, 24	
Category B	Critical tasks		
	Insufficiently handled tasks		
	Adequately solved tasks	26, 29	MRA, PSS
Category C	Critical tasks		
	Insufficiently handled tasks	57,33 %	
	Adequately solved tasks		
Category D	Critical tasks		
	Insufficiently handled tasks	55,00 %	
	Adequately solved tasks		

		Test No. 4	Topics
Category A	Critical tasks	15, 22, 24	DDS, ISM, ISM
	Insufficiently handled tasks	2, 5, 6, 8, 9, 11, 12, 16, 18, 20, 23, 25	
	Adequately solved tasks	1, 3, 4, 7, 10, 13, 14, 17, 19, 21	
Category B	Critical tasks	26, 27, 30	MRA, SCF, ISM
	Insufficiently handled tasks	29	PSS
	Adequately solved tasks	28	
Category C	Critical tasks		
	Insufficiently handled tasks		
	Adequately solved tasks	50,42 %	
Category D	Critical tasks		
	Insufficiently handled tasks	49,48 %	
	Adequately solved tasks		

		Test No. 3	Topics
Category A	Critical tasks	3, 6, 10, 11, 12, 14, 16, 23, 25	VBDTO, VBDTO, SDT, SDT, F, S, DDS, ISM
	Insufficiently handled tasks	5, 13, 19, 21	PSS, F, ISA, SA
	Adequately solved tasks	1, 2, 4, 7, 8, 9, 15, 17, 18, 20, 22, 24	
Category B	Critical tasks	27, 29, 30	
	Insufficiently handled tasks		
	Adequately solved tasks	26, 28	PSS, PSS
Category C	Critical tasks		
	Insufficiently handled tasks		
	Adequately solved tasks	65,33 %	
Category D	Critical tasks		
	Insufficiently handled tasks	33,00 %	
	Adequately solved tasks		

		Test No. 5	Topics
Category A	Critical tasks	3, 18	PSS, P
	Insufficiently handled tasks	5, 6, 8, 14, 15, 19, 23, 24, 25	PSS, MRA, ITC, S, DDS, ISM, SF, SA, C
	Adequately solved tasks	1, 2, 4, 7, 9, 10, 11, 12, 13, 16, 17, 18, 20, 21, 22	
Category B	Critical tasks		
	Insufficiently handled tasks		
	Adequately solved tasks	26, 27, 28, 29, 30	MRA, PSS, PSS, PA, ISM
Category C	Critical tasks		
	Insufficiently handled tasks		
	Adequately solved tasks	47,92 %	
Category D	Critical tasks		
	Insufficiently handled tasks	46,25 %	
	Adequately solved tasks		

From those data for category A and B, we can observe that as the most problematic appear to be issues of: *structured data types, pointers, files, dynamic data structures, improved sorting methods and sorting files.* Also the following thematic units can be included in problematic issues: problem solving strategies of algorithms and properties of sorting algorithms and sorting arrays. From the above, we can therefore conclude that the acquisition of basic concepts is not a problem for

students, but we are currently working with more advanced data structures or algorithms, what is reflected in the failure on a unit *"sorting algorithms"*. Low success rate within the evaluation of category D proves this fact. Only in one case, the level was reached just above the level of satisfaction. Tasks in category C were processed more or less adequately. However given the extensive concept of the tasks we analysed them in more detail, and we found out that most students demonstrated deficiencies in the actual representation of the algorithm, what is related to the fact that the topic *"problem solving strategies and methods of representing algorithms"* appeared among the critical tasks as well as the tasks to be considered.

V. CONCLUSION

We intend to submit the results reported above a more detailed analysis, particularly through unstructured interview with the students. The aim is to identify truly critical parts, and process illustrative examples, interactive animations and applications for these areas, applying animation-simulation modelling to improve efficiency of acquiring the studied issues or skills.

ACKNOWLEDGMENT

REFERENCES

[1]   H. Sutopo, Selection Sorting Algorithm Visualization Using Flash. In: The International Journal of Multimedia & Its Applications (IJMA). Vol. 3, No. 1, 22 – 35 pp. ISSN: 0975-5578.

[2]   P. Saraiya, Effective Features of Algorithm Visualizations. Blacksburg: Virginia Polytechnic Institute & State University, 2002. Master thesis. [cit. 2015.5.04]. Available on: http://scholar.lib.vt.edu/ theses/available/etd-08202002-132927/unrestricted/ Thesis.pdf

[3]   J. Urquiza-Fuentes, J. A. Velázquez-Iturbide, A survey of successful evaluations of program visualization and algorithm animation systems. ACM Transactions on Computing Education (TOCE) – Special Issue on the 5th Program Visualization Workshop. 2009. Vol. 9, No. 2, pp. 1–21. Available on: http://www.researchgate.net/publication/220094505 _A_Survey_of_ Successful_Evaluations_of_Program_Visualization_and_Algorithm_Animation_Systems

[4]   T. Avancena, A. Nishihara, Ch. Kondo, Developing an Algorithm Learning Tool for High School Introductory Computer Science. Education Research International 02/2015; (Article ID 840217). 11 pp. Available on: http://www.hindawi.com/journals/edri/2015/840217/

[5]   J. Jurinová, Rozvoj kognitívnych vedomostí za využitia multimediálnej učebnej pomôcky. In: XXVI. DIDMAT-TECH 2013 NEW TECHNOLOGIES IN SCIENCE AND EDUCATION. Gyor : University of West Hungary, Tribun EU, s.r.o., 2013. s. 136-141. 255 s. ISBN 978-963-334-184-1.

[6]   J. Jurinová, Instruction Videos for Psychomotor Skills Development. In: R&E-source : časopis pre výskum a vzdelávanie. Special issue 4, december (2015), pp. 129-133. ISSN 2313-1640.

[7]   S. Diehl, Software visualization: Visualizing the Structure, Behaviour, and Evolution of Software. Springer New York, 2007.

[8]   P. Mička, Quicksort. [online]. Algoritmy.net. [s.a.], ©2008-2015 [cit. 04.01.2015]. Dostupné z: http://www.algoritmy.net/article/10/Quicksort

[9]   AlgoViz.org. Algoviz portal. [online], ©2009-2010, [cit. 02.07.2015]. Available on: http://algoviz.org/

[10]   S. Halim, Sorting. [online]. 7 VISUALGO. [s.a.] [cit. 04.05.2015]. Available on : http://visualgo.net/sorting.html

[11]   Anon. Sorting Algorithm Animations. [online]. sorting-algorithms.com, ©2015 [cit. 04.05.2015]. Available on: http://www.sorting-algorithms.com/

Effectiveness of Teaching Based on the Comparison of Textbooks

Iveta Kmecová

Institute of Technology and Business in České Budějovice
Department of Management
České Budějovice, Czech Republic
kmecova@mail.vstecb.cz

Abstract—The paper's introduction contains a set of notes concerned to a high quality preparation of pupils and students and doing best in achievement of adequate efficiency related to the educational process, where the pupil's or student's personality development and activation together with his/her key competence and self-cultivation development, as well as preparation for the labour market successful versatility plays a role of great importance. The pupil's or the student's capability to work with information contained in the natural language test is considered to be much significant for his further labor or private life. Therefore, any school is responsible for the quality of education and teachers should work with adequate and actual, high quality teaching and learning aids.

Keywords— textbook, educational process, efficiency of educational process, quality of educational process

I. INTRODUCTION

Nowadays, the educational process aims at the student's personality development. In terms of education we are currently experiencing continuous efforts to increase the quality of education and modernize schools. At schools, students should be provided with such education which would enable them to successfully integrate into practice and react flexibly to the changes in the labour market [1].

Technical and vocational education and training (TVET) makes a significant contribution to economic competitiveness and welfare in a global knowledge-based economy. The main challenge for vocational education and training is to meet the changing skills needs of individuals and the world of work in accordance with the principle of lifelong learning [7].

The most important prerequisite for achieving this goal is to provide a quality preparation for the future career. This should be also accepted by teachers. The teacher, as an important factor in the educational process, may significantly contribute to the quality of education and its efficiency improvement by introducing new teaching aids, teaching methods, modern technologies etc. into the teaching process.

Authors [9] performed a research, which the main method was educational experiment. Students of different ages were divided into different educational institution during this process of progressive teaching of school. The main result of this research proves that influence on the level of student's subjectivity is constantly increasing. [2] also dedicate to this theme. They provide overview of methods and advantages in university education in LA.

Therefore, each school wishing to succeed in the competition must adjust to the new labour market conditions and make constant changes leading to the improvements of the quality of services provided.

II. QUALITY OF EDUCATION AT SCHOOLS

In today's world, quality and innovation is a prerequisite for the competitiveness of states, businesses and schools. Quality is a condition for the existence of schools and it is possible to agree with the argument that the future of a nation and mankind/people depends largely on quality of education.

The quality of school is represented by two basic criteria: [4]: output criterion (amount of knowledge and experience the student acquires and their use in real life) ; and the criterion of affect (formation of the student's personality, his/her value systems, motivation necessary for further education towards self-cultivation).

[11] states in his article that students believe that a success in science primarily depends on extraordinary talent, which has a negative influence on their motivation to learning. [6] describes social-contextual factors, which take care for internal motivation and which support internalization which leads to required results of education.

School, as an educational institution, should promote the complex personality development of the student. It bears the primary responsibility for improving the student's general and vocational education, as well as the development of all components of his/her personality and social roles the student is being prepared for. Education should be focused on the student's successful in-

tegration in professional and social life. Following this aspect, we can say that school plays an extremely important role in the life of an individual [5].

It is essential for schools to provide the students with a quality education that is a prerequisite to properly acquire and develop the competences [13]. [12] examines teaching and learning from the point of view of student, how to reveal the intricacy of language and educational requirements in the form of unknown discussion, genres and learning practices a student must to admit to appreciate as a participant in the educational culture of economics.

The primary objective of education is to prepare students for life, to create the graduates who have a specific professional profile and are able to assert themselves in real life. Therefore it is important to apply both theoretical and practical components of education in schools. This is the only way we can prepare the students for the labour market [3].

Following this, it should be noted that the teaching quality assessment is justified. This is even more true when introducing the new textbooks / teaching materials.

III. TEACHING MATERIALS QUALITY EVALUATION

The term teaching material quality refers to the clarity, readability and complexity. Teaching material should manage the student's progress and provide him/her with all that is necessary for effective learning.

The methods used for teaching quality evaluation may be divided into three basic groups: experimental method, expert methods, and statistical methods that examine various textbook parameters obtained by measuring the individual characteristics of the curriculum in the textbook. Such parameters include, for example, the average text size, its readability, and the difficulty level of the text. Text readability is determined by: Cloze test, Fog index and Gunning-Fog index [10] [14].

A. Experimental method

This method is based on a pedagogical experiment, which is the most objective method for textbook quality evaluation. The independent variable will be the textbook / teaching materials. In the experimental study group, the students and teacher will use a new textbook / teaching material, in the control group they will use the previous textbook. Intervening variables (objectives of the lessons, teacher, students, classroom, teaching methods, timetable etc.) should be the same in both experimental and control group. After the experiment, the knowledge, skills and attitudes of the students in both groups will be compared [in 10, p. 46, according to 14].

B. Expert methods

This method assess the adequacy, methodology, attractiveness, complexity and other textbook parameters resulting from the statements of certain groups of observers – experts, teachers, students and the like. In this method, a questionnaire has an irreplaceable role [in 10, p. 46].

C. Statistical methods

These methods examine various curriculum parameters obtained by examining individual characteristics of the curriculum in the textbook. Such parameters include [in 10, p. 47-49, according to 14]:

- *average text size* – the number of words in the textbook within one teaching unit.

- *text difficulty level* – may be determined by:

— *linguistic-quantitative method:* it is based on measuring the textbook difficulty level, arrangement of measurable units of verbal text, such as terminology, sentence structure and others. These methods include Flesch or Pisarek method for measuring text difficulty, Mistrík formula of measuring the text clarity and others.

As an example, Flesch method for measuring text difficulty is given. Flesch created a formula which laid the groundwork for educational applications in this field. It refers to measuring the text readability (Reading Ease - RE) for subjects with a certain level of education. This is measured as follows: First a sample from the text (extent – 100 words) is chosen systematically. Subsequently, the average number of syllables per word (SL) is counted. Finally, the average sentence length in terms of the number of the words (WL) is counted and the gathered data are inserted into the following formula:

$$RE = 206.853 - 0.846\, SL - 1.015\, WL$$

In this measurement, the scale is from 0 (the easiest texts) to 100 (the most difficult texts). In other words, texts are assigned a score on the Flesch scale, which indicates the necessary level of education for understanding the particular text.

— *subject evaluation methods:* the difficulty level is determined through information obtained by questions from certain groups of subjects, such as experts or textbooks direct users (students, teachers).

These methods include The Complex Measurement of Text Difficulty by Nestlerová - Průcha – Pluskala. 10 random text samples are taken from the textbook / teaching material, each sample in the extent of 200 words. From each thematic unit, 5 more samples are taken (extent of the samples 100 words). The words and terms in samples are counted, the average length of sentences and

their parts is calculated, and on this basis the parameters of the textbook are determined.

In this measurement, the scale is from 0 (minimal difficulty) to 10 (maximum difficulty).

text readability – is determined by cloze test, Fog index and Gunning-Fog index.

Cloze test — from the textbook/ teaching material a random sample in the extent of about 250 words is taken. The first part of the text (35 words) is without any changes, but the 36th and then each tenth word (i.e. 46th, 56th, 66th etc,) is omitted, until 20 words are omitted. Then a chosen group of students who the textbook is intended for is asked to fill in the missing words or to replace them by synonyms. If they fail to complete at least 13 missing words, the text is too difficult for them. Cloze test is easy to implement by using computer technology [14, p. 328].

Fog index — From the textbook / teaching material, a sample (about 100 words) is taken. It is more efficient to work with more samples from one textbook. In the selected sample, all long words (three-syllable and polysyllabic words). The average length of sentences in the sample is calculated through dividing the total number of words in the sample by the number of sentences. Using the formula:

FI= average sentence length+number of long words×25+5

It is possible to calculate Fog index. The ideal score is about 12. In good textbooks / teaching materials, the score is 11 or lower.

Gunning Fog index — a random sample in the extent of about 100 words is taken from the textbook / teaching material. It is more efficient to take more than one sample. An average number of words in the selected samples and the percentage of long (3 or polysyllabic) words is calculated. Gunning Fog index is calculated as:

$$GFI=ANW+\%LW\times0.4$$

Where:

GFI = Gunning-Fog Index;

ANW = average number of words per sentence;

LW = percentage of long words.

The calculated index represents a number of years of study necessary for comprehensible reading of the textbook / teaching material. The value of the index may be lowered by using simple vocabulary and short sentences [14, p. 328-329].

IV. EMPIRICAL VERIFICATION OF DIDACTIC EFFICIENCY OF THE TEXTBOOK

We present preliminary results of the research of textbooks didactic efficiency in vocational education. The research was implemented by the author at a technical secondary school in Hlohovec, September – January, school year 2008/2009.

Objective of the research

- To monitor and verify the didactic efficiency of the proposed chapters for the Economics textbook at a technical secondary school in Hlohovec.

- To check the quality of the proposed textbook in relation to the outputs of the educational process of Economics.

Research topic

- Content of the Economics textbook

- Students' satisfaction with teaching economics using the particular textbook / teaching material.

- Findings about the students' attitudes and views on the quality of teaching Economics.

Research methodology

The following methods and techniques related to investigation of a created Economics textbook have been applied:

- natural pedagogic experiment;

- questionnaire;

- cloze test;

- didactic test;

- statistical methods for processing results.

V. THE MAIN RESEARCH HYPOTHESIS

H: The Economy subject is being taught more efficiently with the use of chapters contained in the created text-book than with the use of classical text-book.

In order to verify the main hypothesis, 5 sub-hypotheses were formulated. In this paper, partial results obtained from the verification of three working hypotheses are presented.

A. Partial hypothesis H1

H1: The students in the experimental class achieve better results, when writing the Economy didactic test, within cognitive area than the students in the reference class.

In order to verify the partial hypothesis H1, the non-standardized, with objective score system (NR Test) has been applied. The student's performance has been comparable with the performance of other students.

1) H1 hypothesis statistic verification

In research, the statistical method of Mann-Whitney U-Test was used. Based on the calculated values, the null hypothesis was rejected, at a sig-

nificance level of 0.05 in favour of the alternative hypothesis. There were significant differences between the students' performance in the experimental and control study groups. This decision was therefore applied both in the study field and apprenticeship.

2. Verification of H1−study field

TABLE I.
RESULTS OF DIDACTIC TEST OUTPUTS IN THE EXPERIMENTAL AND CONTROL CLASS − STUDY FIELD

STUDY - Group	
EXP	*CON*
$n_1 = 16$	$n_2 = 10$
$\overline{X}_1 = 20.75$	$\overline{X}_2 = 16.60$
$s_1^2 = 1.96$	$s_2^2 = 12.71$

For a quantitative trait of final DT score, in the cognitive area, a non-parametric Mann-Whitney U-Test at high frequencies was chosen.

TABLE II.
NULL AND ALTERNATIVE HYPOTHESIS − H1 VERIFICATION

H_0	There are no differences between the performance of the students in the experimental and control study groups.
H_1	There are differences between the performance of the students in the experimental and control study groups…

$$u_1 = n_1 n_2 + \frac{n_1 \times (n_1 + 1)}{2} - R_1 = 16.10 + \frac{16 \times (16 + 1)}{2} - 426.5 = -130.50$$

$R_1 = 426.50 \quad R_2 = 158.5$ in [6, p. 309]

$$u_2 = n_1 n_2 + \frac{n_1 \times (n_1 + 1)}{2} - R_2 = 16.10 + \frac{10 \times (10 + 1)}{2} - 158.50 = 56.50$$

Test criterion was the smaller of the calculated values, i.e. u1= −130.50.

$$u_0 = \frac{u_1 - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2}{12} \times (n_1 + n_2 + 1)}} = \frac{-130.50 - \frac{16.10}{2}}{\sqrt{\frac{16.10}{12} \times (16 + 10 + 1)}} = \frac{-210.50}{18.99} = 11.08$$

$$u_{krit(\alpha)} = u_{krit(0,05)} = 1.96 \, [8, \text{p. } 97]$$

Legend:

n_1 − the number of students - experimental group [EXP].

n_2 − the number of students - control group [CON].

$\overline{X}_1$− Arithmetic average of the DT score [in points], experimental group.

$\overline{X}_2$− Arithmetic average of the DT score [in points], control group

s_1^2 − variance values, experimental group.

s_2^2 − variance values, control group.

R_1 − The sum of the sequence of values in the experimental group

R_2 − The sum of the sequence of values in the control group.

The calculated value 11.13 was compared with the critical value (1.96). The calculated value u > critical value, therefore the null hypothesis was rejected and the alternative hypothesis was confirmed. Between the performance of the students of both groups (in the study field), at a significance level of 0.05 there were statistically significant differences [10, p. 97-98].

3) Final conclusion

H1 hypothesis (in the study field) was confirmed.

At the end of the experiment, the students in the experimental group achieved better results in the didactic test in Economics than the students of the control group.

H1 hypothesis was also confirmed in the apprenticeship. Between the students' performance in both groups (in the apprenticeship) was at a significance level of 0.05, statistically significant differences [10, p. 98-99].

For illustration purposes, there are presented the results of the measured parameters in the apprenticeship.

4) The results of measured parameters − apprenticeship

The results of measured parameters (arithmetic average, median, modus, standard deviation, variance, variation margin, variation coefficient, minimum, maximum) are shown in Table III.

Measured parameters	Apprenticeships–Group	
	EXP [n_1=19]	CON [n_2=26]
Arithmetic average $\overline{X}$ [points]	19.25	17.35
Median $\tilde{X}$	19	17
Modus $\hat{X}$	17/22	17
Standard deviation s	1.94	3.05
Variance s^2	3.76	9.28
Variation margin R [%]	20.00%	48.00%
Variation margin R [points]	5	12
Variation coefficient V [%]	10 %	17 %
Maximum x_{max} [%]	88.00%	88.00%
Maximum x_{max} [points]	22	22
Minimum x_{min} [%]	68.00%	40.00%
Minimum x_{min} [points]	17	10

From the results shown in Table III., we can see that in the final didactic test, the arithmetic average score of the experimental group is higher than the score of the students of the control group. In the performance of the students in the control group were big differences. The difference between the highest and the lowest score was 12 points (48%). On the other hand, in the performance of the students of the experimental group were mean differences. The sample was more homogeneous than heterogeneous. The difference between the highest and the lowest score was 5 points.

B. Partial hypothesis H2

H2: At the end of experiment, an evaluation of learning process provided by students in the experimental group will be more positive than the students in the control group.

In order to verify H2 hypothesis Mann-Whitney U-Test at high frequencies was applied. The students fulfilled the Questionnaire for evaluation of Teaching Quality and the Questionnaire for evaluation of Lesson Teaching Quality in order to verify the H2 hypothesis.

The questionnaire comprised 23 questions [10, p. 146-150]. For illustration purposes, we present the answers to questions concerning the H2 hypothesis verification in the study field.

a) Question 1

Was the Economics textbook motivating in various proportions and relationships, i.e. encouraged you to activity and increased your interest in learning from the textbook?

- always
- often
- sometimes
- not very often
- never

Scale	Experimental group		Control group	
	Number of responses	Percentage %	Number of responses	Percentage %
a)	2	12,50	0	0,00
b)	11	68,75	0	0,00
c)	3	18,75	3	30,00
d)	0	0,00	5	50,00
e)	0	0,00	2	20,00
Σ/ [%]	16	100	10	100

H_0	In the opinions of students of the experimental and control group whether the Economics textbook was motivating, i.e. encouraged them to activity and increased the interest in learning, there were no differences.
H_2	In the opinions of students of the experimental and control group whether the Economics textbook was motivating, i.e. encouraged them to activity and increased the interest in learning, there were differences.

$$U=n_1 \times n_2 + n_1 \times (n_1+1)2 - R_1$$

$$U=16 \times 10 + 16 \times (16+1)2 - 140.50 = 155.50$$

$$U=n_1 \times n_2 + n_2 \times (n_2+1)2 - R_2$$

$$U=16 \times 10 + 10 \times (10+1)2 - 210.50 = 4.50$$

$$u=U-n_1 \times n_2 2 n_1 \times n_2 \times (n_1+n_2+1)12$$

$$u=4.5 - 16 \times 10216 \times 10 \times (16+10+1)12 = -75.5018.97 = 3.98$$

Legend:

n_1 – Number of students, experimental group

n_2 – Number of students, control group.

R_1 – The sum of the sequence of values in the experimental group.

R2 – The sum of the sequence of values in the control group.

The calculated value 3.98 was higher than 1.96 (critical value), which means that the null hypothesis was rejected and the alternative hypothesis was accepted.

1) Final conclusion

H2 hypothesis (question 1, study field) was confirmed. In the opinions of the students in the experimental and control groups, whether the Economics textbook was motivating, i.e. encouraged them to activity and increased the interest in learning, there were differences [10, p. 109-110].

H2 (question 1) was also confirmed in the apprenticeship.

a) Question 2

Were the topics in the Economics textbook easy to learn?

- very easy,

- quite easy,

- some of them were easy, some of them were difficult,

- rather difficult,

- very difficult

TABLE VI.
NUL L AND ALTERNATIVE HYPOTHESIS – H2 VERIFICATION, STUDY FIELD

H_0	In the opinions of the students in the experimental and control groups (Were the topics in the Economics textbook easy to learn?) were no differences
H_2	In the opinions of the students in the experimental and control groups (Were the topics in the Economics textbook were easy to learn?) were differences.

$$U=n_1 \times n_2 + n_1 \times (n_1+1)2 - R_1$$

$$U=16 \times 10 + 16 \times (16+1)2 - 165 = 131$$

$$U=n_1 \times n_2 + n_2 \times (n_2+1)2 - R_2$$
$$U=16 \times 10 + 10 \times (10+1)2 - 186 = 29$$

$$u=U-n_1 \times n_2 2 n_1 \times n_2 \times (n_1+n_2+1)12$$

$$u=29 - 16 \times 10216 \times 10 \times (16+10+1)12 = -51.018.97 = 2.69$$
[10, p.105-106]

The calculated value 2.69 is higher than the critical value (1.96), which means that the null hypothesis was rejected and the alternative hypothesis was accepted.

1) Final conclusion

H2 hypothesis (question 2, study field) was confirmed. In the opinions of the students in the experimental and control groups (Were the topics in the Economics textbook easy to learn?) were differences.

H2 (question 2) was also confirmed in the apprenticeship.

C. Partial hypothesis H3

H3: The clarity of the created test will be higher than 65 per cent, while the evaluation will be done with use of Cloze test.

The students' quality evaluation of the created textbook / teaching material refers mainly to evaluating and comparing the clarity of the created teaching material and traditional textbook in Cloze test.

1) The results of measuring the text clarity through Cloze test

Cloze test: from the textbook/ teaching material a random sample in the extent of about 250 words is taken. The first part of the text (35 words) is without any changes, but the 36th and then each tenth word (i.e. 46th, 56th, 66th etc.) is omitted, until 20 words are omitted. Then a chosen group of students who the textbook is intended for is asked to fill in the missing words or to replace them by synonyms. If they fail to complete at least 13 missing words, the text is too difficult for them. Cloze test is easy to implement by using computer technology [14, p. 328].

Cloze test belongs to the statistical methods of textbook quality assessment. In the research, three samples of three units were randomly selected from the created teaching material for Economics. The same number of samples was taken from the traditional textbook (Economics textbook currently used at school). The samples both in the created and currently used textbook formed the syllabus for the experimental teaching unit, i.e. they were selected from the same

Effectiveness of Teaching Based on the Comparison of Textbooks

thematic units. The students in the control group (both in the study field and apprenticeship) completed the texts with missing words (in the traditional textbook) or replaced them by synonyms. To allow the clarity comparison of the traditional textbook and created teaching material, the same activity was done in the experimental group, where the students were asked to complete 20 missing words in 3 randomly selected samples in the created teaching material. If students were unable to complete at least 13 missing words (65 %), the teaching material was rated as difficult.

The total number of completed words in cloze test in percentage (both in the study field and apprenticeship) are shown in Fig1.
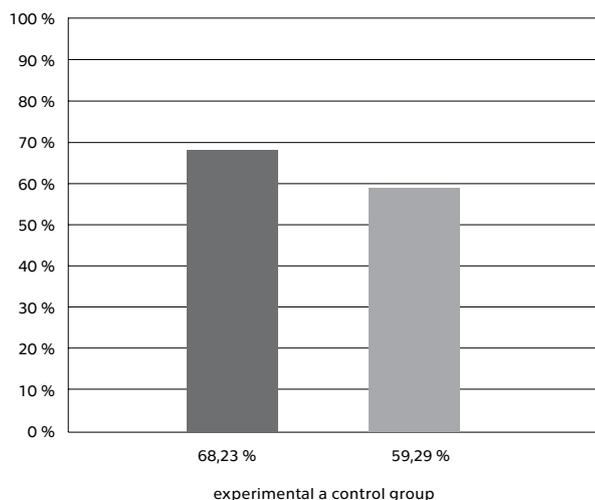

Fig. 1. Total Number Of Completed Words In Cloze Test In Percentage

The students in the experimental group, both in the study field and apprenticeship, achieved the average result of more than 13 completed words in each of the randomly selected samples. The students of the control group managed to complete less than 13 words in all three samples. The results in Fig 1 show that the average number of completed words in the experimental group accounts for 68.23 %, which is more than 65 %. The average number of words in the control group (in the study and apprenticeship group) provided the total of 59.09 %, that is less than 65 %. Therefore we can say that the students find the proposed text understandable and easy to read. Based on this, we can conclude that the currently used textbook is for students incomprehensible and difficult to read.

2) H3 verification − study field

STUDY - Group	
EXP	**CON**
$n_1 = 16$	$n_2 = 10$
$\overline{X_1} = 43.00$	$\overline{X_2} = 34.50$
$s_1^2 = 0.79$	$s_2^2 = 2.76$

To verify H3 hypothesis, Mann-Whitney U-test at high frequencies was applied.

H_0	There are no differences between the experimental and control group in the number of points achieved in cloze test.
H_3	There are differences between the experimental and control group in the number of points achieved in cloze test..

$R_2 = 687$ in [6]

$$u2=n_1n_2+n_1×(n_1+1)2−R_2=16.10+10×(10+1)2−687=−472$$
$$u0=n_2−n_1n_22n_1n_212×(n_1+n_2+1)=−472−16.10216.1012×16+10+1=−55218.97=29.09$$

$$u_{krit(\alpha)} = u_{krit(0.05)} = 1.96$$

n_1 −number of students in the experimental study group;

n_2 −number of students in the control study group;

$\overline{X_1}$ − arithmetic average score for cloze test [in points], experimental study group, study field;

$\overline{X_2}$ − arithmetic average score forcloze test [inpoints], control study group, study field;

s_1^2 − variance in the experimental study group − study field;

s_2^2 − variance in the control study group − study field;

R_2 − sum of sequences of values in the control study group.

Conclusion: The calculated value 29.09 was higher than $u_{krit(0.05)}$, which means the null hypothesis was rejected and the alternative hypothesis H1 was accepted.

There were statistically significant differences in the number of points achieved in cloze test in the compared classes.

3) Final conclusion

H3 hypothesis (in the study field) was confirmed. The clarity of the created teaching material evaluated through cloze test was higher than 65 %.

Following the results obtained through cloze test we may state that the clarity of the created teaching material in the experimental group (study field, apprenticeship) was higher than 65 %. This means that the created teaching material was not difficult for the students, in other words it was appropriate for the students. Having analysed the results, we argue that the sub-hypothesis H3 was confirmed. The students in the experimental group achieved 68.23 % in cloze test, i.e. the clarity of the created text was higher than 65 %.

D. Interpretation of the results

The working hypothesis H1 was confirmed both in the study field and the apprenticeship. Its probability is therefore 95 %. The results obtained in the study field are showed in Table I., the apprenticeship results are showed in Table III. The arithmetic average score of the final DT in the experimental group (study field) was 20.75 points, in the control group (study field), the score was 16.60 points, which means that the students in the experimental group achieved better results than the students in the control group. Similarly, in the apprenticeship, the experimental group arithmetic average score (19.25) was higher than the score of the control group (17.35). The results are listed in Table III.

Based on the analysis of the above mentioned results, we can say that the H2 hypothesis was confirmed. At the end of the experiment, the students in the experimental group evaluated the teaching process more positively than the students in the control group. This finding was confirmed both in the study field and apprenticeship.

E. Conclusion

In order to verify the main hypothesis, it was divided into 5 sub-hypotheses. In the paper there were presented the partial results of three working hypotheses.

The H1 hypothesis was confirmed at a significance level of 0.05. It was confirmed that at the end of the experiment, the students in the experimental group achieved better DT results in Economics than the students in the control group.

The H2 hypothesis was also confirmed at a significance level of 0.05. As confirmed, at the end of the experiment, the students in the experimental group evaluated the teaching process more positively than the students in the control group.

We can state that the H3 hypothesis was also confirmed. The clarity of the created teaching material assessed through cloze text was higher than 65%.

With respect to the above-mentioned results, the following statement might be postulated: "The teaching in course of Economy is more efficient with the use of the proposed Economy text-book had been more efficient, because the students working with that text-book achieved better performance results in the didactic test than the students in the reference class. The same is concerned to teaching and learning quality, which had been provided within experimental class".

The research which has been done confirmed that the teaching and learning provided with the use of proposed textbook enables:

- To improve the learning attractiveness.
- To motivate the students to work systematically.
- To setting an individual studying tempo.
- To promote the students' reading literacy and creative thinking.
- To make the study more interesting for the students.
- To improve the students' results achieved within didactic tests.

VI. FINAL CONCLUSION

The research has shown that the created textbook for Economics was appropriate for students. The students in the experimental group were mostly satisfied with the textbook, saying that the content of the textbook attracted their attention and motivated them to activity. This resulted in a better final DT performance of the students in the experimental group, both in the study field and apprenticeship.

In conclusion, we believe that introducing newly created textbooks / teaching materials in teaching (despite modern types of media) may contribute to improving the quality and efficiency of the educational process.

VII. BENEFITS FOR THE PRACTICE. CONCLUSIONS AND RECOMMENDATIONS

Providing schools with new textbooks created in accordance with the new science and technology findings plays an important role in meeting the objectives of the educational process. In teaching the vocational subjects, we would recommend:

- To constantly evaluate the quality of textbooks in relation to the results of the educational process
- Through monitoring the didactic effectiveness of the textbooks, to determine which educational function of certain textbooks fail to comply with them adequately, and

based on the findings, introduce the missing components into the newly created textbooks

- To increase the quality and efficiency of the educational process by introducing newly created textbooks / teaching materials

REFERENCES

[1] Andress, J.M., 1911. The aims, values and methods of teaching psychology in a normal school. *Journal of Educational Psychology. 2* (10), 541-554. ISSN 00220663.

[2] Avella, J.T., M. Kebritchi, S.G. Nunn a T. Kanai., 2016. Learning analytics methods, benefits, and challenges in higher education: A systematic literature review. *Journal of Asynchronous Learning Network. 20*(2), 17. ISSN 19395256.

[3] Bajtoš, J., 2003. Theory and practice of didactics. Žilina EDIS , 384 p, ISBN 80-8070-130-X.

[4] Bajtoš, J., 2010. Implementation of microteaching in the undergraduate training of teachers in terms of PF UPJŠ in Košice. Integrating theory and practice of teaching methodology as a determinant of quality modern schools. In:Yearbook contributions from the international scientific conference.Košice., pp. 36-45, ISBN 978-80-7097-843-6.

[5] Bajtoš, J. a R. Orosová., 2011. Microteaching in undergraduate teacher training. Faculty UPJŠ in Kosice., 81 p, ISBN 978-80-7097-914-3.

[6] Deci, E.L., R.M. Ryan, R.J. Vallerand a L.G. Pelletier, 1991. Motivation and Education: The Self-Determination Perspective. *Educational Psychologist. 26*(3-4), 325-346. ISSN 00461520.

[7] Hrmo, R., L. Krištofiaková a J. Miština, 2015. Building a Quality a Quality System of Technical and Vocational Education in Slovakia Towards a European Labour Market. In WEEF 2015. Proceedings of 2015 International conference on Interactive Collaborative Learning (ICL), 20. September 2015, Florence, Italy. [b.m.] : IEEE, 2015, [7] s. ISBN 978-1-4799-8706-1.

[8] Chráska, M., 2007. Methods of educational research - Foundations of quantitative research. Praha Grada Publishing, 1. vyd., 272p. ISBN 978-80-247-1369-4.

[9] Khairutdinova, R.R., O.G. Selivanova a S.K. Abildi-NA., 2016. Pedagogical conditions of school students' subjectivity formation in the educational process. International *Journal of Environmental and Science Education. 11*(3), 141-150. ISSN 13063065.

[10] Kmecová I., 2010. Didactic efficiency of textbooks in educational process. Trnava., Ph.D. thesis. Materials Science and Technology in Trnava, STU Bratislava, Faculty of Materials Science and Technology, Registration number: MTF-10901-52770.

[11] Lin-Siegler, X., et al., 2016. Even einstein struggled: Effects of learning about great scientists' struggles on high school students' motivation to learn science. *Journal of Educational Psychology. 108*(3), 314-328. ISSN 00220663.

[12] Richardson, P.W., 2004. Reading and writing from textbooks in higher education: A case study from Economics. *Studies in Higher Education. 29*(4), 505-521. ISSN 03075079.

[13] Turek I. a S. Albert, 2005. Quality of schools .Slovak University of Technology in Bratislava, 128 p, ISBN 80-227-2274-X.

[14] Turek J., 2008. Didactics, ".Bratislava: Iura Edition, 595 p, ISBN 978-80-8078-198-9.

New Challenges in Education

Mariola Krakowczyková

Warsaw Management University
Faculty of J. A. Comenius
Karviná, Czech Republic
mariola.krakowczykova@pedagogikakarvina.cz

The twentieth century and twenty-first is a time of intensive development of science and technology. This development is especially noticeable in education. It is very important that teachers were aware of the need to improve the level of education in line with the development of the discipline. Their innovative actions should focus in many important areas, among which noteworthy: design classes, during which efficient use of audiovisual aids, computers in teaching, use activating methods, develop creative thinking, ability to work the gifted and improve lessons through innovative planning methodology.

Following this path, technical measures such for example radio, TV, Internet, DVD players, etc., should, and even must, be applied also in the teaching process.

I. DEFINITION OF DIDACTIC MEANS

As reported Okoń[1] in its publication *"Wprowadzenie to dydaktyki ogólnej"* immense use of technology in the process of school and extracurricular education increases its importance. For this reason, it has developed a new area of education, which is called learning technology, which deals with educational theoretical foundations, which are applied in the practical application of teaching resources in the educational process. Which complements and enriches didactic activities, and these funds must be used to optimize teaching and learning.

There are many definitions of teaching resources, inter alia. Czesław Kupisiewicz[2] defines educational resources, such as objects that give pupils a certain sensory stimuli that act on their sight, hearing, touch, etc., which makes them the direct and indirect cognition of reality.

According to Maria Nagajowa[3] for educational resources are considered educational resources - objects that accelerate the learning process and help achieve the best educational outcomes.

Robert Dottrenst educational resources named as teaching aids. There is no doubt that the school facilities, classes and educational resources available to students and teachers form the condition of the possibility of work and quality, but the idea that education needs most modern room and more or less modern facilities, is irrelevant.

II. DISTRIBUTION OF TEACHING RESOURCES

Many didacticians detail has divided and categorized educational resources. Below is a breakdown of teaching resources and characteristics of various authors.

Breakdown of teaching resources according Cz. Kupisiewicz[4]:

- *Visual* - natural objects, machines, tools, agents, models, moving and still images, color and monochrome, schematics, symbols, ie. words, letters and numbers, and among other diagrams etc.;

- *Hearing* - vinyl records and cassette tapes, along with devices that allows them to play, radio player, music instruments, etc.;

- *Visual-auditory* - television, CD players, etc.;

- *Partially automates* - the process of education - learning (textbooks, teaching tools, language labs, called. Automated class and so on.

Distribution of teaching aids according to R. Dottrense and other[5].

Audiovisual training aids:

- Visual aids - pictures, illustrations, slides;

- Audio equipment - boards, tape recorders, radio;

- Audiovisual aids - talkies, television, guided didactic films.

Didactic aids according Wróbel[6]:

---

1   Okoń, W., *Wprowadzenie do dydaktyki ogólnej*, Warszawa: Wydawnictwo Akademickie „Żak", 2003, str. 275.

2   Kupisiewicz, Cz., *Podstawy dydaktyki ogólnej*, Warszawa, 1988, str. 213.

3   Nagajowa, M., *ABC metodyki języka polskiego*, Warszawa, 1990, [in.] Węglińska, M. *Jak przygotować się do lekcji? Wybór materiałów dydaktycznych*, Kraków 2009 str. 140.

4   Kupisiewicz, Cz., *Podstawy dydaktyki ogólnej*, Warszawa: xxx, 1988, str. 216.

5   Węglińska, M. *Jak przygotować się do lekcji? Wybór materiałów dydaktycznych*, Kraków: Oficyna Wydawnicza „Impuls", 2009, str. 138.

6   Wróbel, T. *Ogólne podstawy nauczania początkowego*, [in:] Praca nauczyciela w klasach I-IV, Warszawa 1974, [in:]

- Educational materials generally under-stood, are defined in a single other group of modern audio-visual aids (audiovisual), which are in the learning process is becoming increasingly important. They have an important role in initial training. At this level, where the predominant specific and figuratively-practical thinking must be utilized thought processes that maintain it, and must be used in a variety of devices that support dynamic thinking in pupils producing states of tension and interest in attention and facilitating memorization and contributing to the creation of the pupils more incentives to work and willingness to learn.

Besides teaching aids such as pictures, models, agents, has recently developed new tools, called Popular audiovisual means.

Although the signals come to us by various factors, but most of these signals comes to us via sight and sound - touch, smell and taste is the addition of data transmitted outside.

For this reason, modern teaching aids used at an earlier stage let actually divided into three major groups:

- visual

- sound

- audio-visual.

Terminology definitions according to M. Lelonek[7]:

Marian Lenonek states that in school practice, we can meet different concepts determining educational resources, which the framework is not fully understood, and are often confused. Terms such as: educational resources, opinion means an educational resource that determines the different content, even if partly build on each other. The relationship of teaching aids of opinion or educational resource materials is a logical view built up is thus superior. It is therefore considered justified to define the concept: a resource tool.

Classification of teaching resources according to R. Więckowski[8]:

Didactic means:

A. technical
- sound (radio transmitting equipment, tapes, records);

- visual (slides, silent movies, computer programs);

- audio-visual (sound film, television broadcasts, tape recordings);

B. conventional
- textbooks;

- graphical aids;

- models;

- the actual pictures.

Educational resources according to M. Nagajowa:

- word - printed and written texts, e.g. books, dictionaries, encyclopedias, supplementary reading; workbooks used for training;

- simple visual - among others.: drawings, maps, models; reproduction, illustration, portraits, photographs; objects, e.g. folk art, cultural heritage;

- technical visual - e.g. School boards, diascopy, graphoskop;

- sound technical - e.g. Record player, tape recorder and radio;

- technical audio-visual (Audiovisual) - e.g. a film, television and so on.

Among the types of breakdown of teaching resources are most often made a distinction breakdown Edward Fleming and John Jacoby. These authors divide educational media into three groups:

Natural teaching resources that are directly visible reality itself;

Technical educational resources that show the reality behind through aids. This group included:

- visual means;

- sound means;

- visual-audio equipment (audio-visual);

- handling;

- model;

- automatic.

Symbolic resources that demonstrate the fact by using the appropriate symbols, eg. The spoken or written words, signs, technical drawings, graphs.

Classification according to W. Okoń[9]:

1. Simple means:
- *word means* - consisting primarily of textbooks and other printed texts. Their onset

M. Węglińska. *Jak przygotować się do lekcji? Wybór materiałów dydaktycznych*, Kraków: Oficyna Wydawnicza „Impuls", 2009, str. 138-139.

7   Lelonek, M. *Środki dydaktyczne*, [in:] M. Lelonek, T. Wróbel, *Praca nauczyciela i ucznia w klasach 1-3*, Warszawa: 1990, str. 117.

8   Więckowski, R., *Pedagogika wczesnoszkolna*, Warszawa: WSiP, 1999, str. 243.

9   Okoń, W., *Wprowadzenie do dydaktyki ogólnej*, Warszawa: Wydawnictwo Akademickie „Żak", 2003, s. 276-277.

is dated, which in 1492 was the year John Gutenberg invented printing. Currently, these teaching aids are widespread and provides a basis in the process of transmitting and acquiring knowledge.

- *simple visual means* (visual) - e.g. The original objects, models, paintings, drawings, maps. With them is associated linking ideas with sensory entertainment. This follows from the fact that intellectual knowledge embodied in speech and thought makes sense if, when it is connected with the things and experiences. It is important that albums are the words used by the student, hiding the fact that it may be viewed in direct or indirect form.

Direct form have visual means when they occur as:

- Natural specimens in their natural environment, e.g. Trees in the forest, the animals in their natural environment, etc.;

- Natural specimens in natural artificial environment, for example. Specimens transferred to the study, exhibited at an exhibition or in a museum;

- Stuffed specimens as dry specimens, such as stuffed animals or plants or dried wet preparations, preserved in suitable liquids and microscope slides.

They have an indirect form of visual means, if the point to the fact in the form of:

- models, it is a means of representing what the best indications of real objects;

- paintings, i.e. flat creations that acts directly on the eye.

2. Compound means:

- Mechanical visual resources that enable the transmission of images through technical devices, which are e.g. a camera, diascopy, episcope, microscope, telescope. They constitute the oldest group of composite resources. Currently, the richness and diversity of very large, and may be exemplified as: cameras, video cameras or players. We photograph not only the country and its objects, but also other planets.

- Hearing resources allow us to transmit sounds and noises through the turntable, tape or radio.

They allow indirect impact on people through information in verbal form, sounds, and noises. It must be noted that the impact strength of these compositions depends on the quality of the delivered content, and the readiness of the listener.

- Visually-acoustical devices (audiovisual) combine sound and giant such as sound film or television.

They transmit more services than audio devices. Predominantly captures an image factor, which in conjunction with an acoustic moment a strong impact on the imagination of the customer.

- Means that automate the process of learning, which can offset teaching tools, language classrooms and computers.

Didactic resources that belong to this group, are now beginning to be fully active. They develop from various means. The difference is visible from other devices by:

- allows you to fully automate learning,

- require direct contact with party technologies.

Yet they are three known types of these resources: educational tools, language classrooms and computers.

Didactic machines are arranged in such a way that they can manage the learning process without the help of a teacher. They are represented by, among others:

- training machines that allow the acquisition of knowledge,

- testing machines that allow succeed checking the results of work of pupils,

- practical exercises machines that make it easier to maintain the knowledge and habits.

Language classrooms are dated only from the Second World War. Their equipment consists mainly of managing an opinion that is placed on the table presenter; tape recorder and headphones for listening to testimony and exemplary own statements in a foreign language.

Computers are devices that come into school with great dynamics indicate a new standard for acquiring and developing all information.

Although the above summary, we note that the didactic resources largely enhance the function of the educational process, for example with the following elements:

- cognition of reality (cameras, TV cameras, audio-video player, microscopes, telescopes);

- acquiring knowledge about reality (reprographic equipment such as copiers, computers, scanners);

- shaping attitudes and emotional relationship to reality (images, movies, audio recordings);

- development activities of transforming reality (equipment cabinets, stimulation

devices, educational games, sports equipment, computers).

The above broad classifications of teaching resources is timeless, although funds are undergoing changes. Turntable CD player has been pushed, but currently those funds are already outdated when available are mp3, mp4 players or smartphones that do not take up much space, and need only be connected to boxes that was audible sound with perfect quality. The VCR was represented by a DVD player, although this device is represented by a laptop, tablet and projector. In place of conventional plates are picked interactive whiteboard, the classic textbook representing e-books, ordinary remarks, we can send by mail. It is necessary to go with time, but we must be sure that the fulfillment of the didactic process at the school for hours through these means, not an increase in labor efficiency teacher. We also hold the view that this means less fulfills didactic functions that are indispensable in the process of instruction, it is meant living word, live training.

About this already spoken Z. Mysłakowski[10], which warned that the results of the medium does not matter, but the didactic process, including the activities of teachers and pupils, which seeks to make changes in pupils. Participation means in this process relates to the fact that they represent and enrich the activities of some teachers and students, and can act more intensively on the process of building the personality of the student.

Current didactics marches on and modernizing educational resources. Process technology enabled the use of such funds, which was represented by the majority of teachers, and over time began to represent some of the activities of students, became means-methods. We must remember that such devices such as laptop computers, interactive whiteboards, DVD players, mp4 etc. no man can work independently. This overview didactic function was targeted at pointing out some possibility of introducing modern technology into the didactic process in order to enhance the effects of shaping personality, and his influence on the multilateral development of personality.

Characteristics of selected didactic means: computer, multimedia presentations, interactive whiteboards, internet

Computer - once filled an entire room now fits in your handbag. Currently, computers perform different functions, but one thing is certain - the didactic function device works flawlessly. Computers can be used for movie playback, music or portable drive. It is not easy not to use it at school when they have a place in almost every home.

Mirosław Kisiel11 notes that public instruction, such as e.g. Music classes in elementary school, the use of computer programs meets with obstacles. Even though education, especially music and use the latest technology is the easiest, especially with regard to the lack of appropriate music room, but you cannot give up and try to use the computer in music education.

Using computers for hours not indicative only of following the development of technology according to the time available, but often invites the student to actively creative attitude, stirs the imagination, and also improves intellectual abilities.

The market appears a lot of free computer programs that work with your computer are very good and effective didactic means, for example. MuseScore, Audacity in music education and so on. These programs in music education possible to distinguish between the notes, highlight the graphic demonstration melodies, giving the possibility of forming a separate hearing, enhancing feelings of rhythm and even allow you to create custom playlists.

TABLE I.

Plus	Minus
• rapid action • interesting for pupils • supports the process of learning and education • caters for the interests of children • the possibility of repeating the same actions • gives visual and auditory senses • simplifies the process of linking education with entertainment	• never fails to properly show reality • that students can use this opportunity in school, it is necessary to adapt this space

Multimedia presentation, is often portrayed as one of the most attractive forms of communication, notably because it links several media absorbs both the pupils and the teachers themselves.

If it is well done, it must give the possibility to perceive objects debate, the greatest possible number of senses. Presentation must characterize different content during readable aesthetic design. The level of presentation must be adapted to the possibilities of its subscription audience. Currently, publishers and their publications to add a multimedia presentation, which should fulfill the role of teaching aids.

---

10   Mysłakowski, Z., *Nauczanie żywe a podręcznik szkolny*, Lwów, 1936, str. 286.

11   Kisiel, M., *Wykorzystanie komputera i programów multimedialnych*, [in:] Juszczyk, S., Polewczyk, I. (red.), M*edia wobec wielorakich potrzeb dziecka*, Toruń: 2005, str. 188.

TABLE II.

Plus	Minus
• operates in several senses simultaneously, which has an impact on improving the efficiency of education • contained content can be adapted to the level of their abilities • flexibility in communicating with • the possibility of execution through a program that offered free	• class must have suitable equipment, e.g. A computer, projector, interactive whiteboard

Interactive whiteboards, is one of the most used didactic resources used in education, but not the most popular, which have an impact on the high cost of the purchase.

Interactive whiteboard can be compared with a huge touch screen that works alone or with a computer or projector. When using an interactive whiteboard, it is actually using a computer on the big screen. The interactive whiteboards were used interesting solution, which we can use writing, crossed out, and so on the projected material.

We must remember, however, that the interactive whiteboard is a device that has tremendous benefits and enriches learning, if properly utilized. If the teacher does not have sufficient knowledge regarding its use, she becomes an obstacle for teachers, and not being able to diversify teaching.

TABLE III.

Plus	Minus
• effective presentations e.g. films, educational presentations • total user interaction • the possibility of writing, highlighting, etc. crossed out. on-screen presentation • low operating expenses • no need for special classrooms equipped e.g. TV, crates, DVD player • the possibility of entering the previous session, which allows the initiation of additional teaching exactly at the point early release	• high cost of acquisition • not all offered interactive whiteboard can function as a classic chalkboard • after long usage boards can cause eyestrain • lack of funds for training teachers to use interactive whiteboards, which makes the boards cannot be fully utilized.

Internet forms a worldwide computer network expanded. It offers its users various forms of entertainment, but offers resources that can benefit education. It offers immediate access to a large number of teaching aids, concepts hours or longer prepared online educational programs, create them have already been used new technology and programming languages and programming languages networking applications such as Java, JavaScript, HTML, PHP or most effective and beneficial to the creation of interactive internet educational program FLASH.

The Internet can be a tool for contemporary problems of education. Once the school determined the main source of knowledge, and is now just one mouse click, which gives us a thousand answers to each question for a few seconds. Of course, there also arises the question, what percent they are beneficial, but science resolution really valuable stuff from the Internet must be beneficial to take a little bit.

We cannot make an enemy of the Internet, it is necessary to look for a friend who I can help in approaching the pupils.

TABLE IV.

Plus	Minus
• quick access to almost any information • the possibility of using materials from around the world • the possibility of listening to music, movies, etc. letting • unlimited access to network inventory	• the possibility of using the Internet by its users scope that we can effectively use the Internet, we must find in themselves art department beneficial information from not benefit • because we have unlimited possibilities that gives us the Internet, and use it in an inappropriate manner, can have negative effects on users

Here is a brief description of selected didactic resources. It is important to deepen knowledge on the subject, so that later could be used in teaching. Teachers must realize that the actual audio transmission enables us remember only 30% of the information, but the Audiovisual increase this number to 80%.

For this reason, if you have the opportunity to teach use of the above means, increase the efficiency of the education of pupils, for this reason it is useful to engage in these educational resources.

Currently, teachers are not able to fully exploit the benefits that they provide multimedia resources, therefore the education in this direction extremely important.

It is also important that the school as an educational institution recognized the need to follow modern trends. Must seek funds that will be used for classroom equipment and teacher training. Remember that the present school, can only detect potential, which is located in modern technologies.

USED SOURCES:

[1]   Kisiel, M., *Wykorzystanie komputera i programów mul-timedialnych*, [in:] Juszczyk, S., Polewczyk, I. (red.), *Media wobec wielorakich potrzeb dziecka*, Toruń: 2005.

[2]   Kupisiewicz, Cz., *Podstawy dydaktyki ogólnej*, Warszawa, 1988.

[3]   Lelonek, M. *Środki dydaktyczne, [in:] M. Lelonek*, T. Wróbel, *Praca nauczyciela i ucznia w klasach 1-3*, Warszawa: 1990.

[4]   Mysłakowski, Z., *Nauczanie żywe a podręcznik szkolny*, Lwów, 1936.

[5]   Nagajowa, M., *ABC metodyki języka polskiego, Warszawa*, 1990, [in.] Węglińska, M. *Jak przygotować się do lekcji? Wybór materiałów dydaktycznych*, Kraków 2009.

[6]   Okoń, W., *Wprowadzenie do dydaktyki ogólnej*, Warszawa: Wydawnictwo Akademickie „Żak", 2003.

[7]   Węglińska, M. *Jak przygotować się do lekcji? Wybór materiałów dydaktycznych*, Kraków: Oficyna Wydawnicza „Impuls", 2009.

[8]   Więckowski, R., *Pedagogika wczesnoszkolna*, Warszawa: WSiP, 1999.

[9]   Wróbel, T. *Ogólne podstawy nauczania początkowego*, [in:] *Praca nauczyciela w klasach I-IV*, Warszawa 1974, [in:] M. Węglińska. *Jak przygotować się do lekcji? Wybór materiałów dydaktycznych*, Kraków: Oficyna Wydawnicza „Impuls", 2009.

Quality Assessment at Schools

Lucia Krištofiaková

DTI University
Department of Didactics
Dubnica n/V, Slovakia
kristofiakova@dti.sk

Abstract—The contribution is oriented on the quality assessment in the school environment. The author would like to make readers familiar with activities as well as experience related to the issue. The paper deals with the quality assessment at tertiary and secondary education. The author mainly focuses on the system of quality management at the tertiary educational institution – the Dubnica Institute of Technology located in Dubnica nad Váhom. The tools for verifying the system of quality management – internal audit – are consulted in detail.

Keywords—*quality assessment; education; internal system of quality management; internal audits*

I. INTRODUCTION

The issue of education/schools quality is very topical these days, no matter whether they are universities or secondary schools. Quality assessment is very subjective, similarly as the education quality assessment. Objectively provable quality of the educational institution is of its importance from the social as well as individual point of view, but particularly the aspect of deciding when the individual chooses their study programme, i.e. the school s/he will study at or that one has to be taken into consideration. As everybody has the opportunity of choice, we have quite a significant competition in the education market.

As stated by Strakoš [8], the quality of tertiary education in Slovakia is a frequent topic of discussions. It is involved not only in strategic documents, expert analyses and publications, news and media commentaries, it appears regularly in meetings, informal conversations, Internet forums and blogs. However, the issue is often related – mainly in case of universities – to the quality assessment of research and development.

Turek [9] stated in his publication that each school should have elaborated their own system of quality management which will relate to all processes running in there and which will include all employees at the same time.

The author votes for the idea that within the school quality assessment and improvement it is important to focus on all processes executed at the school in question.

II. ORIENTATION ON QUALITY IN EDUCATION

By the quality (of education processes, educational institutions, and education system) some experts mean the desirable (optimal) level of operation or production of the processes or institutions which can be prescribed by certain requirements (e.g. education standards) and can be also objectively measured and assessed (Průcha, 1997, p. 27) [6].

At school, the term "quality" has been used for a short time. The term of "efficiency" (of school, education, school system, teaching process, financial means utilization for educational purposes, etc.) has been used more frequently. The term "efficiency" is usually relates to the investigation and assessment of the school operation results whereas the term of "quality" relates to all processes executed at school (in the training process, educational system, etc.) including the planning of work [9].

The author is of the same opinion as Hrmo and Krpálková-Krelová [3], that for the school it is very important to provide quality education and orient thus on meeting the expectations of its partners. If the school is to meet the expectations it has to learn about their and constantly improve all the processes, particularly the training process.

To improve, the school management should know own situation, how the individual processes are carried out, what the school strengths and weaknesses are like as well as learn about the opportunities and threats that may occur; i.e. it is necessary to execute the assessment.

The internal assessment of the school is described by Turek [9] as a systematic collection, classification and evaluation of valid and reliable data on school, requirements and needs of its clients for the purposes of follow-on decisions. The school can develop only if it knows about its drawbacks and is able to correct them in time. Further development of the school is connected with the improvement of its positives (advantages, strengths). The improvement of the quality of the related school as an institution can be done by no other institution (education body), it should be done by the school itself (if the school is interested). The internal assessment is liable only if executed responsibly, objectively as a goodwill to map the school reality. In case, the internal as-

sessment is carried out only formally or the results are deformed in the effort to show only the positives, the assessment is of no significance as sooner or later such an assessment will do only harm to the school and its pupils/students, and all the work will result as useless and negate the attitudes to the quality assessment. Turek and Albert [10] mention the following objectives of self-assessment (internal assessment):

- Consideration of own performance and capacity and revelation of critical fields in expertise of the school, i.e. map the existing conditions. The self-assessment thus provides a map of the expert activities of the school.

- Thorough objective self-assessment helps the school improve and increase the quality.

- Via self-assessment the school „reports" to its clients, and its founder. The school can thus justify it reflects „the voices" of its clients and respects their needs, wishes, requirements.

- Every school should know the answers to the questions: how good we are? How can we improve? Self-assessment can provide the answers.

- Self-assessment allows to identify the school's strengths and weaknesses as well as diagnose what could be improved, determine the priorities and plan the action necessary for the school quality improvement.

- Regular self-assessment (e.g. every year allows learning about the dynamics of the school development, how and in what it changes in time (in what fields the school is better in comparison to the previous year, or to its status two, three years ago, and in what fields it gets worse, where the possible reserves are).

The follow-on parts of the paper discuss the quality assessment and improvement at the tertiary educational workplace – the Dubnica Institute of Technology in Dubnica nad Váhom (DTI), and introduces the internal system of quality management (VSMK) at the school. The contribution closely deals with the internal audits – the tool for the verification of the quality management internal system.

III. INTERNAL SYSTEM OF QUALITY MANAGEMENT OF DTI IN DUBNICA NAD VÁHOM

The main objective of the internal system of quality is represented by the development of quality importance as well as its assurance by the university and faculty activities.

The internal system of quality which has been adapted by the Internal Regulation of the school, includes also the policy of the school in terms of quality assurance in tertiary education as well as the procedures of the school in related quality assurance [12].

The topic of significance of quality development and its assurance is an issue at my workplace as well. The Dubnica Institute of Technology in Dubnica nad Váhom has implemented and fully functional system of quality management in accordance with ISO 9001:2008 Standard in the following field: Education in all levels of university studies and related research, development and publishing activities.

The certification audit proved that the management system meets the requirements of the aforementioned Standard and the Dubnica Institute of Technology in Dubnica nad Váhom was granted a certificate by QSCert, spol. s r. o. Company confirming the implementation and utilisation of ISO 9001:2008 Standard in the field.

The Dubnica Institute of Technology in Dubnica nad Váhom in compliance with the criteria of Internal System of Quality Assurance of university education (KVSK) according to Sec. 87a of the Act No. 131/2002 Coll. on Universities as amended, and in compliance with the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG Regulations) and the requirements of ISO 9001:2008 Standard defines the integrated Internal System of Quality Assurance and System of Quality Management, its policy, quality objectives and the procedures by means of the Guidelines for Quality and Related Organisational Standards.

Via the policy of quality the management of the Dubnica Institute of Technology in Dubnica nad Váhom determines the basic principles leading to meeting the mission and objectives in the following fields of quality assurance: constant improvement and efficiency of the Internal System of Quality Management, orientation on a student and practice, research and development, quality and involvement of employees, and development of education infrastructure.

Regarding these activities the management of the Dubnica Institute of Technology in Dubnica nad Váhom demonstrates the preparedness and commitment to assure and constantly improve all processes influencing the quality of the training and related services provided, and thus meet the requirements of students and other parties interested as well as the legislation requirements and hence permanently increase the satisfaction with the provided training, and results with own research and publication activities.

The monitoring and the assessment of the quality system efficiency, including the validity of school's principles related to the quality, is inves-

tigated and assessed within VSMK investigation by the management. To investigate the quality system the Vice-Rector for the Quality in cooperation with responsible owners of the processes executes the assessment of the Internal System of Quality Management of DTI in the scope of the following:

- Quality Assessment of study programmes and feedback provided by the training participants.

- Assessment of related research and development activities and innovations of study programmes in terms of research and development outcomes.

- Quality assessment of pedagogical employees' development.

- Internal audit of processes and systems.

- Quality assessment of suppliers.

- Assessment of discrepancies, complaints and results of internal audit.

- Efficiency of corrective and preventive activities.

- Assessment of processes performance.

- Investigation of meeting the objectives and policy of the Internal System of Quality Management of DTI.

- Changes liable to influence the Quality Management System.

- Corrective and preventive measures for the System of Quality Management improvement.

Regarding the scope of the topic it is not possible to deal with the mentioned Internal System of Quality Management in detail. For the purposes of the contribution, the following part deals more closely with internal audits as the tools supporting the quality at the higher education.

IV. INTERNAL AUDITS AS THE TOOLS OF QUALITY ASSURANCE

Internal audit is a valuable tool for collecting the information on the Internal System of Quality Assurance. The objective of the internal audit of DTI is to consider the level of the accordance of the processes and documentation of the quality system with the requirements of ISO 9001:2008 Standard in practice as well as to assess the efficiency of the Internal System of Quality operation, improve the quality system processes and its documented procedures.

Internal audits of DTI's quality is executed by certified auditors (certificate of internal auditor of Management System Quality according to ISO 9001:2008 Standard) and in compliance with the plan of internal audits.

Makýš and Šlúch [5] mention the following objectives of the internal audits execution:

- monitor the management system processes execution,

- learn about the drawbacks related to the implementation of management system documentation in practice,

- assess whether the management system corresponds with the requirements of the related standard and legislation requirements as well as the requirements defined by the organisation,

- reveal the fields in which the management system can be improved.

Internal audit is carried out in three stages: the preparation, execution and assessment of the internal audit.

The process of internal audits execution is shown in Figure 1.

Stage	Procedures of quality assurance
Preparation of internal audit	Comprises the preparedness of the Program for Internal Audit consisting of: • objective of internal audit, • identification of audit group leader and its individual members, • identification or required documents which have to be at disposal, • date and place of audit, • estimation of audit time and duration, including the time schedule of internal audit.
Execution of internal audit	For the audited: internal audit starts with learning about the contents of internal audit verification. Subsequently, the audit group collects the data (e.g. via interviews, documents survey, etc.). Significant discrepancies are investigated. Findings and proves are recorded in Audit List. Execution of internal audit ends with final negotiations with the audited so that they learn about the findings.
Assessment of internal audit	Auditor elaborates the Protocol on Internal Audit. If there are proposals to improve the Internal System of Quality Management, they are recorded in the Protocol. Leading auditor passes the Protocol on Audit to the Vice-Rector within three days from the internal audit execution. The Protocol has to be signed by the audited which represents the acknowledgement of discrepancies found.

Fig. 1.   Stages of internal audit execution

The assessment of internal audits is a part of regular investigation of the Internal System of Quality Management of DTI.

Besides the planned internal audits it is possible to carry out also unplanned audits. The reason for unplanned audits can be as follows:

- occurrence of complaints, insufficient process results,

- essential changes of the quality system or organisational structure of the institution,

- employee's incentive of hard breach to legislation, internal procedures, and duties and responsibilities,

- need to verify the correction of discrepancies found in previous internal audits,

- need to verify the implementation and efficiency of accepted corrective measures.

V. CONCLUSION

Assurance of required quality at schools is a complex process requiring a complex approach. However, nowadays the assessment and follow-on activities leading to the improvement are essential and crucial for successful existence of the school, particularly when the competitive environment is taken into account. The complex approach dealing with all processes running at school environment (e.g. in the form of the implementation of the Internal System of Quality Management at school) is considered to be a significant step towards achieving the success of the school.

ACKNOWLEDGMENT

REFERENCES

[1]   Depešová, J. Odborné technické vzdelávanie v podmienkach výrobnej praxe. In : Edukacja - Technika - Informatyka : wybrane problemy edukacji technicznej i zawodowej. - ISSN 2080-9069, Roč. 6, č. 1 (2015), pp. 82-87.

[2]   Hrmo, R. Príručka kvality Dubnického technologického inštitútu v Dubnici nad Váhom (Vnútorný predpis vysokej školy upravujúci vnútorný systém kvality).

[3]   Hrmo, R., Krpálková Krelová, K. Zvyšovanie kvality vyučovacieho procesu. 1. vyd. Bratislava : STU v Bratislave, 2010. 176 p., ISBN 978-80-227-3249-9.

[4]   Kentoš, M., Slávikovi, G. Zvládanie stresu manažérmi. Praha : Radix, spol. s r. o., 2013. 72 p. ISBN 978-80-87573-08-2.

[5]   Makýš, P., Šlúch, M. Systém manažérstva kvality podľa ISO 9001:2015 a jeho interné audity. Žilina : M KREO, s.r.o. 96 p., ISBN 978-80-971299-1-0.

[6]   Nezvalová, D. Kvalita ve škole. Olomouc : Univerzita Palackého v Olomouci, 2002. 89 p., ISBN 80-244-0452-4.

[7]   Projekt KEGA č. 006DTI-4/2016 Model hodnotenia a zlepšovania kvality výchovno-vzdelávacieho procesu na stredných odborných školách.

[8]   Strakoš, J. Pedagogická príprava a prax úspešných vysokoškolských učiteľov. Bratislava : Univerzita Komenského v Bratislave, 2016. 64 p., ISBN 978-80-223-4153-0.

[9]   Turek, I. Škola a kvalita. Bratislava : Wolters Kluwer s. r. o., 2015. 376 p., ISBN 978-80-8168-221-6.

[10]   Turek, I., Albert, S. Kvalita školy. Bratislava : Slovenská technická univerzita v Bratislave, 2005. 128 p., ISBN 80-227-2274-X.

[11]   Vaníčková, R., Jakúbek, P. Project culture of project oriented companies. In : Přemysl Pálka, Adriana Knápková, Le Thi My Hanh, Hoang Cam Trang. Proceedings of The 3rd International Conference on Finance and Economics. Zlín : Tomas Bata University in Zlin, 2016. 705-717, 13 p. ISBN 978-80-7454-598-6.

[12]   Zákon č. 131/2002 Z.z. o vysokých školách.

Fast Feedback for Education of Migrants

Jaroslav Kultan

University of Economics in Bratislava
Faculty of Economic Informatics
Department Applied Informatics
Bratislava, Slovakia
jkultan@gmail.com

Abstract—**The article is devoted to actual problems of educational migration flows both in real and virtual environments. The article discusses the positive and negative experience with virtual platforms in lot of country. Attention is paid to cultural and cognitive characteristics of the students belonging to the Generation Z, which requires the creation of entirely different instruments for implementing the educational process. The authors propose the method of creation, management and evaluation of feedback in the process of virtual educational migration using the latest IT- technologies that are used to create ultra-fast feedback and allow bringing new technologies into the learning process. Testing of methodological tools was held in the University of Economics in Bratislava (Slovakia).**

These results confirm the possibility of the new method of providing feedback, allowing to improve the training quality of students, who are members of the educational migration flows. However, the use of IT- technologies is not a sufficient factor in improving the quality of education and the level of progress achieved by the trainees, but it can be a good helper during examination, automation of selected methods of control, more individualized approach to learning.

Keywords— education; educational migration; modeling; virtual technologies; feedback; economic feasibility; incentive effect; Generation Z; cultural and cognitive characteristics; highly skilled migration

I. INTRODUCTION

In today's globalized world international migration flows are becoming increasingly important being a complex and multidimensional phenomenon. They have many characteristics and different directions, one of which is educational migration related to the internationalization of education and the demand for highly qualified personnel. In fact, educational migration is a global intellectual capital both for a distinct society and countries' associations.

Such interest and competition among the developed countries are due to shortages of highly skilled labour resources. Per experts, at the beginning of the XXI century the lack of specialists in such fields, as IT-technologies, was as follows: in the United States - 850 thousand people, in Europe - 2 million people. The high demand persists in such industries as aerospace, aviation technol-

ogy, health, education. It is noted that the problem cannot be solved only through the expansion of domestic resources implementing new educational trends and retraining. Thus, due to the expansion of educational migration flows one can get several benefits from the dissemination of knowledge and satisfaction the demand for highly qualified specialists in the most advanced and fastest growing sectors of the economy.

Effective educational migration can be one of the mechanisms to solve existing problems, as its economic, political and social benefits are obvious. Thus, exports of education allow a country:

- sell educational services on the international market;

- cut costs on primary and secondary education of future foreign entrants;

- use financial investments of foreign students for the learning process;

- improve the gender and age structure of the population by attracting young people of reproductive age [1], [2].

In general, educational migrants are a quite promising object for research. They have a high communicative resource and are more attractive to the host community than other migrants because they can have a positive impact on the development of the region or country. [3].

Success in the field of educational migration depends on the decisions and actions agreed at the university management level, regional and state policy. Migration can be regarded as a significant resource required highly skilled migration in general. It is necessary to consider the features of today's younger generation, which is significantly different from previous generations. They are often called Generation Z (Digital Native). Common features of Z generation are that they are "linked" to each other due to such things as the Internet, YouTube, mobile phones, SMS, MP3- players, hand-held devices such as PSP

Based on the research we can say that training pays off when using the most convenient ways for human feed. So, D.Kolb concluded that people often learn by using one of the following methods of mastering the material: 1. The specific practices: a real experience enables a person to under-

stand and feel what he has to do. 2. Razmyshle-nie: involves the analysis of others and their own experience. 3. Postroenie model: the creation of a theory that gives meaning to the observed phenomena. 4. Metod trial and error: people seek to try different options, actively experimenting with new approaches [4] Accounting for the specifics of the cultural-cognitive profile of the student and the nature of its educational activity will meet the expectations of students and make the learning process more effective. [5].

Educational migration is a source of highly skilled labour that requires a change of approach to learning Passive 'approaches based only on memorizing and reproducing the material under study, can no longer fully meet the psychological type of students. In life, there are many Generation Z virtual gaming moments, are increasingly necessary to introduce into the process of teaching interactive technologies.

II. EDUCATIONAL MIGRATION: REAL VS. VIRTUAL

Per UNESCO forecasts, foreign students in 2025 will be 5-7 million. Two-thirds of them amount to come from Asia. [6]. UNESCO defines the category of educational migrants - persons authorized to undergo specific training programs in high schools in the country offices, of which they are not. At present, the competition of countries - exporters of education is entering a new round. By 2025, the total number of students in the world will increase from 97 to 260 million. Man. The citizens studying abroad are interested in both donor countries and recipient countries. On a personal level in education abroad are showing great interest in the students themselves and graduate students. They are often trained in teaching even at his own expense. Experts predict that competition for international students as the most desirable category of migration will escalate. Overall, the world market of educational services is estimated at 50-60 billion dollars. Particularly active in attracting students are economically developed countries (United Kingdom, Germany, USA, France, Switzerland, and others.).

Small countries have a higher mobility of students who, after completing his studies, planning to stay and work in leading foreign research centres. These countries tend to have well-developed structure of distributed learning. In order to attract foreign specialists, stimulation and motivation of return, went abroad compatriots countries use a range of complex measures: - implementation of special programs, the hiring of highly qualified specialists Simplify procedures - work permit foreign student, - the creation of specialized structures - English training language - the conclusion of contracts between universities, - stimulation of returning to his native country, - the development of infrastructure for innovative entrepreneurship. Migration policies in many countries are increas-

ingly focused on attracting highly skilled professionals, graduate students, giving them several privileges and preferences.

New direction of training and attracting foreign specialists and students are massive open online courses (MOOC) /MOOC is electronic learning courses, including video lectures with subtitles, presentations, infographics, textual lecture notes, homework, virtual labs, tests and final examinations/. Unlike traditional lectures video materials are presented in 5-10 minutes' fragments (corresponding to clip material perception by new generation). While training there are actively used forums for communication between students and lecturers. MOOCs are created by most of the leading universities in the world. Applying information and a variety of virtual technology, you can create flexible, customized training scenarios adapted to the pace of assimilation of each student. Moreover, with the help of web cameras can be monitored and non-verbal communication, and using smart phone "smart" watches - even change the physical condition of the student. This allows you to keep track of the time of the loss of focus, adapt and optimize the flow of information process [7].

It is in danger of creating a monopoly for education on the part of the major universities in the world. Thus, they will have the possibility of selecting the best specialists. Per this, many universities in the world aggressively using new technology to increase its share in the market of educational services. These include in their programs the best teachers of the world courses. In addition, the development of big data analysis techniques make MOOC versatile research environment.

There are several problems when using MOOC platforms.

- Virtual learning cannot all specialties. While using the remote control and the experimental technique robot in a field like medicine, you can begin to talk of the possibility of virtual learning.

- Also, change the social side of learning. For a generation of gadgets skills online communication and training will be an important part of socialization as the growing popularity of virtual communication and remote work "[8].

- "For many students, MOOC - not a tool for vocational education, and the kind of intellectual entertainment for the memories" [8] - which is also one of the key problems of application MOOC.

- MOOC platform and tools are also cultural influence. The liberalization of education with its transition to the online broadcast sharply complicate traditional values.

- It is an effective tool for "exhaustion" the most successful students in the world's leading universities.

Open education gives students a chance to choose an individual way of learning. In the electronic media used modern technology to develop the necessary professional competences as simulators, games and the like, which is more understandable and familiar to today's younger generation.

In the future, we will develop mobile applications, improved teaching methods. This will allow the option to develop and blended learning (virtual and real) [9].

In the modern system of education, new trends are clearly visible, which require new approaches and methods of training to remain competitive as a university, and teachers.

This is a cross-border higher education and internationalization of universities, ie, education received when teachers, students, programs, universities across national borders. Universities are integrated, ie developing dynamically to adapt to a rapidly and continuously changing environment. [10].

Therefore, expanding educational migration, both real and virtual. Cognitive features of the Z generation, preferring virtual and creative forms of work requires building new educational trajectories. Particularly noteworthy are learning technology, in which students take an active part in the proposed activities.

Thus, in the existing context, we can talk about an innovative educational environment (ILE), a system-organized set of information, technical, training and methodological support are inextricably linked with the person as the subject of the educational process. ITS accumulates all national cultures and in general can be regarded as a macro environment, and in a specific sense - as an immediate social environment, as the microenvironment [5] training.

III. COMPUTER SIMULATION OF EDUCATIONAL MIGRATION CASES

One of the main components of the active adaptation model of educational migration is the formation of the educational system and its forms and forms of post-graduate education (lifelong learning). An important role in this model plays the feedback in the education process and its assessment. It is important not only from the educational point of view of the result, but also in relation to the correction of the educational content and forms. One can assume that educational migrants have originally owned the basic skills to work with information and communication means the modern technology of mobile telephony [12].

Therefore, it is natural and appropriate in the process of transmitting information and knowledge to use e-support and e-learning, which has a number of advantages [13]:- relatively easy way to obtain training materials; flexibility in curriculum development; -effectiveness of communication between lecturers and students; - geographically unlimited training; - electronic register of actions and measures in the assessment of students' knowledge; - remote access to the lecturer; - long-term reduction in direct and indirect costs for the organization and management of education; - implementation of training in concrete and specific conditions in production and non-production companies.

The main disadvantages in this process are: -intensive processes of training courses preparation; - limited practical skills; - limited direct interaction between lecturers and students; - access to computers connected to the Internet with the necessary data rates.

Additional features typically include:

- Self-study, in which one can use multimedia programs with educational topics stored on CD-ROM or DVD- ROM. The disadvantage is the risk of non-transparency in the form of educational materials processing by students

- Online courses via the Internet and Intranet also have a form of self-study by the university and other educational portals with a minimum requirement for the registration of the user. There can be used the methods of direct access with direct attachment of an educational portal on the Internet. One can work by the off-line method, in which students download materials from the educational website and save it in their computer.

- Training with the lecturer-leader is carried out on-line, synchronously and in real time. The most suitable form is the use of videoconferencing systems, a modern information tool, that is used for video and audio connection for two or more participants, allowing to share data presented [14].

Thus, on-line education has certain advantages, but the main problem is the establishment of feedback and assessment activities based on IT-technologies. The learning process, objectives and ways to achieve them can be compared with certain simplifications of a technical control system. In the technical sphere, there are developed different approaches to creating effective feedback for linear and nonlinear systems. Learning process can be viewed as a system that has many features in common with technical systems.

In this part discloses certain basic concepts of feedback in the learning system using modern information technology. In the management

process is necessary to set the aim of the process and verify the achievement of this goal. In case of any deviations from the set objectives, it is necessary to change the input value to the controlled system.

In practice, there may be a few cases of the process development: the system detects a deviation, and outputs a one-time impact of moderate intensity; the system provides a short impact and a few small ones, which are summed up; the system strongly reacts to the deviation, and then gives a moderate impact and several integrating small impacts (Figure 1).
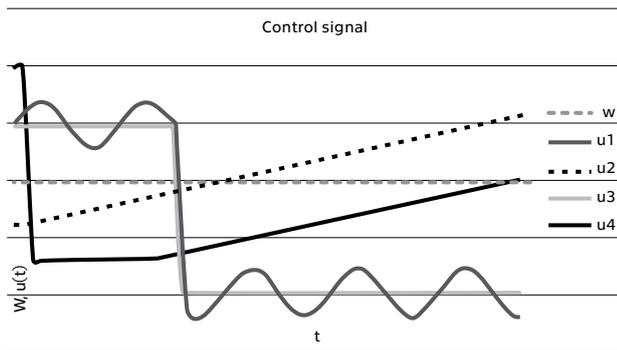

Fig. 1. Change of control signal

Depending on the system, strength, impact duration and deviation magnitude there can be achieved several results. The most significant result is a noticeable gradual tightening of the system to the desired result. The less acceptable result is the goal enlivenment with minor fluctuations. Typically, these variations require more energy input and / or may result in a violation of the system stability. If the impact is not enough tightening may continue for a long time and does not bring a positive result. The most unacceptable result is too much excitation of the system and the violation of its sustainability (Figure 2)
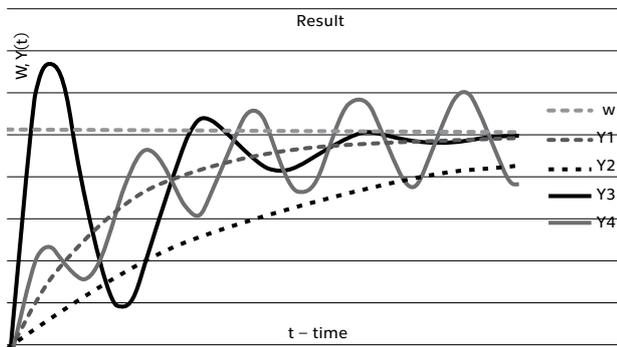

Fig. 2. System reaction to impact signal

In technology, there are many methods of selecting the correct exposure to preserve stability and achieve the objectives. It often happens that we achieve only the first part - the stability and only then try to change a little to achieve the goal and objectives modified. The main task of man-

agement theory is the selection of the most successful impact on the system.

Learning management system is shown in Figure 3, where U - the lecturer; S - student; w - the object of learning; y - learning outcomes; e - deviation; v1 - the environmental impact on the lecturer; v2 − the environmental impact on the student; u1 - student's activity management.
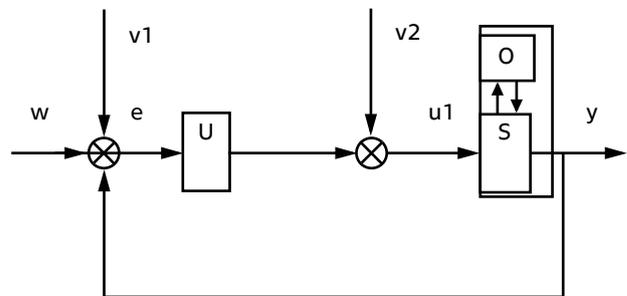

Fig. 3. Learning Management System

One of the main problems is the use of a comparative determination circuit measurement value. It is also necessary to select the magnitude of the impact on the system and the frequency of this feedback. [15]. Too many tasks, assignments, tests, presentations, various consultations can lead to students' fatigue, sometimes even lecturers, and the disintegration of the system.

Depending on the impact on the system / student - teacher / we may have different costs of achieving targets. The main task of management - minimizing costs (Fig. 4).
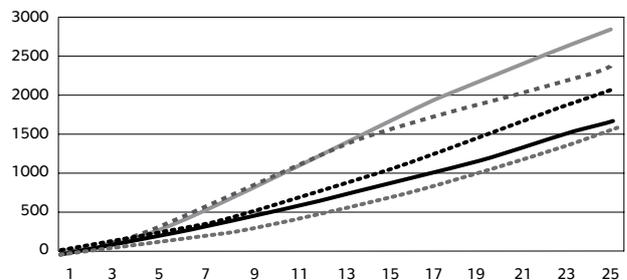

Fig. 4. Changes in expended energy E

Thus, you should not ask a lot, but it is necessary to give such assignments, tests using modern tools (chat, forum, presentations, formative testing computer automated systems, etc.) To the area under the curve y_i (Fig.2), (Fig.5) was minimal, but the student has reached the desired result.
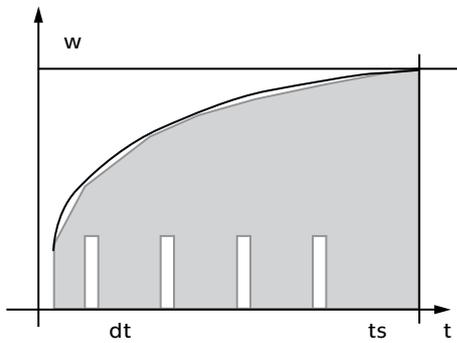
Fig. 5.   The control signals and energy spent

For the calculation of the impact of the given element on the result one can apply the following equation:

$$P_i = \sum_{j}^{n} p_{i,j} \text{ , or } P_i = \text{mod}\left(p_{i,j}\right)$$

where i − element coefficient

j − element of student

n −number of students

P − element of study

Knowing the value of P_i (Fig.6) can pick up a plurality of stimulating elements in an amount to achieve the desired objectives with optimum cost (Fig. 7).
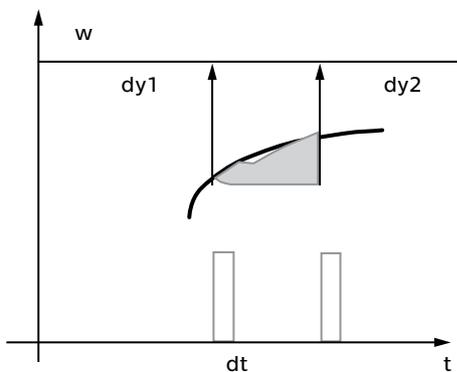

Fig. 6.   Increment of knowledge in the time of stimulation elements
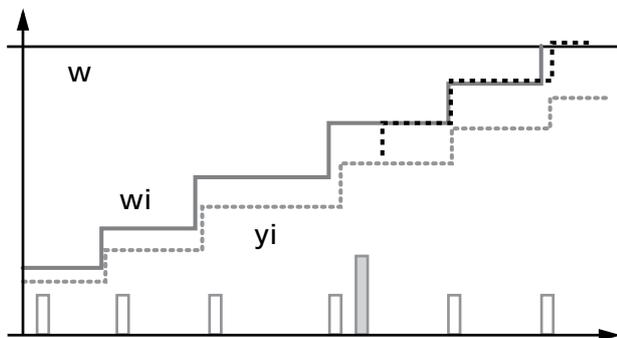
Fig. 7.   The sequence of exposure control system

Currently, to achieve very fast and efficiently the desired result, it is necessary to break the pro-

cess into several smaller processes. Then to add a stimulus. In the case of partial failure of achieving objectives, it is necessary to add another stimulus.

The use of IT technologies in teaching not only facilitates the work of the teacher, but also has an impact on the learning process. The possibility of implementing several types of feedback may also lead to changes in the training process, a process for lectures. This is a new methodology using IT technology to explain the new educational material conducive to motivating the audience. The role of feedback is to provide information on the state of knowledge and understanding of new material directly in the learning process. The teacher can change the ways and methods of work, can explain in more detail incomprehensible or not to spend time on something that is already known to all. The resulting additional time is used for the transfer of knowledge from other areas of science.

For this purpose, a small application to mobile phones, and the teacher can make a presentation directly into several issues. The great advantage of this feedback system is the fact that the teacher receives responses from all students.

If we compare the classical scheme of learning with the proposed method, it is possible to say, in the first case the explanation takes the first theme, you can set 1-2 control issues and move on to the following topics with a certain risk of students' understanding. In the second case, at first one defines a drawing, diagram or leading questions, but gets the opinion of all students. Further, based on existing knowledge, there is assessed and explained the correct answer with analysing errors. The work involves all students, and the lecturer has an idea about the general level of knowledge and transfers to the following topics. In this scheme, the student is no longer a passive listener, but an active creator of new knowledge. The use of this technique will allow full use of existing knowledge of students [16].

Investigation of the impact of the introduction of continuous feedback with the application of Learning Management System (LMS) Moodle has been realized in the University of Economics in Bratislava (Slovakia). The results of this research confirm the possibilities of the new method of supporting feedback improving the quality of students' training [17].

The research engaged 430 students for 2 years. During each semester, students solve several tasks with the use of various types using LMS Moodle. Then there were calculated the main statistical parameters of the results depending on the serial number of the task. The tested parameters were the number of students, solving the task, the mean value of the results achieved, the deviation of the correlation coefficient with the total value of the result achieved, calculated con-

nections of the results achieved and assessment at the exam. We assume that the more progress achieved - a relative value, the better the grade obtained in the exam. Values achievements of students were obtained from the information system of the Economic University in Bratislava (Fig. 8).

Based on the results shown in the graph (Fig. 7), which indicates the possible dependence of the results achieved on the number of decisions one can make a hypothesis about improving student outcomes, depending on the increasing number of students, solving this type of problems.

Total
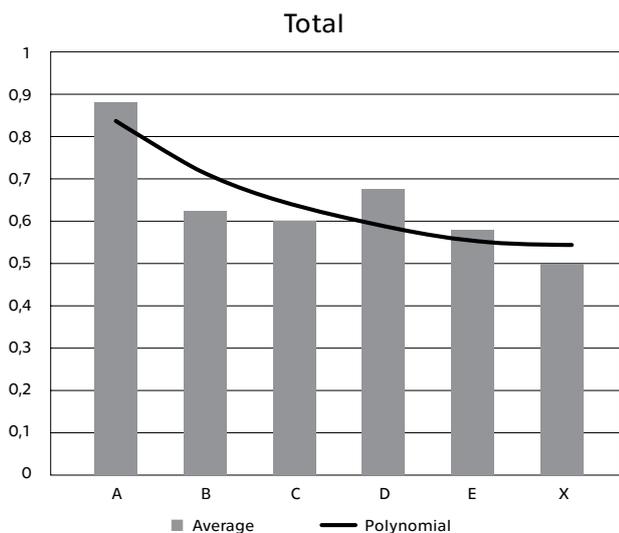
Fig. 8. Dependence of results achieved and the resulting assessment 2010/2011
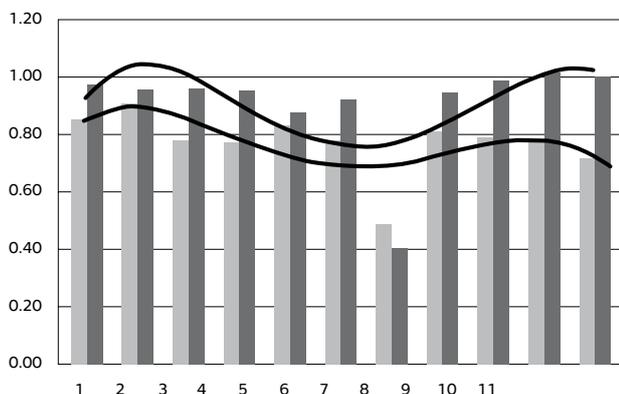
Fig. 9. Dependence of achieved results on number of decisions

When considering the dependency of progress in the training and the exam it can be assumed that the results achieved are sufficient grounds to achieve good results in examinations. However, some issues are increasing the number of grades in the LMS system, but the low result in the exam. This phenomenon may be due to increased self-confidence of students. The following year, the students were warned that, despite the good results, they need to pay attention to preparation before the exam. It led to the improvement of students' performance, and there is a higher correlation coefficient for the final evaluation and the results

Based on the results shown in the graph (Fig. 9), which indicates the possible dependence of the results achieved on the number of decisions one can make a hypothesis about improving student outcomes, depending on the increasing number of students, solving this type of problems.

At the same time, the use of IT-technologies is not enough evidence to improve the quality of education and level of results achieved by the students. It is assumed that IT- technologies can be a good support during examination, automation of selected methods of control, individual approach to learning. Therefore, it is necessary to pay attention to the creation of methods of IT-technologies application in education based on more research

Use of these systems could be one of the tools of teaching migrants at adaptation courses even during the stay pending a decision whether to grant the right of residence in another country. Persons without leaving their country can show their competences, which can lead to faster decision whether to grant a visa.

The practical use of these technologies in the learning process of foreign students was carried out in Kazakhstan and Dagestan. During lectures lecturer of the Economic University in UIB Almaty, ENU and Astana DGINH Makhachkala. Part of the lecture was to carry out a direct method and part of the lectures and workshops using IT. Important role played in the process of learning different forms of creating feedback. All students could be seen and heard, the requests could be checked in a chat, and the results of these requests on the server database system. If necessary, one could use the program TeamViewer to view the contents of a student computer screen. All the tasks the students solved on the server Oracle, which was installed on the server kultan.euba.sk:8080/apex or on the server MySQL installed on site hostinger.ru. Electronic verification and registration of the student's work made it impossible just to sit in the classroom but demanded high activities. The exam takes place in a fully online mode and contains both a theoretical part and practical. Since students are not in the same room, the exam tasks should be formulated in such a way that they cannot be solved by CtrlC CtrlV. The practical part of the exam takes place in the mode of direct connection to the server of the selected system. The lecturer can check the performance of each student by means of the direct access to the desktop. The entire exam takes place under the supervision of the video camera, and the students already know that the exam is recorded. So, if in the classical exam the lecturer can distract or look the other part of the audience, the camera will not.

Thus, one can manage joint training courses to improve the general level of education and reduce costs [18].

IV. CONCLUSION

After analysing theoretical and practical provisions relating to educational migration flows, we have come to following conclusions:

- Effective educational migration can be one of the drivers for the resolution of several socio-economic challenges.

- Attracting foreign students creates a special kind of competition.

- Can talk about a virtual educational migration

- Emergence of new forms of learning both the real and virtual requires new approaches in creating training programs.

- There are several problems when using virtual platforms. Virtually, one cannot teach all specialties, there is a loss of socializing function of real learning, geographically expanding the influence of other cultures and language localization.

- A properly designed open (virtual) education has a chance to select an individual learning path, use of IT-technologies and blended learning (virtual and real).

- One of the important issues is to support the feedback (lecturer-student-lecturer), definition of its model and the possible ways of its implementation. Modelling of the processes of feedback is possible by the analogy with the modelling of the technical system control.

- The main objective of the feedback control is the selection of the most successful impact on the system.

- The wrong selection of stimuli may have negative consequences. Therefore, the implementation of activities should take place with the best labour costs associated with the use of IT-technologies, with which the Generation Z prefers to work.

- Use of these systems may be one of the tools for teaching migrants at virtual adaptation courses when they prepare to move to another country. Thus, they can show their professional competences that promotes faster decision whether to grant a residence permit and training.

- With the creation of modern virtual educational platforms and programs economically feasible to limit the real presence of foreign lecturers at the host university to a certain minimum, followed by the virtual feedback support.

Thus, the education system is entering a new paradigm of real and virtual education, due to the interaction of international actors in this process, that requires the development of new educational courses and programs taking into account the cultural and cognitive features of Generation Z.

REFERENCES

[1] Krasinets, E.S. (2012). Mezhdunarodnaya migratsiya naseleniya Rossii v usloviyakh perekhoda k rinku [International Migration of Population of Russia in Transition to Market Economy]. Moscow: Science, 231.

[2] Vikhovanets, O.D. (2009). Obrazovatelnaya migratsiya kak chast migratsionnoy politiky Rossii [Educational Migration as Part of Migration Policy of Russia]. Doklad na zasedanii Nauchnogo Soveta FMS Rossii [Report at the meeting of the Scientific Council of the Russian Federal Migration Service]. Available at: http://www.fms.gov.ru/about/science/science__session/forth/vih.pdf (date of access: 10.09 2015).

[3] Kuprina, T.V. & Sergeeva, L.V. (2015). Mezhdunarodnaya obrazovatelnaya). migratsiya: problemy sotsialno-kulturnoy adaptatsii i vozmozhnie puti ikh resheniya [International Educational Migration: Problems of Socio-Cultural Adaptation and Possible Solutions]. Sovrenemmie kontseptsii professionalnogo obrazovaniya studencheskoy molodyozhi: kollektivnaya nauchnaya monografiya. [The modern concept of vocational education of students: collective monograph] Ulyanovsk: SIM-JET, 44-56.

[4] Kuprina, T.V., Minasyan, S.M. & Ruda O.V. (2010). Upravlenie emotsiyami v zerkale kross-kulturnikh issedovaniy [Emotion Management in the Reflection of Cross-Cultural Investigations]. Yerevan (Armenia): Limush, 151.

[5] Zharkov, V.K. & Taratukhina, Yu.V. (2015). Pedagogicheskiy konstructuvuzm v krosskulturnoy srede [Teaching Constructivism in Cross-Cultural Environment]. Moscow: Yanus-K, 276

[6] Ryazantsev, S.V. (2015). Mezhdunarodniy rinok truda i mezhdunarodnaya migratsiya [World Labor Market and International Migration]. Available at: http://biz-books.biz/book-upravlenie-personalom/mirovoy-ryinok-truda-mejdunarodnaya.html (date of access: 4.09 2015).

[7] Kultan, J. at al. (2010). Role of Modern IT-technologies in International Cooperation of Universities. In: All-Russian competition of scientific and practical projects in the field of technologies of virtual education in the teaching process: proceedings on 6-10 October 2010. Belgorod: Belgorod State University, Vol. 2, 104-111.

[8] Saraev, V. (2014). Ne leninskiy universitet millionov [Non-Leninist University of Millions]. Expert, 28 (907), 49-54.

[9] Belous, A. (2015). Kurs na virtualnost [Course is Virtual]. Ural Federal, 34 (6811), 3.

[10] Kirabaev, N. (2008). Dialog tsivilizatsiy: obrazovanie v poiskakh obshchey strategii razvitiya na puti k innovatsionnomu obshchestvu XXI veka [Dialogue of Civilizations: Education in Pursuit of Common Devel-

opment Strategy on Way to Innovative Society of XXI century]. World Public Forum "Dialogue of Civilizations". Moscow: Studio Matrix, 121-126.

[11]   Sherega, F.E. & Arefyeva, A.L. (2010). Chislennost uchashcheysya molodyozhi obrazovatelnikh uchrezhdeniy Rossiyskoy Federatsii: srednestatisticheskiy prognoz do 2014 goda i otsenka tendentsiy do 2025 goda [Number of Students of Educational Institutions of Russian Federation: Medium-term forecast up to 2014 and assessment of trends up to 2025]. Moscow: TsSPiM, 218, 271.

[12]   Kozík, T. at al. (2006). Virtual Cooperation and E-learning. Nitra: Pedagogical Faculty UKF in Nitra, 113.

[13]   Kozík, T. at al. (2011). Conference Systems in Educational Applications). Nitra: Pedagogical Faculty UKF in Nitra, 176

[14]   Kozík, T. & Depešová, J. (2007). Technical Education in Slovak Republic in Educatuonal Context in EU. Nitra: Pedagogical Faculty UKF in Nitra, 140

[15]   Kultan, J. (2014). Feedback in Educational Process. In: Proceedings of Lectures of the summer course Nitra 2014. Nitra: Constantine the Philosopher University in Nitra, 208-213

[16]   Kultan, J. (2015). Quick Feedback and Motivation. In: Proccedings of Social and Humanitarian Knowledge Institute. Kazan: Juniversum, No.1, 317-324.

[17]   Kultan, J. (2011). Research of LMS Moodle Implementation in Educational Process. In: Proceedings of III International Scientific Conference in Social and Humanitarian Knowledge Institute. Kazan: Juniversum, 295-300.

[18]   Kultan J., Zuev V.I., Abramov V.S. et al (2014) Development of Regulatory Support of E-learning in Republic of Tatarstan. In: Proccedings of VI International Scientific Conference in Social and Humanitarian Knowledge Institute. Kazan: Juniversum, No 1, 62-67.

Changes to Perfection in the University Systems

The Importance of Cooperation

Miriam Mattová

Vysoká škola manažmentu/City University of Seattle
Bratislava, Slovakia
miriam.mattova@hotmail.com

Abstract— **It is important to understand that there is a growing demand for education. The education systems have grown, developed, and changed and have become much more accessible over recent years. In order to keep the demand growing and simultaneously to maintain its quality, it is necessary to understand the current changes in learning, and bring them into the education processes. It is necessary to prepare educators appropriately showing them new concepts of learning as well as to change the mindset of administrators to become ready to accept and apply innovative leadership.**

All it means is to show the importance of cooperation and accept the industry demands of today upon students' qualification in the future working fields but also look for methods of management that can be applied in the university environment.

Keywords—university; university innovations; cooperation; industry demands

I. INTRODUCTION

Young students spend most of their time studying and gaining knowledge from books at universities. As times have changed companies and all industries demand much more from students when applying to jobs. Most students need universities to provide practical experience, which can be only achieved, from the business sector representatives. Changes in management methods at universities should provide students with skills they will need. Innovation and collaboration with corporations is the key to the new demands of the working market.

The process of learning is simple where a student will pick up information from what others know, or from given experiences. Success of each individual comes through many different learning processes (new skills, capabilities, attitudes and especially knowledge's), which cannot be measured.

Society's education systems are viewed as very costly, but not as a profit centers. Many governments in Europe help universities by subsidizing their costs in order to educate students, which contributes to the increasing development of the society.

II. NEW BEGINNINGS

For every student, it is not only important to gain knowledge but to also gain skills, to change views dependent on certain needs, to be able to make correct decisions on the workplace, be able to solve issues and problems in a workplace and to be able to judge based on capabilities. New principles and new learning styles need to be introduced to accelerate the learning processes at universities. If business would interact with university systems, not only learning process would change and develop, but also information processing might become easier to cope with, social interaction of students can grow due to new challenges, and especially cultural diversity can increase. This change in university learning systems can be a very difficult and long-term process, which can bring disagreements. Learning needs to have different varities in order to gain as many skills and come across or face different situations. Psychologists say that there are "four levels of learning namely, role learning, understanding, application and correlation" [4], but any knowledge or skill that is taught will surely be forgotten if it is not repeated or used regularly.

III. JOINING FORCES

The cooperation between universities and firms has become a very current and researched topic. In the European Union the competition between people, firms and economies have largely increased. In the 21st century we live in a world where there is free access to almost all information we need to know. Not only access to information, but also communication facilities have grown to a level where universities have to innovate in order to fit the new society we live in and be better than national or international direct or indirect competition. It is important for university and firm relations to show their role and meanings for the society and future students. Students are interested to see universities evolve and bring

industry linkages and new research sources both in the private and public sector [4]. The University and firm teamwork could bring up "three distinct aspects: the relation between science and economy, the inter-organizational relations between universities and enterprises, and the inter-personal relations between science people and professors and company employees" [1]. It is important to point out that firms and universities have different missions and vision for their research and learning processes. Universities want to target fundamental learning and research and firms more applicable learning and research. This divided thinking can change the whole future perspective of this new concept. If the Universities are interested in introducing research and learning in practice, it is necessary for Universities to offer business a new and unique analysis and a better-prepared work force.

IV. NEW SYSTEMS

In this developing age, we live in a world where universities have to understand, that knowledge is not the only focus it should have. Fundamental learning and research is a need of students that are searching for university options. Currently universities research knowledge which firms later apply to mode. In this case the university and students do not see the knowledge production and therefore do not have any experience and cannot develop or alter their findings based on results. To continue, the competition from other research institutes (consulting companies or research laboratories) have an easier role to produce a better final output. The competition and universities "produce new knowledge, with immediate applicability, relevant for the market. As a consequence, the university is interested in commercializing as much as possible, and the company in positioning as an innovative organization" [3].

In the future, universities should use their research and knowledge, which would show partnership between the two sectors (the industry would be responsible for the technological assurance and the university for providing labor in the given sector, which would result in perfect cooperation and satisfaction of both parties). The universities' innovation will always play an important role for the public and its public development.

V. THE FIRM'S EPRSPECTIVE ON THE FUTURE COOPERATION

It is commonly known that development and research receive major funding and attention from the public and the state, resulting in a lucrative investment. If the firms cooperate with universities in the future, the result can be either informal or formal partnerships depending on both parties. The informal partnership can be characterized as very flexible and would be better for smaller firms that are interested in an irregu-

lar cooperation. On the other hand, the formal partnerships, which will occur on a regular basis, could result in join-ventures. Formal partnerships consist of long-term contracts where objectives of both parties are the same. Even though there are many positives to this, joint venture problems might arise. Both parties can face problems with different organizational cultures, different norms and values, different work consistency and especially differences in decision-making. On the other hand, what is very beneficial is the cost sharing of the projects and tasks for firms. This could lead to a reduction in costs, but it is also important to mention that in some countries of the European Union the government finances associations between firms and universities only if it contains beneficial research and development solutions. Like in every project there are many advantages and disadvantages for the cooperation. The firms are interested in gaining an increase in their economies which results from investment in university researches, developments, innovations, skills and lastly university employees. On the other hand from the perspective of the university and its faculties they will see lower costs of researches and development, which results in smaller risks and also the capability to handle more or larger projects. It is important to mention that the state government funds certain university projects so the firm will not have to provide 100% of the funding.

The university offers firms trained students which are motivated to develop and show themselves on the market; therefore, this cooperation can be seen as a costless and efficient investment that will bring the most efficient discoveries and/or innovations.

VI. DISSADVANTAGES TO THE COOPERATION

Above mentioned advantages are brought down after identifying the disadvantages which are as important to mention.

Firstly both the universities and the firms have different ways of coordinating and processing information, which could bring up problems if these issues are not coordinated in a similar matter. To continue public universities are primarily funded from government sectors, which could mean the companies would choose state universities prior to the private sector even if they would be a better choice for the firm's needs. Results and objectives of a project could be used by one's purpose only and therefore be unproductive for the other party. Next it is important to mention who is the owner of the "know how" of the research (those who take credit for the project). Both parties need to be adequately mentioned in the results of the findings. Lastly if a proper contract is not signed before the start of the cooperation, clarification difficulties could arise in the future. In Slovakia, there is no tradition of universities cooperating with firms and therefore Universities and firms

will firstly have to learn how to cooperate with each other, which could affect the results and delays in timelines.

VII. THE UNIVERSITY PERSPECTIVE ON THE FUTURE COOPERATION

For the universities, this opportunity could be beneficial for all, especially for the progress and improvement of the society. For firms this cooperation is an activity that brings a competitive advantage, but for the universities it means it's a need. As the European Union wants to develop and have a strengthened economy, it needs to increase their innovation and development. Compared to the United States and other nations from the EU, I can see a successful cooperation between firms and universities (for example Harvard, Stanford and even Brown and Princeton Universities are financed by the private sector which now result in leading research groups). Firstly creating employees by the university would give the students and professors extra salaries, percentages from the projects, new offices and especially new equipment. This means the students would receive perfect training and freedom of research, which would help them grow without worrying about funds for projects. To continue, as already mentioned the students will not only develop the project but also will have the capabilities to text and run the results. Most importantly the ability to learn directly from the people in the industry will contribute to a better student and university profile resulting in better serving and giving back to the society. Unfortunately there is a big threat concerning lack of staff to support the projects, which ties into high administrative costs, which could lead to problems.

VIII. METHODS OF PARTNERSHIP

It is important to understand that there isn't just a partnership between the universities and firms but between all employees, staff members, students, academics, stakeholders, and lastly owners.

The partnership could be fostered through specific research, training, consulting or learning programs by joining ventures. The consulting could bring universities important advantages on the university profiles and firms can build trust and awareness within the universities and their new offerings. Students at universities take these new opportunities and put maximum effort into performing what is required, and the motivation factor produces better results. This type of cooperation could be handled with small assistance contract dependent on a certain project or research or if it's a long-term relationship with a firm the contract can be steady and develop based on future needs and wants of both parties. The European Commission [2] refers to eight main forms of cooperation join activities, consulting, contract research, join publications or supervisions, and lastly formal or/and personal networks.

The new trends in the labor market are important to be shown to the students. This could be done through involvement of CEO's, managers or department leaders of firms. The views of firm employees could shape the modules and syllabuses in order to make the study programs more relatable to real life examples. The reasons why the demand for education has grown is due to the competition the markets are facing. These new generation students look for learning programs, which will develop their skills in order to have an advantage above other people looking for jobs in the same industry. Lastly firm members can be a part of university board commissions and professors and students can contribute to the decision-making processes in private sector firms.

This new trend shapes the universities into more innovative institutions and have a strong entrepreneurial base.

IX. CONCLUSION

In conclusion, the cooperation between firms and universities are complicated but very important, for the long-term development of the universities. Multiple factors such as finance, strategies, objectives and situations influence the future of this cooperation. Therefore it is important to plan and develop strategies to overcome issues or problems. The benefits given from this partnership can improve learning, develop new skills in new students and future employees, improve business performances, and help the economy and the society by decreased unemployment. The university can have a better reputation and image by expanding and having more research options. Lastly the problems that can arise between the firms and universities are mainly due to the lack of money invested into research and due to problems with communication and objectives both parties do not have in common.

REFERENCES

The template will number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] was the first …"

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors' names; do not use "et al.". Papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished" [4]. Papers that have been accepted

for publication should be cited as "in press" [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

[1]   Croissant, J.L., Smith-Doerr, L. (2008): Organizational Contexts of Science: Boundaries and Relationships between University and Industry. In: Hackett, Edward J.; Amsterdamska, O., Lynch, M.,

[2]   European Commission (2011): The State of European University-Business Cooperation, Münster: Science-to-Business Marketing Research Center

[3]   Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., Trow, M. (2005): The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies. London u.a.: SAGE Publications

[4]   Urayaa, E. (2010). Conceptualizing the Regional Roles of Universities, Implications and Contradictions, European Planning Studies, 18(8), pp. 1227-1246

[5]   Wajcman, J. (eds.): The Handbook of Science and Technology Studies, 3rd edition. Cambridge u.a.: The MIT Press, pp. 691-718

Gaming Methods in the Management Teaching at the Secondary Schools

Martina Polčáková

Tomas Bata University in Zlín
Faculty of Management and Economics
Department of Enterprise Economics
Zlín, Czech Republic
polcakova@fame.utb.cz

Kateřina Bočková

Department of Management and Economics
DTI University
Dubnica n/V, Slovakia
bockova@dti.sk

Abstract— **The aim of presented paper is to design the game methods to teach Management at the secondary schools. The concept is anticipated with the analysis of information sources describing gaming methods and their principles with an emphasis of economical subjects teaching, mostly subject Management. Next in form of research we identify, if games and gaming methods are attractive not only for pupils and students but for adults as well, than through the interviews with teachers of economical subjects we identify the possibilities of use of gaming methods in the Management teaching on secondary schools. The core of the work is the design of specific gaming methods for teaching the subject Management, which were actually implemented in the classroom. Questionnaire survey with pupils identifies strengths and weaknesses of the use of these methods and validates the use of these methods.**

Keywords—gaming methods, economical subjects, management

I. INTRODUCTION

Nowadays an important factor presents ability of each individual to adapt, be dynamic and learn new things. In time when information technology is developing, everything is changing constantly who is not be with it sooner or later lose track of trends in neighbourhood or do not understand them. Especially more then can discover others who manage this and can prepare less adaptable on site. Organizations change, increase or disappear, arise branches, merger or amalgamation of organizations, new information system is implemented. Neither for management it is not easy because of insists on keeping up, innovative and proactive behaviour and the use of modern techniques and tools as well as prepares colleagues and employees. First of all need to begin to effectively learn because no everyone has this property and each person has a unique mix of features and capabilities. More than time to effective learning is just at secondary schools.

It turned out that the most effective way of learning je a form of gaming as Horčička and Jelínková [10]. But the game is not a game. Normal game possibly amuses or learns some in-teresting facts. The principle of teaching gaming method is quite similar to the classic games but contain some features which distinguish it to the classic games.

Gaming methods in the system of didactic method as such are not exhaustively defined. Elements of the game can expose into many didactic methods which are classified on various factors. "Game" occurs for example in didactic method, simulation, role playing or didactic method aimed at learning and problem solving etc.

The output of this paper is answer to the question whether we can use gaming methods for improvement in Management teaching with specifics economic subjects at the secondary education. We suggest specific gaming methods in the Management teaching. We apply them to the teaching at the secondary school among pupils based on interviews and questionnaires. Than we identify the strengths and weaknesses of gaming methods and validate their application in secondary education.

II. METHODOLOGY

The concept of specific game methods preceded by analysis of information sources describes gaming methods and their principles with an emphasis on learning and education with regard to the specifics of economic subjects. We use the analysis and summary of relevant findings which were collected during about fifty-year history of gaming methods by scientific community. In this area we mainly focus on the validity of using gaming techniques as alternatives for traditional learning methods (lectures and case studies). After elaboration of this part we should be able to estimate about using games and gaming methods for specific purpose. We specifically mean the suitability of gaming methods as tools for teaching specific knowledge and skills.

We could found only a little information of the issue of gaming methods in the Czech secondary education. We have to use mainly English expert articles which are concerned with this topic.

Through the use of questionnaire survey we could identify facts whether game and gaming methods are attractive not only for pupils and also for adults. With this step we wanted make sure whether it is appropriate and relevant to propose the inclusion of gaming methods into contemporary secondary teaching. The questionnaire survey was carried out between April 11th 2016 and April 22nd. 2016 between 100 samples of respondents. The goal was to determine if respondents like games which develop their skills and thinking. For process of the questionnaire we used www.vyplnto.cz. This questionnaire contained 6 questions.

Using interviews with teachers of economic subjects we investigated the possibility of using gaming methods in these subjects in light of the time terms, demands on the preparation, applicability and legislation. In this context w formulated the following key questions:

KQ1: Which significance have games in secondary education?

KQ2: How effective use games in the process of secondary education?

Respondents were pre-selected and approached with the request to participate in the qualitative survey. There were 5-dpth qualitative interviews with 3 men and 2 women.

The result of this paper is the design of gaming methods for teaching the subject Management which were implemented in the classroom. Questionnaire survey of pupils we identifies strengths and weaknesses of those methods in teaching. The survey was realized personally in April 2016.

III. GAMING METHOD AS AN IMPORTANT TOOL OF EDUCATION

Significant stimulus to use games in school teaching have come psychology and research about principle and significance of the game, for example [1] and [4]. Beyond question is also positive effect of game like spontaneous activity resulting from the satisfaction of natural needs and interest of adult human (spontaneous learning „out of curiosity").

Game theory contribute to the knowledge of the game as a multipurpose activities which serves satisfy of many different needs of the child and allows his development in all aspects. Prominent Greek philosopher Plato was one of the first who realized practical value of game. Plato in his „Laws"provides practical advices how encourage game on small children.

Theoretical considerations about the game and its essence appear with some exceptions (J. A. Comenius, J. J. Rosseau, B. Froebel) as lately as 19th century which come into notice to a child in many ways.

Maňák in [15, s. 31] indicates that another promoter of the idea of using games in school teaching has also Czech teacher, theologian, philosopher, social and religious thinker, priest and writer J. A. Comenius through his work „Schola ludus". His approach but rather emphasized the child near a natural activity as a framework for learning. He also used dramatization of teaching materials which pupil conveys the experience of becoming recognized activities and exact conditional and permanent adoption.

English philosopher Herbert Spencer (1820–1903) was based on the belief that children play mainly weed out excess energy. He considered unusual game for speech innate power and the energy that a child needs discharge during the day. Instead German psychologist Karl Gross saw that game is a king of certain functional exercise where a small child (like an animal cub) is preparing for future embarking on life.

In a further understanding the importance of game came on in the early 20th century renowned Viennese physician and psychiatrist Sigmund Freud (1856–1939).

He saw the opportunity how tap into deep of personalities through the game, how to know their wishes and interests. H used the game as well as a method for treating mental illness. Based on the assumption that „human expressions and behaviour are determined how many pain or pleasures bring. A man repeatedly finds the pleasant experience and prefers to avoid unpleasant one. In the game human behaviour and conduct may not conform to any external givens, is motivated by the desire of the individual" [5, s. 64].

Freud also supposed to the game activities of child are directly or indirectly in symbolic action reflect wishes and conflict as mentioned Geoffrey in [7].

Significant contemporary theory of game is theory of Geneve psychologist Jean Piaget. He connects the game of child with his intellectual development as described in [20].

The Dutch historian Johan Huizinga wrote in [11] that the reason for the game is for example discharge of energy, training in the activities which will be operated seriously or vicarious satisfaction of desire which cannot be fulfilled in fact. According to [11] the game was kind of similarity or other facility to Freudian displacement (in this role would rivalled with dream). Huizinga in his book Homo loudens (The Origin of Culture in the game) [11] set of several characters which do not lose their topicality till today:

- the game is free negotiation, nobody can force me to play,

- it is the appearance of an ordinary life into a temporary sphere of activity with own tendency,

- the game is closed spatially and temporally bounded,
- it is possible the repeated the game – whole game or in part,
- the game has specific rules and regulations,
- for the game can be found rhythm, harmony and tension.

Huizinga [11] wrote this definition: „*According to a form we can collectively called game as a freedom of action which is meant by just and stands outside ordinary life but that can still players to fully take on which further no material interest and which is net achieved any benefit which takes place in specifically designated time and in specially designated space which takes place according to certain rules and raises the life of a social group that likes to surround secret of which lifted out of the ordinary world that is acted by for another .*"

With this definition we cannot certain agree wholeheartedly that the game achieves nothing. Through the game is it possible practice a variety of skills (motor skills, memory, and creativity) to simulate a variety of situations occurring in real life. The game is able to relax. The game increases the intensity of life and enriches the human being as a personality. By game we are expanding experience and enrich our own life

It is necessary to appreciate the importance of game in learning of children and give her thoughtfully official space in the school work a significant educational resource. The game is an activity which entertains and is based on the intrinsic motivation of the pupils that we need to encourage. In contrast the learning and work are only a secondary motivation (for a fee) with is confirmed [12], [14], [24].

Authors of Pedagogical dictionary [21, s. 48] define a didactic game follow: „*Didactic game is an analogy of spontaneous activity of children which tracks (for students is not always obvious way) educational goals. It can take place in a classroom, the gym, on the playground, in the village or in the countryside. The game has rules and requires preliminary management and final evaluation. It is designed for individuals and also groups of pupils. The role of educational leadership tends to have a wide range of main organizer to the observer. The advantage is a stimulate charge because awake interest in increasing the involvement of pupils in activities undertaken, stimulates their creativity, spontaneity, collaboration and competition forcing them to use different knowledge and skills, engage life experience. Some educational games are similar model situations from real life*"

In [2, s. 65] author wrote that didactic game is „*game with the educational program. The goal of didactic game is develop cognitive processes and intellectual abilities of the child to expand his knowledge amusing way. The structure is consist role, activities and rules of the game. The game role reflects didactic summary and concrete objectives, form of activity which didactic riddle should solve. An essential requirement is entertaining, attraction activities. Game activities motivate child to solve didactic tasks without them didactic game is not game. Game rules contain specific requirement for game activities more attractive and enjoyable. Compliance with the rules increased dumping efficacy of didactic games. Didactic game have abundant principally use in pre-school education but in modified form is massively applies on older children and adults.* "

IV. DIDACTIC GAME AS ONE OF TEACHING METHODS

Lately many innovative currents emphasize the importance of the game as a teaching method. Using the game for educational purposes has a long history which is confirmed [18]. Consistently use them teachers of the lowest of primary school. Incorporate it into the education process with a goal to fostering interest of students in learning and new knowledge, he says [25]. Based on the efforts to alternative approaches to teaching this method meant increased application in recent years. Through the games and play activities is it possible solve common and complex learning tasks with pupils because the game is for them powerful motivation stimulus which is able to significantly mobilize their cognitive potential, says [19].

Preparation of classwork in which the method is implemented is for teachers consuming and requires rethinking functional filling organizational and content, material security, preparation and selection of students groups. Space for inclusion of didactic games in teaching which perform this function while not delay we can look at each subject in question. The game has own place in all subjects. This is of course a didactic game but disturbing didacticism can be easily wiped such games. If teacher know how to play game correctly and sensitively choose the appropriate time to include teaching and competently implement [23].

The benefit is if a teacher takes a card catalogue of games for his teaching subjects. In this card catalogue he could sort of game according to certain criteria. He can sort it or example in terms of the impact of games on the development of creativity. In light of the impact of games we distinguish game that affect mobility, fluidity and originality of though and creation, design, production, organization, transformation, ability of novel expression, implementation, translation and transposition, combination, decision making, customization and organization. There can be

also aspects exclusively methodical which provides [12, s. 323-324].

In the literature we can find a variety of educational games for example various quizzes, competitions, problematic tasks – treasure hunt, searing for the tomb of the Pharaoh, Jumanji, Scrablle (to make form letters so many words). In teaching can be used mostly games that develop cognitive functions of students. It provides vicariously a kind of cognitive training in general (this can also include free games – constructive and thematic) or specifically focused on the acquisition, repetition and practice relevant curriculum (educational games and simulation).

Didactic game has a firm place in school teaching and good orient teachers do not regard it as a waste of time. They recognize that the appropriate classification reduces energy consumption significantly - mainly repetition and practice subject matter. Didactic game contains a significant element of self-realization in cognitive activities. Deliberately evoke productive activities and developed thinking because most educational games are based on problem solving. The student learns to follow the rules in the didactic games and in games with rules. It supports his socialization and leads to his self-control. Teaching and cognition go through peacefully and with spontaneous interest which is important. In the game is applying culture of adult life. Student has the opportunity learn through the game to deal with people as confirmed by the [3], [6] a [8].

Result of the game as a didactic method always depends on the classroom climate but also on creativity and organizational skills of teacher.

V. OUTCOMES AND FINDINGS OF ANALYSES

The results of the questionnaire survey can be concluded that the proposal to include gaming methods in secondary school would have found in this sample of your application. Respondents reported particularly experience of a bad time working and a sense for organization and control. This fact points to the fact that gaming methods are rejected unlikely. Whether the player improvements realized or not it surely would have enjoyed the game and helped to develop these skills.

Further interviews were conducted with the teachers of economic subjects. In its basic form the scenario of talks dealt with the question of the nature and benefits of secondary education from the perspective of the respondents. Other question was about motivation of pupils play with practices. Than which kind of games is the most popular among the pupils. Example of some game brings a concrete contribution to development and education of pupils in secondary schools. Last question (according to predetermined outline) was asked at another area of secondary education which should be used more gaming methods.

We note that the inclusion of gaming methods in secondary education has been made by all five of the respondents perceived generally as very important. Specifically essence of the games has seen as for example games offer the opportunity to solve problems from a different perspective. Than enrich the learning process, the benefit was for example effectively lead of game to the acquisition of new competencies or detect hidden personal qualities and skills also enable assume other roles and behaviours and lead to the promotion of cooperation and defining roles within the team.

Based on the findings above we decided to design of specific gaming methods which we recommend include in teaching of Management in secondary schools.

VI. VI. CONCEPT OF GAMING METHODS FOR TEACHING OF MANAGEMENT

Below there are examples of gaming methods which we implemented to the course Management in secondary school (advanced subject field). Those gaming methods are described in detail in Max.

Mind map:

Mind map is for repeating and deepening knowledge of planning, setting goals and priorities in the work of manager

- *Process:* the teacher writes in the middle of the board DETERMINATION OF PRIORITIES. Pupil say everything what they know to key word. The teacher writes on the blackboard and together with pupils creates graphically the connection which organized into the mind map. Pupil improve actively their knowledge, gain visibility, classify their knowledge systematically and discovering new context. The teacher can change the key word for example to TIME MANAGEMENT or PLANNING TIME OF MANAGER.

Brainstorming:

Brainstorming within the frame of theme „Communication and presentation skills of manager"**.**

- *Process:* Objective of pupils is detect a variety of communicate competence of the manager. Other objective is get to know communication with each other. They use their current knowledge, equip berth of their parents. The teacher encourages and motivates pupils to be creative, open and active. Pupils work first of all individual (within 5 minutes each pupil notes his proposal), then discuss their ideas with other members of the group and then present

it as a group against other. The role of the teacher is organizing ideas of pupils, help to check the essential, together with pupils define other key communication skills of managers.

Venn diagram:

Venn diagram in the frame of topic „Monitoring and controlling".

- *Process:* The task is comparing two terms: monitoring and controlling. Pupils draw two intersecting circles. In the first cycle they briefly wrote characters of monitoring. Second characterized controlling. At the intersection is space for common features. Pupils work individually or in the pairs and then present their results in front of the class and teacher. Together define common features and differences of both terms.

Cube method:

Cube method in the frame of the topic „Corporate culture - structure, level, formation and change over".

- *Process:* The teacher introduces pupils with the topic of "Corporate Culture" what about they will be thinking according to six criteria and in random order (determined roll of the cube). The task of pupils is write about the topic within 2-4 minutes as it gives an instruction that "fell" on the block "1" describe, "2" compare, "associate 3", 4 "analyse," 5 "apply, "6" argue.

- *Example of the topic:*

  DESCRIBE: corporate strategy – what is it and what the function of the company is;

  COMPARE: corporate culture and corporate image

  ASSOCIATE: sanctions and bullying in the workplace;

  ANALYSE: assumptions making and changes in corporate culture, corporate values, norms, symbols, patterns of behaviour, manners of company employees, company reputation;

  APPLY: principles of healthy corporate culture at school;

  ARGUE: why create a healthy corporate culture.

Roundabout:

Roundabout in the context of practicing and repeating ot the theme „Stress of the manager at work, how to face and how to cope."

- *Process:* The teacher divides the class into two halves. One half of the pupils are sitting on chairs arranged in a circle. Second

half of pupils form cycle around them - face get out of the ring while the formed around them a second ring such that the face pointing to the circle. Pupils sit in pairs and contact with eyes. Couples sitting opposite each other working together at a specified time. Subsequently, the inner ring is designated as "visitors" and outer as "guests". Visitors are invited by the teacher to move on the next group of clockwise direction. After a certain period of time, the outer circle moves one place so everyone gets a new partner. The role of hosts is to share the information with new visitors. The information has learned from previous discussions in the original composition.

- Visitors ask of hosts and inform them about the new knowledge which they gained in the previous composition. After lapse of time are visitor asked again move to another group. The hosts remain in the place. This process continues until reunites the original group back. The original members of the group again discuss together about given questions in the context of new knowledge which they get during the entire of carousel.

- Half of the students are sitting on chairs arranged in a circle so that his face goes out of the ring (outer configuration) while the other half of the students formed a circle around one second, so that his face heading to the ring (internal organization). It is essential that teachers instruct students how to implement this activating method. Students divided into halves, then groups and circles. Each group enters a sort of starter questions and comments on the papers. He asks a group of fast processing of questions. Continuously monitors time and ensures that each group worked well. Visitors to the instructions of the teacher move to the hosts in a clockwise direction. After connecting with the original group teacher asks the students to re-discuss issues starting with the newly acquired knowledge. In conclusion, there is a discussion across the group.

Example of questions:

- What is stress?

- How stress?

- Provide examples of stressors.

- How a person reacts to stress?

- How to handle stress? Indicate the process.

- How can a manager help of stress?

6-3-5 Brain writing:

Using the Brain writing 6-3-5 within the frame of topic "Motivation and stimulation of workers"**.**

- *Process:* It is a special method which enjoys pupils, important is role of the teacher who is the moderator and evaluator. We use the brain writing 6-3-5 virtually for example with the theme of motivation and stimulation of workers. It is sort on introduction, before the interpretation. The task of groups of pupils is write "what motive them at the present time and what is their positive motivation." Virtually they proceed by a six-member groups of pupils have specified that issue. Each student of the group to question produces three ideas to the question, ideas writes on the sheet of paper which passes its neighbour on the left side and take suggestions from a neighbour on his right hand. Each pupil write other 3 ideas and thus proceed until the moment when the sheet of paper gets back to the original owner, the discussion round ends (takes 5 min) and the following evaluation group, presentation representatives of the groups before the other and the final solution formulation. Method for evaluating enables teacher to differentiate between the concepts of motive and stimulus which in our experience pupils often used interchangeably or do not see any difference.

Additionally we used marking and production of roles. From the lengthier gaming methods which rather than individual topics of education (hard skills) develop basic management skills (soft skills) as team management, coordination, taking responsibility, ability to make decisions in stressful conditions we used Abigail and Colour tower.

VII. RESULTS OF THE QUESTIONNAIRE ABOUT USE OF GAMING METHOD IN THE TEACHING OF MANAGEMENT

We found through the questionnaire survey that 49 % of girls responded to the questionnaire positively, 27% responded negatively to the questionnaire and 24% responded to the questionnaire do not know.

Almost half of the girls liked gaming methods and interest them. The girls positively assessed the gaming models reflect actual practice and teaching through gaming methods for them interesting. The girls also had positive reviews on gaming method as a modern form of education and the problems and issues to be addressed gaming methods are addressed in the classroom. Girls negatively assessed the fact that the gaming method did not motivate them have after school own business.

Questionnaire survey among a group of boys we found that 48% of them responded to the questionnaire positively, 27% responded negatively and 25% responded to the question of the questionnaire do not know.

More than half of the boys liked gaming methods and interest them. Boys positively evaluated teaching through gaming methods as interest. Boys negatively evaluated the gaming method did not reflect actual practice and also that for them is a good way of teaching. Boys as well as girls rated negatively the fact that the game did not motivate the methods to do business after school.

VIII. CONSLUSION

Gaming methods are in the 21st century one of the most attractive teaching methods. They govern them uniquely area quantitatively-based capabilities in the field of business economics with an area of decision-making skills in the field of management and teamwork and people management in the field of managerial psychology. In addition of the practical experience of managing a real company we would be difficult to find another type of educational activities which in this regard as good conditions.

Gaming method divide players into teams which then act in certain roles which mediate the players a lot of experience, offer the opportunity to develop talent and acquire so desired skills, knowledge and skills. From the team character of gaming methods imply emphasis on interaction. On the one hand is active form collaboration of team members. On the other hand it is a process of communication, cooperation and competition between teams. Objectives of different applications gaming methods may be different almost always in them but occurs element evaluation and reflection. Its outstanding feature is a stage, then their character. Each game is divided into several stages representing a specific time period. It gives players the opportunity to feedback and strategic decision making. The winner is the team which the best maximize their profits.

One of the objectives of the present paper was to define and describe the gaming methods and their use in the secondary education. It was accomplished with the help of the study of theoretical knowledge of this phenomenon in many professional publications and resources that combine andragogy knowledge with the practical use of gaming method in secondary education. These sources also revealed the fact that the game is reflected in many areas of human life from childhood to adulthood and old age and its concept is extremely subjective and based on many different factors, so there is no uniform definition of games as such, neither game within secondary education. As it emerged from several sources used the game can be primarily seen as

a children's activity, among other things, can serve as a form of remuneration for the time off, after completion of the tasks and responsibilities, but in many cases it may be just a game that helps us overcome problems or dealing with difficult situations in their personal and professional lives.

In an analysis of information sources we focused on those authors (eg. [28] [29] [11], etc.), who in their definition of the game also reflects the education and development, and the game more broadly understood as a source entertainment and a means to relax, but also as the bearer of self-realization, educate, educational functions or states that the game can be a means to fulfil the various professional, personal and educational needs [26]. Also respondents in the context of a qualitative survey confirmed that games occupy an integral part of the learning process and the development pupils of secondary school especially because they can be consulted on the personal and professional problems from a different perspective, developing soft skills, team collaboration and fulfilment of the individual and give him space creativity, finding new solutions for dealing with and overcoming oneself, discovering new skills.

As well as secondary economic education has specific elements also game in the lives of secondary school pupils may have a specific shape and perform different functions, for example, than the children's games and almost adults also have other gaming themes. Among secondary school pupils who themselves already know rather than the physical important psychological aspect of games and their subsequent analysis because in different situations of your life and get to perceive a degree feedback which is an important means of self-realization. The psychological context may also be related many of the barriers that often secondary school pupils are playing against. This was also confirmed by respondents in the survey because of their expertise and experience has shown that many pupils are in the beginning of the motivation is very low mainly because of various barriers, low self-esteem, shyness or the belief that play is just for kids. It is important to such participants clearly explain the benefits of gaming with respect to practical use in your personal and professional life successfully is drawn into an imaginary plane through the game's story and new roles to find solutions to real problems.

As for classification of gaming methods in the secondary education is concerned, based on the research literature there is no uniform taxonomy and many authors or publication offers various divisions on the basis of different internal and external factors of the educational process. „Game" appears for example in the teaching methods of simulation, role playing, in teaching methods aimed at learning and problem solving etc. In addition the introduction of several classifications from the perspective of various authors (eg. [22],

[9], [27] etc. .) are described in detail in the work of the game within the design of which was devoted to the possibilities of using gaming techniques for teaching Management.

Topics of gaming importance in the secondary education, their benefits and relationship to the didactics and andragogy etc. were confirmed in this work.

REFERENCES

[1]   J. Čáp, "Psychologie výchovy a vyučování", UK Praha, 1997.

[2]   L. Ďurič, "Úvod do pedagogické psychologie", Praha: Státní pedagogické nakladatelství, 1979.

[3]   E.J. Evangelu and O. Fridrich, O., "111 her pro motivaci a rozvoj týmů.", Praha: Grada Publishing, 2009.

[4]   D. Fontana, "Psychologie ve školní praxi", Praha: Portál, 1995.

[5]   S. Freud, "Psychopatologie všedního života: o zapomínání, přeřeknutí, přehmátnutí, poěvře a omylu", Praha: Portál, 2016.

[6]   W. Gentry and C. Burns, "Do we learn from experience?", Developments in Business Simulation and Experiential Learning, vol. 10, s.139-142, 2003.

[7]   P. Geoffrey, "Moderní vyučování", Praha: Portál, 1996.

[8]   G. Hagoort, G., "Umělecký management v podnikatelském stylu", Praha: KANT, 2009.

[9]   S. Hermochová, "Hry pro dospělé", Praha: Grada Publishing. 2004.

[10]   A. Horčička and L.Jelínková, L. "Zvyšování výkonnosti lidských zdrojů zavedením manažerské hry", Trendy v podnikání, s. 51-62, 2013.

[11]   J. Huizinga, "Homo ludens. O původu kultury ve hře", Praha: Mladá fronta, 1971.

[12]   Z. Kalous and O. Obst, O. et al., "Školní didaktika", Praha: Portál, 2002.

[13]   J. Kočí, "Baví vás hry, které rozvíjí schopnosti a myšlení?" [online]. 2016 [cit. 15.9.2016]. Retrieved from https://bavi-vas-hry-ktere-rozvijis.vyplnto.cz

[14]   P. Kukal, "Jak najít tu pravou vyučovací metodu?" [online]. 2005. [cit. 24.9.2016]. Retrieved from http://www.ceskaskola.cz/Ceskaskola/Ar.asp?ARI=102003&CAI=2125&EXPS=%22VYU%C8OVAC%CD2A%22+AND+%22METODA%2A%22

[15]   J. Maňák, et al., "Alternativní metody a postupy", Brno: Masarykova univerzita, 1997.

[16]   R. Maxa, "Využití moderních výukových metod ve výuce ekonomických předmětů na středních odborných školách", Collection of Papers 2011 - The 12th Annual Doctoral Conference, Faculty of Finance and Accounting, University of Economics, Prague, recenzovaný sborník. Praha: Nakladatelství Oeconomica, 2011.

[17]   R. Maxa, "Výukové metody se zaměřením na alternativní metody ve výuce ekonomických předmětů", Sborník příspěvků V. Mezinárodní vědecké konference doktorandů a mladých vědeckých pracovníků Karviná, recenzovaný sborník. Opava: Slezská univerzita v Opavě, 2012.

[18]   M. Montessori, "The Montessori method", New Brunswick, 2014.

[19]   K. Patersonová, "Připravit, pozor, učíme se!", Praha: Portál, 1996.

[20]   J. Piaget and B. Inhelder, "Psychologie dítěte", Praha: Portál, 2014.

[21] J. Průcha, E, Walterová and J.Mareš, J., *"Pedagogický slovník"*, Praha: Portál, 1998.

[22] A. Rachow, "Spielbar II. 66 Trainer präsentieren 88 neue Top-Spiele aus ihrer Seminarpraxis", Bonn: managerSeminare. 2005.

[23] Č. Rosecký, "Učební metoda, učitel a školní vzdělávací program", [online]. 2003. [cit. 20.9.2016]. Retrieved from http://www.ceskaskola.cz/Ceskaskola/Ar.asp?ARI=101014&CAI=2124&EXPS=%22TVO%D8IVOST%2A%22

[24] R. Sárkozi, "Naučte děti myslet a učit se!", [online]. 2005. [cit. 25. 9.2016]. Retieved from http://www.ceskaskola.cz/Ceskaskola/Ar.asp?ARI=102454&CAI=2125&EXPS=%22TVO%D8IVOST%2A%22

[25] J. Skalková, "Obecná didaktika", Praha:Grada, 2007.

[26] J. Vaněk, J. and R. Vaníčková. 2015. Management of the innovation in the company: knowledge sharing or autonomy? *Human Resource Management & Ergonomics,* Žilina: University of Žilina, Faculty of Management Science and Informatics. 9 (1), 97 - 107. ISSN 1337-0871.

[27] G. Wallenwein, "Spiele: Der Punkt auf dem i. Weinheim", Basel, Berlin: Beltz Verlag, 2003.

[28] M. Zapletal, "Velká encyklopedie her. Hry v přírodě", Praha: OLYMPIA, 1985.

[29] M. Zapletal, "Velká encyklopedie her. Hry v klubovně!, . Praha: Leprez, 1996.

Current State of Project Management Education in the Czech Universitites

Martina Polčáková

Tomas Bata University in Zlín
Faculty of Management and Economics
Department of Enterprise Economics
Zlín, Czech Republic
polcakova@fame.utb.cz

Miroslava Komínková

Tomas Bata University in Zlín
Faculty of Management and Economics
Department of Enterprise Economics
kominkova@fame.utb.cz

Miroslav Škoda

DTI University
Department of Management and Economics
Dubnica n/V, Slovakia
skoda@dti.sk

Abstract—The main goal of this article is to describe the current status teaching of project management in the Czech universities. Project management is ensured for the long time in the organizations. If the educational organizations want to be more modern, competitive and gradually develop, should involve project management. The issue of project management and competence is a very actual topic especially because it is still a great shortage of project managers in those organizations. How is it with teaching of project management at universities and how they respond to the demands of practice? The survey was conducted within the frame of project, which was realized at the Tomas Bata University in Zlin.

Keywords—education sector, project management standards, teaching, Czech universities.

I. INTRODUCTION

The interest in the project management is increasing markedly. It is developed through training and education of project management. Expert companies enter more and more standards of project management and certification processes all around the world. Instructors (coaches) and consultants create more courses and assessment tools. Organizations invest in training, methodologies and so on. The trend towards professionalism and focus on standardizing come into consideration as behavioural and personal skills of project managers. Beyond the standards of project management appear more important in the workplace for their performance than the tools and techniques that are emphasized in the standards [29], [5], [16], [28]. The first guide PMBOK and various other standards were published earlier than PMI (Project Management Institute) in 1996. Changes during the different versions of the guide PMBOK indicate an increased perception of project management in various conditions [29], [22], [23], [21], [18], [19], [20], [17], [14].

As author wrote [27] traditional project management is based on Newtonian mechanics (19th century). For a company which use traditional project management and has some changes is appropriate to apply for example the following principles:

- create a fixed hierarchical structure which will be managed by top management (in the organization or project),

- ensure the assignment of load in despite of main line,

- planning should be based on the most thorough control, prediction,

- not only device and describe but mainly observe the project roles,

- find out impacts of decision retroactively next follow causes and quantitatively analysed them [27], [25].

Author [27] farther argue that in the area of project management are the most use two standards (PMBok, ICB) and methodology (PRINCE2). The standardization of project management has already started in 60th of the last century when experts began to gather information about project management in the individual areas. At the same time they try to find the best examples of projects and their management which divided to individual categories. Incurred and recognized methodology. Some of them are specific and may be used only for some types of projects. Others are universal and can therefore be used on whatever project [27]. Over the last decade there have been find out many different standards which helped raise the level of project management profession-

alism [29], [26]. Author [27] says that in an effort to ensure international standards organizations created to deal with their work. Their main goal was unification of terminology. Although there are many standards and metrics, using the same principles and have similar terminology, tools and methods. Different are for example the scope, method which has been processed or place of origin. The best-known tandards include PMBoK (Project Management Body of Knowledge) and RBI (IPMA Competence Baseline).

Nowadays is more and more emphasis on teaching of project management. Universities are trying to incorporate to the teaching also practical examples. One option is for example creation of their own projects where students can learn practically all phases and risks of the project. This classwork is for example at Tomas Bata University where several projects in practice are: Bata Conference and so on. Universities are trying to respond to business requirements.

II. METHODOLOGY

The project IGA – Concept of competency model of project manager was implemented at Tomas Bata University in Zlin - Faculty of Management and Economics (2013 – 2014). The aim of the project was to design a competency model of project managers in the education sector. The education sector can be schools or institutions which provide training courses.

First of all was conducted the quantitative survey which were coupled with an analysis using of project management standards at universities. It is important to aware of that the number of Czech schools is constantly changing (especially in private universities). Based on the list of the Ministry of Education (Ministry of Education, Youth and Sports) has compiled the address list of public, private and state universities. The selection of universities with economic alignment was implemented consequently. Than have been collected information about subjects of project management at those universities: teaching at the bachelor or master degree program (BSP/SME), teaching theory, practice or combinations thereof and whether they are using standards IPMA during the classwork. Based on the qualitative survey were determined two key questions which were concerned on teaching of project management at universities:

- KO1: „Project management is teaching mainly in private schools."
- KO2: „The standard IPMA is preferred in teaching of project management at universities in the Czech Republic."

The quantitative survey was followed questionnaire survey which was designed for teachers of project management. By means of the questionnaire were approached respondents of public, private and state universities in the Czech Republic. 29 teachers responded to this questionnaire.

The questionnaire survey was based on IPMA competences which include behavioural, contextual and technical competence. Among the behavioural competences are IPMA included: Leadership, Engagement, Motivation, Self-control, Assertiveness, Relaxation, Openness, Creativity, Results orientation, Efficiency, Consultation, Negotiation, Conflict and crisis, Reliability, Values appreciation and Ethics. Contextual competences are Project orientation, Programme orientation, Portfolio orientation, Project, programme and portfolio implementation (PPP implementation), Permanent organisation, Business, Systems, products and technology, Personnel management, Health, security, safety and environment, Finance and Legal. Between technical competences are classified: Project management success, Interested parties, Project requirements and objectives, Risk and opportunity, Quality, Project organisation, Teamwork, Problem resolution, Project structures, Scope and deliverables, Time and project phases, Resources, Cost and finance, Procurement and contract, Changes, Control and reports, Information and documentation, Communication, Start-up and Close-out. Moreover was this questionnaire survey extend about managerial competences which include: Interpersonal relationships, Teamwork, Personal development, Planning the future, Continuous improvement, Support of innovation, Competitiveness, Encourage, Customer service, Culture takeover, System control and Coordination.

Respondents were evaluating in each area how the skills are relevant for the job of project manager in the education sector. Importance was determined range 1 – 5 when 1 was the most important and 5 was the least important for project managers at work. In consideration were selected competences which judged more than 50% of respondents as the most important – number 1.

III. POSIBILITIES OF PROJECT MANAGERS ' CERTIFICATION

There are several organizations for certification of project managers

A. IPMA

The best know organizations are IPMA (International Project Management Association) and PMI (Project Management Institute). IPMA was founded in 1965. It is a multinational association of the project managers who has more than 55 association's member. Their goal is develop of competences in their geographic areas, to communicate with more than a thousand practices and develop relationships with corporations, government agencies, universities, training organizations and also with consulting firms. Certifications issued since 1987. It is also shown exponential

growth of certified project managers [1], [2]. IPMA is spread from Europe to Asia, Africa, Middle East, Australia, North and South America. Demand for their products and services continue to grow. Through IPMA spread ideas, their practice move forward through effective cooperation. IPMA has created its own standards and certification program which consists of a central frame and quality assurance process and national programs which were developed by the association [1], [29], [32]. Member of IPMA in the Czech Republic was established SMR (Society for Project Management) in 2001. In that year were also guarantors and the appointment of new examiners. It is interesting that in 2011 was awarded the first certificate grade A − Certified Projects Director (IPMA Level A). The owner of this certificate is Zdenko Staníček. From 2013 SMR own validation on all grades of IPMA and for the next 5 years [1], [26].

The certification exam is designed to reflect the expected tasks and activities of the project manager based on the PMBOK. In addition, certification requires a length of professional experience, depending on the applicant's academic credentials. IPMA Certification is divided into four levels, each corresponding to a different education, experience and specialization. The candidate is assessed comprehensively few forms and then another interview. The main advantages of the certificate are that the candidate can perform the Czech test and in the Czech Republic. This certificate is recognized together with the certificate PMI. IPMA certificate is valid internationally [6], [13], [7, p.2].

As authors wrote [6], [13] levels of IPMA certifications are disport to 4 grove:

- IPMA Level A (Certified Projects Director) − certification is focused on portfolio management / program and use appropriate methods and tools. The candidate has to meet requirements such as participate in the implementation of skills and methodologies, tools in projects to develop the profession of project manager and so on.

- IPMA Level B (Certified Senior Project Manager) − This certification is focused on the ability to manage of complex project management and leadership of managers subprojects. The candidate is able to use skills in complex situations, while controlling usage and deployment competences for side projects.

- IPMA Level C (Certified Project Manager) − certification is focused on project management which has reduced complexity, show here not only knowledge of the degree but also experience. For other development of competences candidate can need guidance.

- IPMA Level D (Certified Project Management associate) − is designed for members of project teams or as a documentary proof of theoretical knowledge of project management issues. It is designed such as for students [6], [13].

In accordance with [27] is a standard competency model which is used for project management. IPMA Competence Baseline (ICB) is focused on competence not only project managers but also members of their teams. The Standard conserves the freedom of organizations (also in the international context) for the application of its procedures but recommended procedural steps which can be applied in a particular situation [27]. According to [8] ICB contains key elements of project management competences. These elements are divided into three main areas: technical, behavioural and contextual competences. Technical competences include a total of 20 elements. Among technical competences include: Project management success, Interested parties, Project requirements and objectives, Risk and opportunity, Quality, Project organisation, Teamwork, Problem resolution, Project structures, Scope and deliverables, Time and project phases, Resources, Cost and finance, Procurement and contract, Changes, Control and reports, Information and documentation, Communication, Start-up, Close-out. A total of 15 elements contained in the behavioural competences. We rank among them: Leadership, Engagement and motivation, Self-control, Assertiveness, Relaxation, Openness, Creativity, Results orientation, Efficiency, Consultation, Negotiation, Conflict and crisis, Reliability, Values appreciation, Ethics. Contextual competences include only 11 elements: Project orientation, Programme orientation, Portfolio orientation, Project, programme and portfolio implementation (PPP implementation), Permanent organisation, Business, Systems, products and technology, Personnel management, Health, security, safety and environment, Finance, Legal [8], [6].

B. PMI

Project Management Institute (PMI) was founded in 1969 and certificated issued since 1984 [2]. According to [6] this standard provides a total of 6 certificates: *„CAPM® (Certified Associate in Project Management), PMI-SP® (PMI Scheduling Professional), PMI-RMP® (PMI Risk Management Professional), PMP® (Project Management Professional), PgMP® (Program Management Professional) a PMI-ACP® PMI Agile Certified Practitioner"* [6, p. 27]. For all certificates except PgMP applicants have to fulfill the entrance requirements and test. For PgMP certification the candidate have to pass out an interview. PMI exam is only in English and is the same throughout the world. It is an internationally recognized certificate. In the Czech Republic is currently possible to take the exam only in Prague. PMI and IPMA have a signed agreement

for mutual recognition of obtained certificates [6]. PMBOK Guide is recognized throughout the world, it is the oldest and most widely used standard of project management. PMBoK publishes the PMI which is the leading global association for project managers [31]. PMBoK include not only knowledge but also the tools and techniques that can help increase the success rate of projects. Decide about the applicability of the project depends on the project manager or organization where the project is solved [27], [14], [18], [19], [20]. Author [27] further indicate that the lasts version PMBoK defines the 5 process groups, 47 processes, 10 knowledge areas and includes a glossary of terms. This standard deals with specific techniques and methods which monitor the progress of the project.

C. PRINCE2

PRINCE2 is a project management methodology that is process oriented and structured. It is based on the experiences of tens of project managers who contributed from their mistakes or omissions, some of their achievements. It contains standards and practices that are verified in practice. This method can be applied to any type or size of the project, the philosophy is always the same. This method should be optimized to suit not only the size but also the importance of a project environment. The British government is owner that the emergence of this methodology has also initiated. PRINCE2 uses not only the British Government but also many companies in Europe but also abroad [27], [3], [4].

The advantages of this method according to [3] is repeatable, based on experiences, everyone knows what to expect. Even when you will be in the middle of the project, you know which documents have to look for and where you can find them it is available early warning ahead of problem. As reported [27] in the methodology PRINCE2 is defined by a total of 7 principles that have to be adhered. If not it is not a PRINCE2. In the methodology are defined the following principles.

- *Rationale of justification* – always have to be ready to answer why the member of the team is working on the project, all of them understood the intention of the project and why it is done. If in the middle of a project is not interested in outcomes and merits, the manager must communicate more with the leadership or change the target project. If this is not possible, it is appropriate to terminate the project and prevent losses.

- *Learning from experience* – the aim of this principle is to avoid repeating the same mistakes and learning from experience from other projects. There are several platforms which shares knowledge about projects.

- *Defining roles and responsibilities* – at the beginning of each project have to define roles, responsibilities and reporting. These roles have to be accepted and approved. Inappropriate choice is a collective responsibility. In the project must be clear who is responsible for the strategic and daily decision-making and delivery of individual products.

- *Controls in various laps* – each great project is divided into smaller parts (stages). This principle is used for example when checking or updating documents. At various stages so may check compliance with the plan.

- *Controls under the exceptions* – there are included for example the delay delivery but still with tolerance does not endanger the operation of the entire project. However if this tolerance is exceeded the project manager must decide how to proceed further.

- *Products and their orientation* – this principle focuses first on the products, then to activity by which they are given projects manufactured and supplied. This is a natural condition which is part of the planning.

- *Controls under the project environment* - adapting this methodology to the environment where the project is solved. It is the difference between managing a large international project and a project that has a small range. In project management include management meetings, which are taken from the minutes, reports from team members and so on [27].

As reported [11] although it presents, using of the milestone method, such an assessment is made milestone only superficially and formally stating that „the project is well under way, with some deviations from the plan." And even on the basis that it was not consistently used the milestone method which requires the time the milestone to assess quantitatively the achievement of planned performance indicators (costs, deadlines and so on.). As a result of ignorance of methods for risk analysis, project managers carry out risk analysis almost intuitively and without the use of recommended methods, such as method RIPRAN [10].

D. ISO 21500

Standard ISO 21500 was officially released by the International Organization for Standardization in September 2012. Work on this standard began in 2006 in the British Standard Institute which it initiated. This standard was subsequently translated into Czech and approved in May 2013. In the Czech Republic is a standard ISO 21500 – Guideline of project management [9], [12]. In accordance with [9] it is a methical approach of project management. This standard covers all standards and concepts of project management.

Current State of Project Management Education in the Czech Universitites

ISO 21500 not only the structure but also the concepts is containing very close to PMBoK. The difference is in the methodology PRINCE2 because there is a different perception of the concept and roles in different projects. Therefore, the user of PRINCE2 should get to know other standards, to avoid misunderstanding.

Author [24] compared in his article ISO 21500 and PMBoK. The comparison showed that PMBoK has 467 pages contained 42 processes. ISO 21500 has 44 pages contained 39 processes. 32 processes are coinciding. The main use of ISO 21500:

- communication facilitate between teams and organizations,,

- acquisition of principles and processes which will be used for further development of project management,

- coordination and optimization through implementation processes,

- increasing the flexibility of project managers by reducing barriers in international projects,

- greater comparability and transparency of the projects [24].

IV. PROJECT MANAGEMENT IN PRACTICE

EY Company is conducting a survey based on are established trends of project management. Their respondents are from various sectors - energy, public sector institutions, information technology and so on.

Their results show that the number of projects is increase slightly. They also indicate that in the given deadline and budget ends only 56% of projects. Half of the respondents said that the most common reason for failure and exceeding the set criteria is to change the scope of the project. Other reasons are for example: different expectations from the project outputs or insufficient staffing and project coordination. The success of the project is assessed retrospectively one of the most widely used benchmarks is timely completion of the project, meeting deadlines and fulfilling expectations. Very important is communication not only members of the team but also the communication with clients and subject matter experts. The most commonly used standards are mainly based on the results of internal standards (65%), followed by PMI and PRINCE2. The importance of the project manager is still growing. Since 2013 is an increase of 12%. The project manager is able to lead multiple projects at once and therefore the company is constantly trying to educate their employees professionally, especially in the form of external or internal training [30].

According to another survey is the typical Czech manager man aged 26-35 years, who have 5-10 years of experience. Project manager is usually a woman aged 26-30 years. She is in practice, varies less than 3 years. Her reward is however also about 35% lower. 23% responders worked as a project manager junior, 60% - senior. It is interesting that 37% of project managers get their work position because of good personal and professional contacts, 29% through social networks and advertising, 25% were selected of HR professionals, only 5,5% got the position through career growth. The most common certifications are the PRINCE2 (35%), than follow PMI and IPMA certification. Another interesting result is the salaries. Respondents with certification have an average of 24% higher salary than those who do not have a certificate. Most often the project managers get its position less than one year. The main benefits of the project managers are: 5 weeks' vacation, insurance contributions and insurance, business mobile, auto, extra bonuses, language courses and so on. The average salary of a project manager is about 69 000 CZK. 94% of project managers are generally satisfied in their jobs [15].

V. RESULTS OF THE QUESTIONNAIRE

Based on the survey was found that project management is teaching at 46% of bachelor programs and 39% of masters programs of economic universities. These courses are assessable for students.

In light of course structure is mainly about interconnection of theory and practice (49%), almost 28% of teaching is directed practical, theoretically 13% of teaching, 11% of schools were not disclosed information about teaching of project management. From the perspective of IPMA standard in relation with structure of teaching is connected theory and practice (70%), 18% is only a theory and 12% is directed practically. *The results show that in teaching of project management is preferred standard IPMA. On the contrary in practice are the most used standards PMI and PRINCE2.*

The qualitative research was followed by the questionnaire survey which was addressed only to educator of project management on public, private and state universities in the Czech Republic. The questionnaire was aimed at IPMA Competence (behavioural, contextual and technical) and was extended on managerial competences. This survey answered by 29 respondents.

According to the results of the questionnaire survey for project managers in the education sector are *the most important behavioural competencies*. Respondents with their answers decided that from a total of 16 competences of project managers in the education sector ore only 7 of them important. There are: Leadership, Engagement, Motivation, Self-control, Results orientation, Negotiation and Reliability. Furthermore for project managers in the education sector are important also technical competencies which include

Project management success, Risk and opportunity, Quality, Teamwork, Problem resolution and Communication.

VI. CONCLUSION

The issue of project management is increasingly hot topic. It is mainly for this reason that each company trying to be competitive in every society. Position of project manager is increasingly in demand. They are still labour market shortage (especially certified project managers).

The topic of the article was project management in the Czech concept. The article was aimed at teaching of project management at Czech universities, the certification of project managers and requirements of companies in the field of project management. First of all the qualitative survey was created. Than was provided information regarding the teaching of project management. The results showed that project management is taught mainly on bachelor programs. The educator of project management is trying to interconnect theory with practice. Students can gained theoretical knowledge verified practically subsequently (mostly continual solution of the project on the topic). During the course is preferred standard IPMA.

In the course of project management education are mainly used IPMA standards. On the contrary companies use the most internal standards than follow standards PMI and PRINCE. It is confirmed also by the latest results of projectman. cz where respondents mostly own certificate PRINCE2 and PMI. Universities should be more reacting to business requirements in the field of project management.

Other part of the article was project manager competences in the education sector. From the created address list were accost educators of project management. Those are in addition to teaching at the same time engaged in various projects as project managers. Respondents had to choose which competences are in their opinion the most important for a project manager in the education sector. The scale was specifying 1-5, the competences identified by numbers 1 were the most important. The results showed that the most important are the behavioural competences.

Position of the project manager is very responsible. He is responsible for coordinating the whole project. The endeavour is always to accomplish the project in the required time and budget. Another survey confirms that although project managers are satisfied with their work and they are rewarded for it properly (including company benefits) is still shortage of them in the labour market.

REFERENCES

[1]   "About IPMA" [online]. [cit. 2015-01-22]. Retrieved from http:// www: http://ipma.ch/about/

[2]   C. Bredillet. et al., "What is a good project manager? An Aristotelian perspective," [online]. 2014. Intrnational Journal of Project Management. Retrieved from http://dx.doi.org/10.1016/j.ijproman.2014.04.001

[3]   C. Bentley, "PRINCE2: A pracitical Handbook. Elsevier," 2010, pp. 322.

[4]   J. K. Crawford, P. Morris, J. Thomas, and M. Winter, "Practitioner development: from trained technicians to reflective practitioners," International Journal of Project Managemenent, 2006, pp. 722.

[5]   L. Crawford, "Senior management perceptions of project management competence," International Journal of Project Management, 2005, pp. 7-16.

[6]   J. Doležal, P. Máchal and B. Lacko, "Projektový management podle IPMA," Praha: Grada, 2012.

[7]   GAPPS, "Framework for performance based competency standards for global level 1 and 2 project managers," Global Alliance for Project Performance Standards, Australia: Sydney, 2007.

[8]   J. Hermarij, "Better Practices of Project Management Based on IPMA cometences," 2013, pp. 628.

[9]   T. Klein, "Komentované vydání normy ČSN ISO 21500 pro management projektu vyšlo!" [online]. [cit. 2014-11-10]. Retrieved from http://www.shine.cz/blog/komentovane-vydani-normy-csn-iso-21500-pro-management-projektu-vyslo

[10]   B. Lacko, "Využívání metody RIPRAN při analýze rizik projektů," Sborník příspěvků, 1. konference „Rizika podnikových procesů RPP 2011" Univerzita J. E. Purkyně, Ústí nad Labem, 2011.

[11]   B. Lacko, "Evaluation of software projects with MTA, " Software development 2012, TU of Ostrava 2012, pp. 51 – 55.

[12]   A. Legerman, A. Zandhuis, G. Silvius, R. Rochelle, R. Stellingwerf, "ISO 21500 in Practice – A Management Guidem," Van Haren Publishing, 2013.

[13]   J. Pitaš et al., "Národní standard kompetencí projektového řízení: National competence baseline of project management,". Vol. 1, Brno: VUT in Brno, 2008, pp. 288.

[14]   PMBoK, "A Guide to the Project Management Body of Knowledge: PMBOK guide," Penn: Newtown Square, 2000, pp. 216.

[15]   "Pohledem projektového manažera Více než 320 informací o projektácích v Česku, " [online]. 2016. Retrieved from http://pruzkum.projectman.cz/

[16]   M. Price, J. Dolfi, "Learning preferences and trend sof project management Professional: PMI (2004) A preliminary report," In: Presentation at the PMI global kongres 2004 – Europe, 2004.

[17]   Project Management Institute, "A guide to the project management body of knowledge (PMBOK® guide),"Newton Square (NA): Project Management Institute, 1996.

[18]   Project Management Institute, "A guide to the project management body of knowledge (PMBOK® guide),"

Newton Square (NA): Project Management Institute, 2000.

[19]   Project Management Institute, "Construction extensit to a quide to the project management body of knowledge (PMBOK® guide)," Newton Square (NA): Project Management Institute, 2000.

[20]   Project Management Institute, "Practice standard for work breakdown structures," Newton Square (NA): Project Management Institute, 2000.

[21]   Project Management Institute, "Organizational project management maturity model (OPM3) knowledge foundation," Newton Square (NA): Project Management Institute, 2003.

[22]   Project Management Institute, "Exposure draft of quide to the project management body of knowledge (PMBOK® guide)," Newton Square (NA): Project Management Institute, 2004.

[23]   Project Management Institute, "Government extensit to a guide to the project management body of knowledge (PMBOK® guide)," Newton Square (NA): Project Management Institute, 2004.

[24]   P. Řeháček, "Standardy projektového řízení". Acta Informatica Pragensia, 2012, pp. 41-49.

[25]   M. Saynisch, "Beyond frontiers of traditional project management: An approach to evolutionary, self-organizational principles and the complexity theory-results of the research program," [online]. 2010. [cit. 2014-10-30]. vol. 41, issue 2. DOI: 10.1002/pmj.20159. Retrieved from http://doi.wiley.com/10.1002/pmj.20159

[26]   "SPŘ – historie" [online]. [cit. 2015-01-22]. Retrieved from http://www.ipma.cz/?page__id=88

[27]   E. Šviráková, "Kreativní projektový management: Project Planning and Management in Cultural and Creative Industries," Zlín: Verbum, 2014, pp. 151.

[28]   J. Thomas, T. Mengel, N. Andres, "Surfing on the edge of chaos developing the master project manager," IPMI global conference 2004 – North America, Conference proceedings. Newtown Square (PA): Project Management Institute, 2004.

[29]   J. Thomas and T. Mengel, "Preparing Project Managers to Deal with Complexity – Advanced Project Management Education," International Journal of Project Management, Vol. 26, No. 3, 2008, pp. 304-315. Retrieved from http://dx.doi.org/10.1016/j.ijproman.2008.01.001, 2008

[30]   "Výsledky průzkumu projektového řízení v České republice a na Slovensku za rok 2015," [online]. 2015. Retrieved from http://www.ey.com/Publication/vwLUAssets/2015-Pruzkum-projektoveho-rizeni-v-CR-a-SR/$FILE/EY%20pr%C5%AFzkum%20projektov%C3%A9ho%20%C5%99%C3%ADzen%C3%AD%20v%20%C4%8CR%20a%20SR%202015__bro%C5%BEura.pdf

[31]   A. Zandhuis, P. Snijders, T. Wuttke, "A pocket companion to PMI's PMBOK Guide," Van Haren Publishing, 2013.

[32]   B. Zwerman, J. Thomas, "Professionalization of project management: chat does it mean for practice?" In: Dinsmore PC, Cabanis-Brewin J, editors. Tha AMA handbook of project management. New York: AMACOM, 2006, pp. 236-47.

The Communication Competence of Teachers and its Importance

István Szőköl

J. Selye University

Faculty of Education

Komárno, Slovakia

szokoli@ujs.sk

Kinga Horváth

J. Selye University

Faculty of Education

Komárno, Slovakia

horvathki@ujs.sk

Abstract — **In this study, we observe the peculiarities of pedagogical communication. We discuss its functions as well as the types, channels and scenes. We also observe the importance of the learning environment in terms of efficiency of the pedagogical communication. We will not approach teachers' communication competence from the point of view of language use or grammar. By applying the approach of educational theory we will explore the topic by introducing the factors that influence teachers' effectiveness. This is why our main intention is to outline the process that leads to the knowledge required to be a teacher.**

Keywords — *communication competence, pedagogical communication, competencies, function of communication, type of communication*

I. PEDAGOGICAL COMMUNICATION

Pedagogical communication is a special kind of social communication. What makes it special is its function and role. Its main function is to meet the educational goals [8]. According to Zsolnai (1996, 1), the subject matter of pedagogical communication on various educational levels includes the change in code usage functions expressing the substantiality of basic pedagogical relations, information exchanges as well as the "communication message" resulted in the acts and processes which are manifested in spoken and written texts as well as gestures, mimicry, clothing, etc.

According to Zrinszky (2002, 24) pedagogical communication is influenced by three concepts.

First, it is necessary to be aware of the fact that teaching is a systematic and regular knowledge transfer. Then the teacher should strive to create the right atmosphere and accomplish the learning goals. Not least, one needs to be aware of the fact that teaching, learning and education is a complex process where the most important thing is that the teacher finds the balance between building human relationships and social learning.

If we consider the pedagogical communication from the point of view of teaching and education an organised communication situation, then the term learning refers to the process and outcome of this situation which influenced by communica-

tion manifests itself in the knowledge. Therefore, we find Barkó's approach (1998, 129 – 130) very expressive. Knowledge is a question appearing in communication which is manifested in the responding process. Asking a question involves the general nature of a personal question. To do this, the teacher needs to acquire a questioning culture that fosters thinking.

What makes pedagogical communication specific is not the language or the communication manner, but the communicative relationship, the intention of developing and enriching a person. The lesson is characterised by oral communication, teachers and students use a language which involves everyday and special communication. The teacher takes into account the existing knowledge of the students. Since the key to all successful communication is adjusting to the partner this cannot be viewed as a peculiarity of pedagogical communication. The fact, however, that pedagogical goals are planned to a large extent in advance is one of the peculiarities. The teacher is proceeding according to a program and is also trying to convince the students to follow it. Not only by communication but in all kinds of other ways too. The use of audiovisual equipment, objects, images, drawings is also a development goal, which is directed at improving literacy and expertise [1]. The teacher's communication used in teaching is significantly affected by his philosophy of education. The philosophy of education is often influenced by what happened during his own student years. At best, based on his knowledge, he develops a philosophy of his own, in a worse case his philosophy is influenced and shaped by his own experiences. A teacher's philosophy of education is also influenced by some external factors, such as the traditions of the institution or the controlling persons.

A teacher with the right communication and personality is able to create a suitable atmosphere for students for learning, discussing their feelings and problems. The teacher helps to reveal their abilities, strengthen their self-esteem. One of the most important duties of the teacher is to cultivate the mother tongue. It varies according to age and it is influenced principally by the fam-

ily. Besides the family, friends also have a great impact on it particularly in view of the fact that even adults borrow some communication elements from each other. Since the student and the teacher are the two participants of pedagogical work, pedagogical communication takes place most of the time between them. Furthermore, pedagogical communication can also take place between parents and the teacher during consulting hours or parents' meetings. Pedagogical communication can also be a part of the parent-child relationship.

The teacher's communication is characterised by pedagogical and verbal communication as well as the efficiency of the teaching process and importance of making contact. Pedagogical communication requires the following skills: empathy, creating contact, tolerance, motivation, cooperation. It is controlled by the teacher and it depends on his personality. Within pedagogical communication the communication climate is very important. The condition of the communication climate is comprehensibility and a confidential atmosphere. We talk about comprehensibility when the parties involved in the communication use the same communication form. It is very important that the teacher is comprehensible to the students so that they can understand his explanations, ask questions, interpret and provide the teacher with feedback. Within the communication climate there is a mutual information exchange on the basis of which the recipient gains further knowledge. One of the factors that might have a negative impact on communication is the state of mind. In case of a bad psychological state of mind anxiety can occur, which would restrain the speaker. A familiar background, however, together with emotional communication can help. The basic elements of pedagogy is encouragement, motivation and inspiration. A teacher with the right communication skills is able to express his thoughts, feelings and needs as accurately as possible. As a recipient he is expected to understand the other person. A teacher with good communication skills creates the conditions for clear and intelligible speech [19].

A. The functions of pedagogical communication

Communication has various functions in human relations.

Pedagogical communication has primary and secondary functions. The primary function of pedagogical communication is to achieve the educational goals and in learning and teaching it has a positive influence on motivation and activation. Furthermore, it helps students to understand the topic, acquire knowledge, achieve the educational goals and it also contributes to the intellectual development [20]. This is enabled by how the teacher speaks, verbal and nonverbal means, which is not based on a one-time, casual relationship but a long-standing one [8].

The secondary role of pedagogical communication focuses on relationships. It focuses on the communicative aspect of the student-student and student-teacher relationship of those who are part of the pedagogical communication. This type of relationship is referred to as asymmetric, because the status of participants is not equal.

Pedagogical communication has a metalinguistic function too, called an interpretative function, which is when we speak of the language itself. When we do not understand something, for example we are not familiar with the meaning of a word, we use the language to obtain the necessary information, to describe or explain. However, the non-linguistic signs might also have metalinguistic roles. During communication non-linguistic signs help to interpret what was orally expressed.

One of the primary functions of communication is *its indicative role,* when the sender, the teacher, passes on unknown information to the recipients, the students. It is also called an *information function* as participants of the communication process obtain some information including facts and their explanation [7]. In pedagogical communication it is provided mostly by the teacher. *The expressive role* of communication is fulfilled when the sender expresses his feelings, moods, emotions often in an exclamatory or wishing sentence. Teachers and students alike can communicate their feelings. This is called *emotional function* [7] because by expressing his emotions the sender's internal tensions dissolve. Satisfaction, joy, annoyance, worry, sorrow, enthusiasm are also included because the unexpressed, suppressed positive emotions can cause tension in the same way as the negative ones. *The warning role* of pedagogical communication is fulfilled when the teacher, by using the imperative calls the students for action. It is also known as *motivational function* [7]. Within the process of pedagogical communication the teacher is trying to encourage the student to: change behaviour, reach a consensus, avoid a particular circumstance or event. This can happen mostly by persuasion. Pedagogical communication has a *controlling function* too [7] because it plays an important role in getting feedback, obtaining skills, competences and evaluating them.

The secondary role of communication focuses on relationships. The pedagogical communication needs to be initiated somehow, for example we greet, address the person to whom we wish to speak. In this case, the *interpersonal role* of communication prevails. During the communication the teacher needs to practice the *contact sustaining role*, since several times he asks the students if they understand what he is saying or listen to him. Every conversation needs to be closed, it is necessary to say goodbye to the other, thus the importance of the *contact closing role* of communication goes without saying. During pedagogical communication the *socialization func-*

The Communication Competence of Teachers and its Importanceand its Importance

tion of communication is also enforced as a way of acquiring a common base of knowledge in the private as well as public sphere [20]. Pedagogical communication also plays an important role in *cultural development* [20] since communication is also used to cultivate people's culture, the aim of pedagogical communication is to pass it on and stimulate creativity. Another role of communication is to facilitate integration so that students, student groups, minorities and nations get to know each other and rather than having views which are full of prejudice they learn tolerance and acceptance.

When the aim of the message is to call attention to something nice, we talk about the *aesthetic function* of communication. In this case the speaker (both teachers and students) seeks some linguistic beauty, humour and other aesthetic effect.

B. Types of pedagogical communication

Below we used the grouping of N. Kollár, Szabó (2004, 399) and Fercsik, Raátz (1999, 19).

According to the *number of participants,* we talk about *interpersonal* that is the *two-person-communication.* In the classroom it can have three versions: the teacher sends a message to the student, the student sends a message to the teacher or the student sends a message to another student. Its main feature is that both the initiator and respondent exchange roles a number of times within the same act of communication. For example, individual problem solving, exams or learning in pairs.

Group communication also needs to be mentioned, which is basically communication between the teacher and the students who are involved in the group. This is the most common communication type in the classroom. Again, several variations come into play. The teacher sends a message to the group, the group sends a message to the teacher or one student to the other ones. This kind of communication occurs when it comes to debates, lectures, explanations or when the students are working on a task in groups. It is very often characterized by interruptions, therefore, those, in charge of the communication session need to resort strong structuring. The structuring can be so strong that even with the distracting questions the communication almost immediately gets back on the right track. The more motivated the students are the less distraction there will be.

As far as the *mass communication* is concerned (through mass communication means, such as the television, radio, internet, etc.) participants of pedagogical communication receive the message from each other and the sender separately, in different time and place. *Intrapersonal communication* which means internal monologue (the person is thinking, searching for answers, looking for arguments) plays an important role in pedagogical communication too. This ranges from thinking, through speaking aloud all the way to creating a record. Intrapsychic communication is the consequence of getting the intrapersonal communication internalized. Silent reading, problem solving, searching for answers to question are the typical examples of intrapsychic communication in the classroom.

There are two main features: 1.The initiator and the respondent is the same person. Consequently, the correction of errors needs to be performed by him and not by one of the observers. 2. Only the person taking part in the intrapersonal communication needs to understand the symbolic form of the message, therefore misinterpretation of the linguistic symbols is not a problem. As observers (e.g. the teacher) are excluded from the intrapersonal communication of the student, they do not know exactly (just from meta-communicative signals) that during a frontal kind of lesson what processes take place in students' minds.

On the basis of *the proximity of those taking part in pedagogical communication* we distinguish between *direct and indirect communication.* It is direct when the teacher and the student are involved in the process at the same time and they are close to each other. In case of an indirect communication a third person is used to forward the message from the sender to the recipient. A third person can be a technical device too that provides the connection.

According to the *coding system* used in pedagogical communication we distinguish between *verbal* – written or oral – *communication* which is based on words and *non-verbal communication* where not the words but other signals are interpreted to get the message.

According to the *intention of the sender* the communication can be *intentional and unintentional.* In the first case the sender issues the message on purpose and in the latter case the message is issued despite the intention of the sender.

When it comes to *reciprocity* we distinguish between *one-way communication* and *two-way communication.* During a one-way communication the recipients of the message, in pedagogical sense they are mostly the students, do not send a response to the sender (the teacher). On the other hand we talk about two-way communication when it is a back and forth process, the recipients of the message do respond to the sender. The *one-way pedagogical communication* can be divided in the following way: 1.The teacher takes the role of the sender or mediator, whereas the role of the recipient goes to the student. The most commonly used didactic methods are the oral lectures of the teacher, his explanation or the interpretation of written tests as well as communication transmitted by applying the

media. 2. The message senders are the students, the teacher's task is to evaluate, encourage and help. It occurs mostly in the following situations: classroom tests and exams, comments, reports, assignments. *The two-way communication* can be *dialogical* which takes place between the teacher and the students or between two students. Applying discussions, debates as didactic methods get us to the *group communication.*

According to the relationship and status of the participants of pedagogical communication we have to mention the *peer (horizontal) communication*, which is characterized by equal communication rights. In pedagogical sense this is mostly applicable when it comes to teachers communicating to each other. The *non-peer (vertical) communication* occurs when the participants do not have equal communication rights. This is typical of the relationship between a teacher and a student.

C. The channels of pedagogical communication

A communicating person consciously or unconsciously influences another person's behaviour with the help of a particular system. To do so, he uses different means that carry the very content of the communication. Communication, as a phenomenon does not always take place consciously. Many times without even noticing it, we keep sending signals to the other person. By these signals we do not mean only human speech, but the appearance, smell, gestures and smile of the person we are talking to, which greatly affect us. Consequently, we distinguish between two communication channels. One of them is the *verbal channel*, by which we mean verbal communication. *Non-verbal channel*, on the other hand, conveys messages without including words.

In reality, however, these factors are closely linked and they complement each other. Verbal and non-verbal channels go hand in hand, and they can only be separated for testing purposes. Non-verbal communication includes expressions beyond words [10, 11]. Verbal communication is performed by our words in the conversation. Language plays an important role in everyday life, in social contact its role is fundamental. The basis of verbal communication is the language and speech. Within verbal communication the expression is of great importance. The words uttered do not always mean the same on the sender's and recipient's part. In addition, the use of some words and expressions might cause difficulty too [15].

The majority of social interactions includes non-verbal forms of communication. Non-verbal communication includes expressions beyond words. The information exchange happens by the body, facial expressions and gestures. Non-verbal communication is only an instant, because it reflects the sender's actual emotions which lasts only as long as the output. Facial expressions play a sig-

nificant role in non-verbal communication. The eye movements, the position of the mouth, the grimaces determine the expression of the face. Facial expressions just like the gestures are used to supplement or substitute speech. It shows that what we say is not always in harmony with what we think. In our everyday life we try to control the body movements and facial expressions [13]. Non-verbal communication demonstrates that in social intercourse there is a large amount of information flowing to us and we too, do emit a large amount of information. The appearance, dress, use of cosmetics represent a special signal system. Human communication is a two-stage process. There is an intentional level and there is one, independent of our will, the spontaneous or unintentional level. Unlike the unintentional communication, the intentional communication can only be trusted partially.

Some channels of communication can be distinguished not only whether there is speech included or not but also according to its intention. Thus, the communication can be direct, which has a particular intention or indirect, which is not controlled consciously. Most of the direct communication is verbal, but it can consist of conventional non-verbal symbols too, like waving or rejecting something by shaking head. Indirect communication includes mainly non-verbal elements and gestures. In everyday communication direct and indirect communication occur together. Direct communication is supplemented with facial expressions, gestures and intonation which help to decide whether the person we are speaking to is afraid or what feelings he or she has for us. What is more, the indirect behaviour shows us if the other person feels safe in the communicative situation or is anxious, enthusiastic or bored. These emotion-indicating elements accompanying direct communication are in harmony with the content of speech.

D. The scenes of pedagogical communication

The main scene of pedagogical communication is the school. The quality of communication in the particular school determines the cognitive level achieved by the students and the relationship between the teacher and the students. For the communication process there is always a system, which determines how we interpret the message.

The school is a complex communication scene. Most of the students stay in the classroom, however, the school yard, the corridor or the staff room are communication scenes too. This allows a specific form of communication, since students can communicate not only with their classmates but with their friends attending other classes too. This kind of communication is not so formal as the one on the lesson, but it also has its own characteristic features. The size of the classroom, the equipment determine the atmosphere and the

communication [2]. Communication in the classroom is similar to the information exchange taking place in another environment, but it has a different function. The communication of industrial organizations has an impact on the goals of the whole group, whereas pedagogical communication enables conveying information [21]. School communication has become interesting from the point of view of education. Teaching, as well as improving skills and competences take place in a communication process too [14]. The involvement of students in the teaching process has communication prospects too. Maintaining the attention of students of all ages and motivating them is quite challenging. The communication processes also influence the classroom behaviour.

Group is one of the important elements of the communication process. The class itself is a group. Many times this group disintegrates to smaller, overlapping groups. There are ages when the sexes don't mix, they are more likely to interact with other students of the same sex. In early childhood, groups don't play such an important role. It gets more important before puberty. As relationships with parents get weaker, peer groups get more cohesive. In addition to the communication taking place on the lesson, students talk to each other within groups outside the classroom. What is more, emotionally cohesive groups are watching each other and they provoke a lot of non-verbal signals [3].

During the child's development, the communication situations expand and as a result he needs to form a more complex communication role. By creating a communication role, the speaker has to create the listener. The listener needs to have the right skills in order to interpret the auditory and linguistic information. Without them communication cannot exist [18]. When it comes to communication within the school, the teacher's empathy is of great importance too, because it provides him with valuable feedback concerning his own image.

Pedagogical work is mostly intuitive and verbal. Image plays an important role in the teacher's behaviour. Since the major part of verbal communication is not conscious, there are a lot of contradictions in it which reduces the communicative effect. If there is consistency between the signs of the communication channels, communication exerts an influence on the listener. A teaching style which is enforced, on the other hand, causes failure. In Buda's opinion teachers should not see their work only as an operational process but they should take into account themselves too and use communication consciously (2003, 89).

E. Pedagogical communication and the learning environment

School is a communication scene with its external and internal conditions. The institution and its environment has a great impact on pedagogical communication. Since the environment, the setting affect the communication style an aesthetic, cheerful, bright and harmonious environment should be created. In a room, for example, the location of furniture has the biggest influence on the type of communication that is likely to occur there. While the sociofugal seating arrangement does not favour the development of interactions between people, the sociopetal arrangement facilitates interactions. However, the best solution is when the arrangement of the particular room is not final and it can be varied according to the desired task. As for the school environment there are two options for placing the furniture:

Formal way. In this case desks are placed in orderly rows and they are facing the same direction. The teacher's desk is seated in the front together with the board and projection screen. This type of arrangement is suitable for lectures, conferences or a lesson where the frontal method is used. The majority of classrooms in Slovakia have this type of arrangement and the fact that the desks are mounted to one another or fixed in the floor suggests its immutability. Things to some extent define a context in which a particular type of communication takes place.

Another option for the frontal layout is when the desks are placed in a semicircle with the chairs facing the lecturer. This kind of arrangement is also suitable for lectures with frontal structures. In case of formal layout where there are regular rows, the room can be divided in the following way. It all comes to an imaginary triangle which consists of the first row of the room, the centre point of the back row which is connected to the two end points of the first line. This is the area in which most of the teachers' communication is directed in a frontal lesson. Literature [9, 11] refers to it as the zone of active participation, since those students who sit within this triangle have the biggest chance to establish eye contact with the teacher, therefore they can be seen as the active participants of the lesson. If the teacher does not wish to leave seating arrangement to chance, it can be a tool in his hand, which makes it possible to provide more care for some students.

Seating arrangement has a great influence on whom the students are going to team up with, since students sitting closer to each other have more opportunities to communicate. Determining the seating arrangement can help to meet the educational goals. However, this does not guarantee the high quality of education.

Informal method. One possibility is to put six chairs around a desk. It is desirable when the class is divided into small groups (not on the ba-

sis of the abilities) in order to carry out cooperative work. This kind of arrangement gives everyone the chance to speak to everyone. In case of pairwork or tutoring situation, the most advantageous arrangement is when students sit by the table next to each other. Another option is to create a circle with the chairs but without the desks. It is suitable for discussions, case studies, developing self-awareness skills.

Since a classroom must serve multiple functions, it would be very important to equip it with easily movable furniture. Seating arrangement in the classroom determines the participation in the teaching and learning process.

II. THE COMMUNICATION COMPETENCE OF THE TEACHER

When characterizing the communication competence the literature mentions the concept of communication competence too, which refers to the level of communication, quality and effectiveness of the relationship.

In the 21st century competences have changed, especially in the helping professions, such as pedagogy. The hierarchical arrangement has become more partner or client-centric, which presupposes a stronger flow of interactions between the teacher and his student.

One of the basic interactions of education, the communication between the teacher and his student is of key importance both in terms of the efficiency of education and the teacher himself too. It is also obvious that the teacher interacts with the student not only by his communication but his overall personality. The role of the teacher and the student that they play in the education process is a certain set of behaviours. Everybody who plays a particular role must be familiar with the concrete set of behaviours that goes with it, so that he can meet the expectations of the society. This means that he must have knowledge, professional and practical too, to play his role in a way that is acceptable by the whole society. Below is a brief outline of the process that leads to knowledge necessary to practice the teaching profession. And to the question why it is important for us, we get the most adequate answer from Lenkovics (2014) who, based on a number of studies, made a conclusion that how well a teacher is prepared has the greatest impact on students' development.

Among the many possible approaches to how prepared the teacher is, we will discuss it in terms of constructive knowledge. There is a simple explanation to this, since in the competency-based teaching and learning process the answer to the questions of how constructive the teacher is or whether he is able to achieve adaptivity or find out about students' previous knowledge and also

if he is capable of formulating appropriate tasks is fundamental.

The most important elements of the teacher's knowledge are his views, the evaluation system, practical knowledge and reflexion. Views are assumptions that are believed to be true about the world, but they don't always prove so. They have an influence on our judgements and decisions. They come from three sources: previous school and personal life experience, theoretical knowledge obtained in the training, experience gained during the practical training and personal experience from teaching. The organization of views is a sort of evaluation system that acts as a filter aimed at selecting the experience. In terms of organising the teacher's knowledge it is important to explore these views. They relate to five areas: the views of trainee teachers on students and studying, their views on teaching, the subject and the syllabus as well as the trainee teachers' views on acquiring teaching, furthermore their views on themselves and the teacher's role.

As far as the teacher's knowledge is concerned, the evaluation system and practical knowledge need to be mentioned too. The evaluation system serves as a link between the views and practical knowledge. Practical knowledge comes from practice. Only what the teacher is convinced about, what he saw, experienced or tried will be incorporated into knowledge.

As for reflection, it can be interpreted as either the process or knowledge which is basically the result of the process. Pedagogical knowledge includes awareness-enhancing techniques of practical activities too. From analysing the activities in the light of their goals we can expect to increase their effectiveness and at the same time we contribute to the development of teaching profession. The use of reflective paradigm in the teaching process results in reflective teaching, which is a certain kind of thinking characterised by continuous and conscious analysis and practice. Its aim is to ensure self-monitoring and self-improvement. There are two directions of reflectivity that can be distinguished: in the first case, the teacher analyses the happenings of the student or student group, and in the second case, his own personality, his views and activities are in the centre of analysis [22]. The teacher reflects upon his work for the following reasons:

- To develop himself, his professional competence.

- In order to understand the students' needs and skills better.

- Reflection develops emotional intelligence, especially when there is enough concern about analysing the emotions. When we are aware of our feelings, it is easier to deal with them.

- Reflection is the key factor to improvement which is only possible if we reflect on what has happened, we analyse it and by looking for further knowledge and new ways we never stop experimenting [12].

We conclude that the teacher reflects on his work because he wants to be successful. The relevant pedagogical literature [5] based on the personality-oriented psychology of Rogers [17], sees the characteristics of an effective teachers in: empathy, unconditional acceptance and congruence.

According to Buda (2006) empathy is an interpersonal skill that helps to enter into another's personality. It helps to understand the students' point of view without having to give up himself or influencing the students. The importance of empathy lies in feedbacks. What is more, it also helps to perceive non-verbal behaviour. It is a performance depending on the actual state. Fatigue, worry, awareness of problems and an increased level of introspection have a negative impact on it. To teach and concentrate on the class at the same time is a demanding emotional and cognitive task. The role of empathy is that it gives greater security and flexibility in the communication field and due to the information from feedback the efficiency of work can increase. Teachers apply this emphatic understanding in different ways. Some of them just indicate it verbally, which contributes to deepening the conversation directly; but on the other hand to non-verbal attitudes, movements, postures, we can just give a non-verbal answer.

It is important to create a warm attitude of trust, unconditional positive acceptance in which the student can be himself. The teacher does not remain neutral, but clearly takes side with the student. In Roger's opinion, the need of unconditional acceptance is stronger than any other instinct, once it is taken care of, it is no longer needed to mobilize the defence systems and the way to a deeper level opens up.

During teaching and education the teacher's sincerity, credibility is of great importance. This goes with a high level of self-knowledge and the result is congruence (corresponding to each other), so the teacher gets in personal contact with the student…the better he can accept and identify with the full complexity of emotions without fear, the more congruent he is [17].

Teachers, accordingly, should with sufficient awareness and subsequent self-reflection analyse their communication behaviour both in terms of the relationship and the situation. This supporting atmosphere provides students with the possibility of personal growth.

REFERENCES

[1] Barkó, E. 1998. A kommunikatív didaktika. Budapest : Dinasztia Kiadó. 263 o. ISBN 963-657-227-5.

[2] Barabási, T. 2008. Kommunikáció és tanulásszervezés az iskolában. Kolozsvári Egyetemi Kiadó. 169 o. ISBN 978-973-610-742-9

[3] Buda, B. 2003. Az iskolai nevelés – a lélek védelmében. Budapest : Nemzeti Tankönyvkiadó. 2003, ISBN: 96319-4452-2.

[4] Buda, B. 2006. Empátia. Budapest : Urbis. 105 o. ISBN 963 9706 06 X

[5] Falus, I. 1998. Didaktika. Elméleti alapok a tanítás tanulásához. Budapest : Nemzeti tankönyvkiadó. 539 o.

[6] Fercsik, E., Raátz, J. 1999. Kommunikáció szóban és írásban. Budapest : Krónika Nova Kiadó. 184 o. ISBN 963-85658-0-2.

[7] Forgó, S. 2011. A kommunikációelmélet alapjai. Eszterházy Károly Főiskola.

[8] Gavora, P. 1988. Pedagogická komunikácia v základnej škole.

[9] Bratislava : Veda. 248 o.

[10] Gavora, P. 2007. Učiteľ a žiaci v komunikácii. Bratislava : UK. 197 o. ISBN 978-80-223-2327-7

[11] Gászpor, R. 2010. Bevezetés a kommunikációelméletbe. Kolozsvár : Scientia Kiadó. 124 o. ISBN 978-973-1970-31-8

[12] Haláková, Z. 2012. Pedagogická komunikácia pre študentov učiteľstva. Bratislava : UK. 116 s. ISBN 978-80-223-3179-1

[13] Hunya, M. 2014. Reflektív pedagógus – reflektív gyakorlat. [online]. Elérhető: http://www.ofi.hu/publikacio/reflektiv-pedagogus-reflektiv-gyakorlat. [idézve 2014-11-02.]

[14] Lázár, J. 2001. A kommunikáció tudománya. Budapest : Balassi Kiadó. 134 o. ISBN 963-506-410-1

[15] Mészáros, A. 2002. Az iskola szociálpszichológiai jelenségvilága. Budapest : Elte Eötvös Kiadó. 576 o. ISBN 963-463-085-5

[16] Németh, E. 1999. Kommunikáció. Budapest : SOTE. 76 o.

[17] N. Kollár, K., Szabó, É. 2004. Pszichológia pedagógusoknak. Budapest : Osiris Kiadó. ISBN 963-389-672-x

[18] Rogers, C. 1981. A terápiás kapcsolat: a jelenlegi elméletek és kutatások. In: Pszichoterápia. Budapest : Gondolat Kiadó. 181–196 o.

[19] Sugárné, Kádár J. 1985. Beszéd és kommunikáció az óvodás és kisiskolás korban. Budapest : Akadémiai kiadó, 1985. ISBN 963-05-34-52-5.

[20] Szabó, K. 2002. Kommunikáció felsőfokon. Budapest : Kossuth Kiadó. 410 o. ISBN 963 09 4303 4.

[21] Szecskő, Z. 1994. A tömegkommunikáció társadalmi hatásai. Bevezetés a tömegkommunikáció szociológiájába. Budapest : Oktatáskutató Intézet.

[22] Szitó, I. 2007. Kommunikáció az iskolában. Budapest : Argumentum Kiadó. 68 o. ISBN 978-963446-458-7

[23] Szivák, J. 2010. A reflektív gondolkodás fejlesztése. Magyar Tehetségsegítő Szervezetek Szövetsége. [online]. Elérhető: tehetseg.hu/sites/default/files/04_kotet_net.pdf#page=8. [idézve 2016-02-05.]

[24] Zrinszky, L. 2002. Gyakorlati pedagógiai kommunikáció. Budapest : Adu- Fitt Image. 149 o. ISBN 963-20203-40.

[25] Zsolnai, J. 1996. A pedagógia új rendszere címszavakban. Budapest.

Testing of University Students in Spectated Fields Combined with Development of Technical Thinking

Viera Tomková

Constantine the Philosopher University in Nitra
Faculty of Education
Department of Technology and Information Technologies
Nitra, Slovakia
vtomkova@ukf.sk

Abstract— **Last years in Slovak Republic the emphasis is on increasing technical education in elementary and high schools. The goal of technical education is to develop key skills of pupils needed to develop technical thinking. In the article are test results of university students – future elementary school teachers. We verified levels of the key skills needed in development of technical thinking of their future pupils.**

Keywords— ***technical thinking, testing, key competences, education of students***

I. INTRODUCTION

In state education program for lower secondary education in Slovak Republic is listed request for development of functional literacy and critical thinking of pupils. If we, by the term of „functional literacy", understand ability of pupil to apply theoretical knowledge to solve practical tasks, then the content of educational field „Man and world of work" is correct to develop both skills. Technical education of pupils in elementary schools is provided by subject – technology, according to new innovated state education program for secondary education of elementary schools is mandatory from fifth to ninth year. Technical education in Slovakia was changed multiple times since 1989, what resulted in low level of the pupils' knowledge and skills. Majority of schools canceled specialized classrooms for subject technology (before- technical education), due these steps many people in age between 15 and 30 years didn't have an opportunity to develop their technical thinking and related key competence in any technical subject.

II. KEY COMPETENCE AND TECHNICAL THINKING

The subject technology in the 6th year includes thesis graphical communication, aimed to teach pupils the rules of technical display. The content of this thesis can be divided to: basics of design activities, basics of technical communication, computer and technical drawing and constructing. In basics of design activities pupil should know how to make technical sketch, to choose best suited material for product and to choose correct way of construction and to propose right technology for production. Pupil should be able to create and realize technical idea for his own needs and for needs of school. [10]

Švec [8] said that competence is specialized complex individual feature to fulfill special tasks needed during professional activities. To achieve certain level of knowledge and skills set by Slovak innovated education program is possible only if pupil handled needed competences. During intentional development of pupils technical thinking the basic competences from elementary school became key competences. Key competences are these which outclass boundaries of any other expertise, influence each other and in their development plays key role reflection and critical thinking. [5]

M. Kožuchová in her book characterized model of technical thinking as integrated model of thinking. Technical thinking is made by 3 different fields:

- knowledge (gain and recall of knowledge and activities),
- critical thinking (analysis, evaluation and synthesis),
- creative thinking (synthesis, elaboration and imagination). [4]

W. Furmanek and W. Walat [6] divide technical thinking into four forms:

- practical thinking,
- graphical thinking,
- imagination,
- conceptual thinking.

It is possible to develop technical thinking of pupils by practical tasks in subject technology, combined with development of graphical skills, spatial imagination and acquisition of terminology in certain field of interest and its practical

application. Development of technical thinking is closely combined with development of creative thinking of pupils. As Valentová mentioned the development of creativity of pupils is nowadays one of the most important tasks of the school system. [7]

Technical thinking of pupils closely corresponds with ability to draw perceived object, phenomenon and facts and their ability to imagine objects displayed in form of simple technical sheet. During the elementary school education pupils, should handle the rules of technical display (orthography) to that point that they created stable base for their ongoing education in technical high school. Handling of technical display rules also develops visual thinking of pupils, which is necessary to develop their technical thinking.

Nowadays in the subject technology pupils learn only how to draw basic rules of orthography, which are the corner stone of displaying in engineering, electro-technics and constructing. A teacher should teach pupil to display an object which represents dimensional structure to the plane thought the orthogonal. [1] [9]

III. THE IMPORTANCE OF FUTURE TEACHER IN TECHNICAL EDUCATION

During development of pupil's technical thinking, that means handling of certain competences, the lead role is provided by teachers and parents. According to Valentová future teachers need to be prepared to handle this task during their studies in university. The teacher in the key element in education with determines not only results but even process of education. [7, p. 91] Gavora said that personality of teacher has irreplaceable place in pupil's motivation to education and creativity. [3, p. 5] He mentioned that creativity is important feature of pupils and during their studies is necessary to diagnose pupils' creativity. Diagnose is one way to get to know your pupils. During diagnose he recommend to use informal ways such as their products: verbal, painted, 3D product, or gestures. [3, p. 68]

An opportunity to develop technical thinking of elementary school pupils in subject technology depends on multiple objective and subjective factors:

- age,
- his mental development level,
- level and kind of pupil's thinking,
- level of spatial imagination,
- motivation (mostly inner),
- content of the current topic,
- usefulness of our knowledge in real life,
- teacher's personality.

All these factors impact the education together and none of them is more important.

Education process is effective if pupil can apply new knowledge and skills in new situations. We know from practice that some of the topics are easy to learn, but lot of topics need huge pedagogical masteries to effectively teach his pupils accordingly to their age but still with all necessary facts. Nature science subjects in elementary school belongs to the not very popular subjects (technology included), because often pupils don't understand new topics and they cannot solve tasks alone. That leads to progressive apathy among pupils. To avoid this state is necessary to pay attention on education of future technology teacher and verify if they handled these needed skills and knowledges.

Orthography belongs to the hardest topics in subject technology on elementary school. Skills needed to draw and read orthographical paper can be developed by tasks that lead to gaining knowledge:

- penetration bodies of different geometrical shapes,
- mutual position properties of lines and planes,
- principles projection [1, p. 19]

We consider these skills are basic competences, which each future teacher should handle regardless of his study program. We observed future teachers' level of basic competences needed in technical display. Students were given simple tasks which we tested even on elementary school pupils.

IV. THE RESEARCH METHODOLOGY

The goal of our research was to find out if future teachers of lower secondary education handled knowledge and skills necessary for technical display, which is used to solve many mathematical, physical and technical problems. Dovalova and Hašková realized research at elementary schools in 2013. The results were that from 84 technology teachers only 47 were qualified and 37 were not, that means 44 % were not qualified [2 p. 21]. These facts influenced us in creating of the testing group. We intentionally didn't test technology students to verify which key competences have been handled by average high school absolvents. We assumed that all respondents have handled competences needed in elementary school orthography. Because of these reasons the testing group was made by 82 university students technology course excluded. We tested 61 women and 21 men. The research tool was graphical test made by seven tasks. We observed cognitive and conative components of personality, which combined with affective create term competence.

[5 p. 43] The maximal achievable score was 37,5 points.

V. EVALUATION OF RESULTS

All tasks were made in difficulty level of elementary school pupil.

Tasks 1, 2, 6, 7 were focused to correct perception of parts and units, imaginary manipulation with object, ability to concentrate and looking for correlations. To correctly answer in tasks 3, 4, 5 students needed to know technological terminology used in orthography.

Results of individual tasks

| Average score | Task 1 95,12 % | Task 2 49,54 % | Task 3 11,43 % | Task 4 35,52 % | Task 5 44,15 % | Task 6 100,00 % | Task 7 67,48 % |
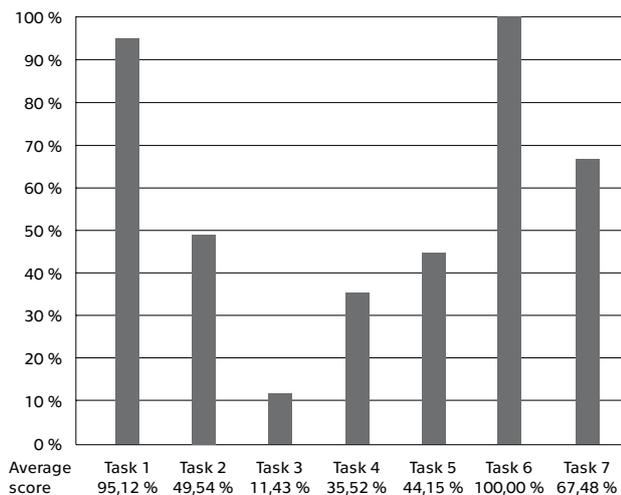
Fig. 1.   Evaluation of results in individual tasks

In first and second tasks were about completing objects from given parts. In first task objects had simple straight lines and in second task objects had curved lines. As we can see in fig. 1, respondents scored 95,12 % in first task and the second was more difficult (score only 49,54 %). That means respondent can easily manipulate with straight line objects. The worst results were in exercise number three. Respondents needed to use their imagination and technical terminology. Students were not familiar witch technical terminology and therefore we had to explain it fist to avoid 0 % results. Even after explanation the results were just 11,43 %. Forth exercise focused on imagination, logic and orientation in plane. We were surprised that only 35,52 % of respondents were successful. In task number five students were supposed to find parts of object on 3D model by orthogonal display instructions. Just 44,15 % of respondents manage to complete the task. In the next task (No. 6) we observed ability of our tested group to percept hidden parts of object. According to perfect results (100 %) we assume that this task was very easy. Last task tested level of imagination and logical thinking. Tested group achieved only 67,48 % in this task. They were supposed to fill empty spots on playing cube. Even though the perfect score in task number six (100 %) the over-

all score in graphical test was only 46,91 %, what we consider insufficient at all.

VI. CONCLUSION

We observed level of technical key competences among future teachers studying non-technical courses, because there is huge probability that some of them will teach subject technology as unqualified teacher. As we mentioned above nowadays 44 % of technology teachers are unqualified. The ministry of education declare request to improve level of technical education and to encourage pupils in their future technical education. It's only possible if pupils can properly handle all necessary competences for technical education during their elementary studies. It only can happened if we focus on technical education at all levels of school education, not only elementary and high schools, but even during pedagogical studies at university.

REFERENCES

[1]   P. Beisetzer, Priestorová predstavivosť v kontexte edukačného procesu. In: Media 4u Magazine: Modernizace vysokoškolské výuky technických předmětů [CD-ROM]. Hradec Králové: Gaudeamus, 2015. s.18 -22, ISBN 978-80-7435-555-4.

[2]   D. Dovalová, A. Hašková, Aktuálne problémy technického vzdelávania na základných školách, In: Technika a vzdelávanie, Banská Bystrica, 2013, ročník 2, č. 2, s. 20 -24, ISSN 1338-9742.

[3]   P. Gavora, Akí sú moji žiaci? Pedagogická diagnostika žiaka, Bratislava: Práca, spol. s. r. o., 1999, 239 s. ISBN 80-7094-335-1.

[4]   M. Kožuchová, Rozvoj technickej tvorivosti. Bratislava: UK, 1995. 156 s. ISBN 80-223-0967-2.

[5]   J. Pavelka, T. Kozík (Eds).,"Interaktívne prostredie a kľúčové kompetencie" Prešov: Prešovská univerzita, 2015, 308 s. ISBN 978-80-555-1424-6.

[6]   W. Furmanek, W. Walat, Przewodnik metodyczny dla nauczycieli techniki-informatyki. 1. wyd. Rzeszów: Wydawnictwo Oświatowe FOSZE, 2002. ISBN 83-88845-08-X.

[7]   M. Valentová, Technická tvorivá činnosť v príprave budúcich učiteľov. In: Media 4u Magazine: Modernizace vysokoškolské výuky technických předmětů [CD-ROM]. Hradec Králové: Gaudeamus, 2015. s. 90 - 94, ISBN 978-80-7435-555-4.

[8]   Š. Švec, a kol. 1998. Metodológia vied o výchove. Bratislava: IRIS, 1998. 303 s. ISBN 80-88778.

[9]   V. Tomková, Technická neverbálna komunikácia, 1. vyd. Nitra: UKF v Nitre, 2013. 202 s.ISBN 978-80-558-0367-8.

[10]   Štátny vzdelávací program, Človek a svet práce. [online 2016-10-26]. Bratislava: Inovovaný štátny vzdelávací program. dostupné z: http://www.statpedu.sk/clanky/inovovany-statny-vzdelavaci-program-inovovany-svp-pre-2stupen-zs/clovek-svet-prace

Organisational Culture of the University and the Communication Between Teachers and Students

Małgorzata Koszembar-Wiklik

Humanitas University in Sosnowiec
Sosnowiec, Poland
gosia.wik2@gmail.com

Abstract— **Culture in an organisation, also in univeristy, is under the impact of numerous factors resulting from both external and internal environment. The characteristic features of organisational culture include: an organisational scenario, philosophy on which the organisation's policy is based, the core of the values which determine the company's philosophy and mission, organisational climate, attitude towards work, the degree of personal responsibility for work, achieving progress in the organisation and customary and traditional ways of thinking and acting. Organisational culture of the university has an impact on the forms used for internal communication. Author made an attempt to identify the organisational culture of some of the university's employees and students. The purpose of the research was to establish what type of culture prevails in that institution and also studied the used forms of communication between teachers and students.**

Key words: organisational culture, higher education, communication management

I. INTRODUCTION

Organisational culture is one of the more important phenomena which drive people's behaviours in various organisations, including higher education institutions. Higher education institutions differ from one another with their organisational culture which, in turn, is the factor determining their ability to adapt and react to the changes occurring in the market of higher education. The higher education institutions in Poland which have been under the impact of the turbulent changes related to the transformation of the political and economic system after 1989, to the development of private higher education institutions, growing influence of business and labour market, demographic and economic changes and the new Law on Higher Education, need to adapt to those changes. It is not easy, however, with the frequently fossilized and hierarchic structures.

II. ORGANISATIONAL CULTURE AT UNIVERSITIES

In the literature you can find a number of different definitions of organisational culture. In 1952 A.Kroberg and C.Kluckhohn defined the organisational culture as "Culture consists of patterns, explicit and implicit, of and for behaviour acquired and transmitted by symbols, constituting the distinctive achievements of human groups, including their embodiment in artefacts; the essential core of culture consists of traditional (i.e. historically derived and selected) ideas and especially their attached values; culture systems may, on the one hand, be considered as products of action, on the other, as conditional elements of future action".[1] Other authors define the organizational culture as "collective programming of the mind which distinguishes the members of one group or category of people from another"[2] or "collection of values, traditions, aspirations, beliefs, attitudes which are the essence of everything which people do and think about in an organisation."[3] S.Cameron and R.Quinn state that "unwritten, often subconsciously observed rules which fill out the gap between what is written and what really happens. Culture refers to common views, ideologies, values, beliefs, expectations and standards."[4]

From the synthetic point of view the determinants of organisational culture development which can be found in the literature can be divided into 4 groups: features of organisation's members, features of the organisation itself, condition of the environment and the object of the organisation's operation.

1   Kroeber A.L., Kluckhohn C., Culture: A Critical Review of Concepts and Definitions, Peabody Museum of American Archeology and Ethnology Papers, Harvard Univer-sity, 1952, vol. 47, No 1.

2   Hofstede G.,Hofstede G.J., Minkov M.: Kultury i organizacje, PWE, Warszawa 2011.

3   Kuc B.R., Zarządzanie doskonałe, Wydawnictwo Menedżerskie PTM, Warszawa 2008.

4   Cameron S.K., Quinn R.E.,: Kultura Organizacyjna-diagnoza i zmiana, Wydawnictwo Oficyna Ekonomiczna, Kraków 2003.

Organisation members and their: values, needs, experience, education, attitudes, language, sex, age	Features of the organisation: vision, mission, goals, history, strategies, management style, incentive system, communication system, organisational structure
Organisational culture	
Environment: cultural values, social, natural and local values, characteristic features of the competition, legal regulations, economic environment, methods of solving conflicts in the community	Object of operation: industry, products, technology, scale of operation, degree of cooperation with other entities

Source: own analysis based on literature

Fig. 1. Factors which have an impact on the organisational culture

In the case of a higher education institution the impact of these individual elements on the organisational culture is specific. The particularly important features of the higher education institution's *environment* include: community's perception of the institution and the values attributed to the it which have been changing over the last few years (prestige of higher education institutions has been undermined and the value of certificates received has been devalued); a relatively significant distance of authority in the Polish national culture which finds its reflection in the relations between students and employees and between the employees with various academic degrees and functions; regulations of the Ministry of Science and Higher Education which impose the framework for the institution's operation; unfavourable demographic changes, low birth rate and ageing of the society which force higher education institutions to compete for students; increasing impact of the labour market and businesses which demand that the institution have a more flexible approach to the market which translates into a necessity to adapt the offered majors and teaching methods.

Important *features of the organisation* include: mission and goals of the higher education institution which, unlike in business, are not profit but achievement of statutory assumptions; history of a given institution – long-term functioning in the market of public higher education institutions is on the one hand their strong point and a distinctive feature but on the other one may result in certain problems with adapting to change; consolidated patterns of relations between employees with different academic degrees and titles; hierarchic structure, top-down management style and high dependence on the decisions of the central authority; specific system of communication with employees.

Object of activity: what is specific for higher education institutions is that they offer a pure service which means a significant heterogeneity which manifests itself in the fact that the quality of the provided service depends to a large extent on the person providing it, higher education in-

stitutions have been trying to implement uniform standards of education, e.g. in the Silesian University of Technology an Education Quality Manual has been introduced, however, the specific character of the lecturers' work makes unification of their conduct and behaviours very difficult; the ways of providing the service have been changing, the possibilities in the area of direct provision of the service (e-learning platforms) have been increasing; accessibility of partner programmes such as e.g. Erasmus, giving the employees and students a chance to study in foreign universities, has been growing; the existence of the system of grants which allows carrying out the research in cooperation with various entities, also on the international level; strong emphasis on the research and commercialisation of its results which shifts the burden from teaching to the scientific activity.

Organisation members: in the case of higher education institutions the features of their members are determined by the institution's profile (technical, human sciences, fine arts, etc.); technical higher education institutions are still dominated by men, both in the structures of authority and among the academics, whereas administration is dominated by women. This results not only from external conditions in which the organisation functions but also from the dominating socio-cultural system. Despite the changes which have been taking place in the last few years in Poland we can still observe the domination of the masculine culture which translates into a domination of a hard approach to the organisation's functioning.

Higher education facilities currently operate in a strongly-competitive market, with determined unfavorable demographic processes, and have to compete for students. One such competitive factor is the facility image and positive relationships with various elements of the environment. The strategic role, in addition to the service offer, when creating a positive image, is attributed to the adopted forms of communication.

The most important environment, from the perspective of a higher education facility, is the student environment, being part of the Generation Y (with access to huge social networks).[5] The Generation Y, also called the Millennials, the Net Generation or the 2.0 Generation are people born after 1980, for Poland it is considered that after 1985.[6] The profile of this generation includes several most important characteristics: *cooperation*- the Net Generation actively participates in discussion groups, plays massively multiplauer online games, shares files and videos e.g. on Facebook

5   Levinson P.: Nowe nowe media, Wydawnictwo WAM, Kraków 2010.

6   Tapscott D., Cyfrowa dorosłość. Jak pokolenie sieci zmienia nasz świat, Wydawnictwo Akademickie i Profesjonalne, Warszawa 2010.

Organisational Culture of the University and the Communication Between Teachers and Students

and other portals, shares information; *fast pace* - this generation has been growing up in the digital era so they expect speed - in computer games, fast response to e-mails or fast reaction to posts; *innovation* - the Net Generation has been raised in the culture of invention, they want the latest and the best available products; *interactivity* - they do not want to be passive receivers but to co-create which may mean bigger interest in the games that provide more opportunity for level configuration or for purchasing additional game accessories. Limits of interactivity are of technological nature.[7] The second important issue in the relational approach is the lecturer - students communication. From the point of view of PR, this type of communication will also determine the satisfaction or dissatisfaction of students and will influence the image of the university in the environment.[8] In fact, the only that remains beyond the control of higher education facilities is their students' communication via social media between themselves and between the students and the environment outside the university. The two most important planes of communication are: university - students (current, prospective graduates) and lecturers – students.

III. METHOD

Author made an attempt to identify the organisational culture of some of the university's employees academics and students. They studied the organisational culture in the Silesian University of Technology. The purpose of the research was to establish what type of culture prevails in that institution and associated university forms of communication. The research was carried out among 123 students and 67 teachers, in February 2016 year. The research was conducted with the use of Cameron and Quinn's questionnaire and questionnaire developed by the author. Type of organizational culture defined by a typology of Cameron and Quinn.

Types of organisational cultures according to Cameron and Quinn:[9]

Clan oriented culture - The place of work is perceived as a friendly place, people work together willingly, team work is appreciated. Supervisors act as advisers, teachers and they care about their employees. Organisations are able to survive due to their employees' loyalty and attachment to tradition.

Adhocracy oriented culture - It is dynamic, entrepreneurial and creative. In this culture risk-taking and experimenting are a daily occurrence, people are not afraid of taking up challenges and leaders are innovative and are not afraid to introduce changes and experiment with new ideas.

Hierarchy oriented culture - It is characterised by integrity and gradation of subordination relations. The scope of work and expected behaviours of people are defined in very seriously treated procedures and regulations. Organisation's integrity is ensured by the emphasis on formal rules and regulations. Coordination and systematisation are a challenge for leaders, strong emphasis is put on efficient functioning of the organisation, following time schedules and gradual, continuous cost reduction.

Market oriented culture - This model focuses on results and task implementation. People are driven by ambition and orientation towards goals whereas leaders are ruthless, demanding and focused on competitiveness. Organisation's integrity is ensured by expansion and desire for victorious competition.
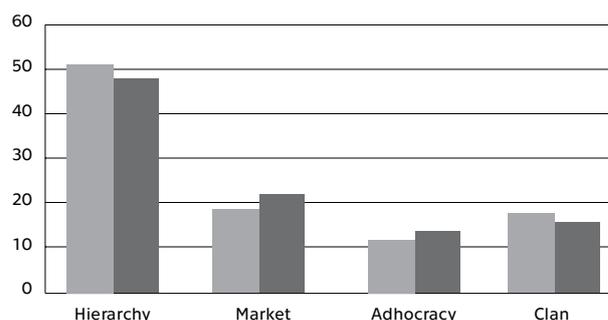
*Source: own analysis based on research*

Fig. 2. Perceived organizational culture at the university (%)

Both of the surveyed groups recognized by the dominant organisational culture at the university is culture of hierarchy - 51% of students and 48% of lecturers.

---

7   Jenkins , H.: Kultura konwergencji. Zderzenie starych i nowych mediów. Warszawa: Wydawnictwo Aka-demickie i Profesjonalne, 2006.

8   Kaplan A. M., Haenlein M., Users of the world, unite! The challenges and opportunities of Social Media, „Business Horizons", nr 53, 2010.

9   Cameron S.K., Quinn R.E.,: Kultura Organizacyjna-diagnoza i zmiana, Wydawnictwo Oficyna Ekonomiczna, Kraków 2003.
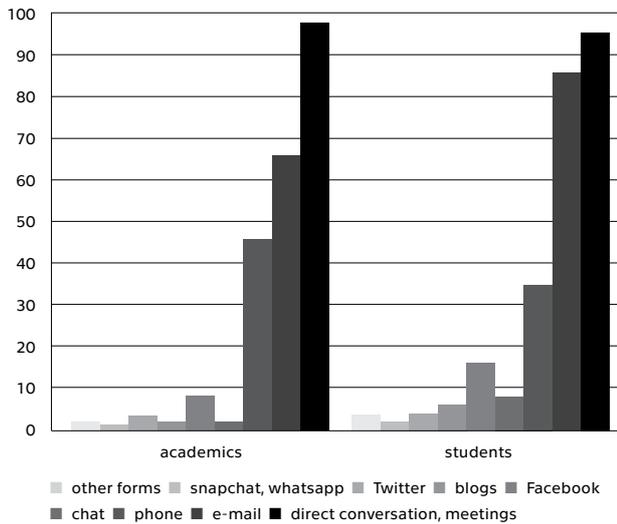
Source: own analysis based on research

Fig. 3. Basic forms of communication in the relation in the group of academics and students (%)

Hierarchy oriented culture is not conducive to the use of social media in communication between faculty and students. The communication between faculty and students modern forms of communication, such as social media (Facebook, blogs, snapchat, Twitter) are used very rarely. The main forms of communication are direct meetings and contact e-mail and telephone.
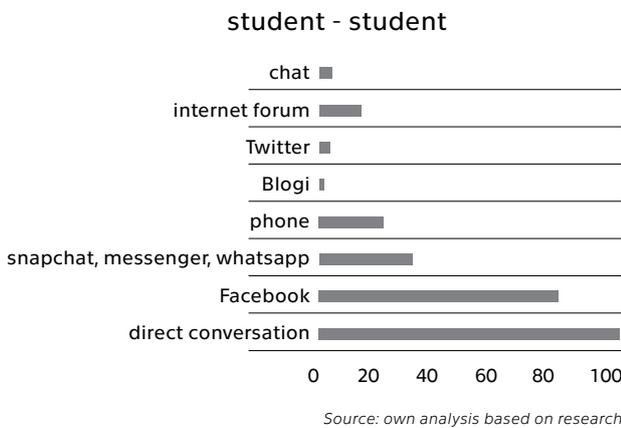
Source: own analysis based on research

Fig. 4. Basic forms of communication in the relation in the group of students (%)

The students communicate among themselves mainly with the use of social media - Facebook, Snapchat, Messenger.
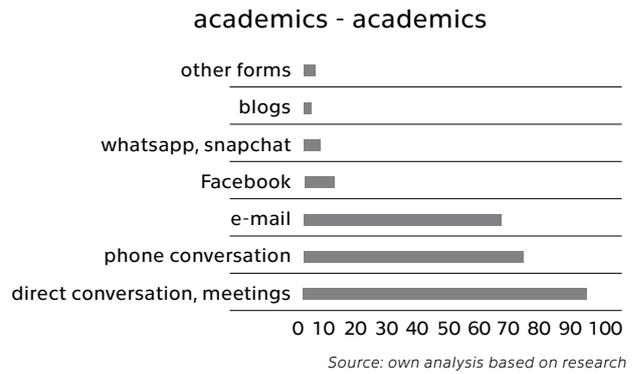
Source: own analysis based on research

Fig. 5. Basic forms of communication in the relation in the group of academics (%)

The lecturers in the communication with each other rarely use social media. Dominate of the direct conversations, telephone and e-mail.
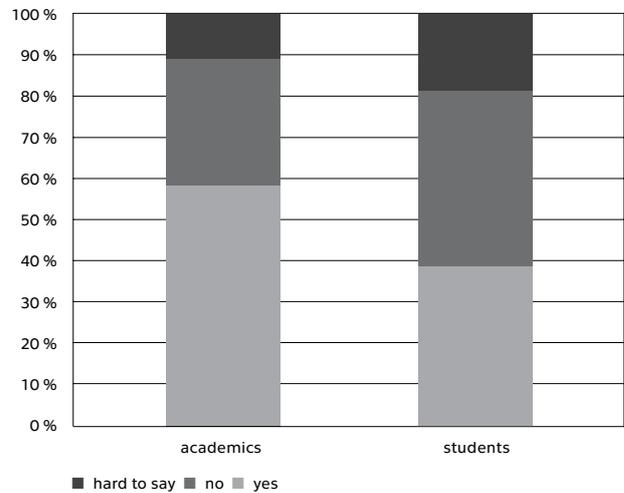
Source: own analysis based on research

Fig. 6. Is the organizational culture of universities promotes the use of social media in communication academics students? (%)

58% of lecturers and only 38% of students believe that the organizational culture of the university promotes the use of social media in communication between lecturers and students. 19% of students and 11% of teachers had no opinion on the subject.

IV. CONCLUSION

As regards other options chosen from among cultural orientations by the academics and students, only the hierarchy oriented culture is on a noticeable level. It may result from the Master-Student relationship consolidated on the level of standards and values and organisational artefacts which, however, in the contemporary system of relations in the academic community seems to play a secondary role. Hierarchic position and the academic degree or title are still perceived as an important element of the academic ethos, nevertheless, in the face of a number of diversified projects and systems of supporting science and

research by grants, it is not perceived as a sources of pro-developmental innovations and not conducive to the use of social media in communication between lecturers and students.

There are differences in the use of social media communication in the generation of faculty and students. You can notice that in hierarchical cultures social media are practically non-existent. Only if relations are not formalised, new forms of communication occur in the relations between employees. Hierarchic relations based on mentors and patrons as specific coryphaei of academic progress guarantee cohesion of the task teams system and the determinant of a professional promotion in the academic and scientific community, but they are not any more the leading source of inspiration in determining employees' individual decisions with respect of their personal life and their professional interests development. The introduction of social media as a communication tool between teachers and students might, as students think, have a positive effect on the perception of universities. The university communication management requires planning and takes account of changes in the media and characteristics of the recipients. Social media have a new specificity, the media are available around the clock, and based on interactivity.

REFERENCES

[1]   Cameron S.K., Quinn R.E.,: Kultura Organizacyjna- diagnoza i zmiana, Wydawnictwo Oficyna Ekonomiczna, Kraków 2003.

[2]   Hofstede G., Hofstede G.J., Minkov M.: Kultury i organizacje, PWE, Warszawa 2011.

[3]   Jenkins , H.: Kultura konwergencji. Zderzenie starych i nowych mediów. Warszawa: Wydawnictwo Akademickie i Profesjonalne, 2006.

[4]   Kaplan A. M., Haenlein M., Users of the world, unite! The challenges and opportunities of Social Media, „Business Horizons", nr 53, 2010.

[5]   Kroeber A.L., Kluckhohn C., Culture: A Critical Review of Concepts and Definitions, Peabody Museum of American Archeology and Ethnology Papers, Harvard University, 1952, vol. 47, No 1.

[6]   Kuc B.R., Zarządzanie doskonałe, Wydawnictwo Menedżerskie PTM, Warszawa 2008.

[7]   Levinson P.: Nowe nowe media, Wydawnictwo WAM, Kraków 2010.

[8]   Tapscott D., Cyfrowa dorosłość. Jak pokolenie sieci zmienia nasz świat, Wydawnictwo Akademickie i Pro-fesjonalne, Warszawa 2010.