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FIRST YEAR STUDENT ADAPTATION TO NEW EDUCATIONAL ENVIRONMENT OF A MODERN UNIVERSITY WHILE DEVELOPING FOREIGN LANGUAGE COMMUNICATIVE COMPETENCE

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Abstract

Modern higher education is greatly affected by globalization and international integration processes dominating nowadays. Students of different national and cultural background study together and they have to communicate taking into account unfamiliar rules of behavior and national customs of representatives of other ethnic groups. Besides the terms and circumstances of education differ greatly from those the first-year students used to have at school. So young people face a lot of problems in socialization and consequently they need some adaptation both to cross-cultural and interethnic relations between the representatives of different nations integrated in a common student group and to a new educational environment of a modern university. All this problems can be settled with the help of a communicative training in a foreign language. Carrying out the assignments of the communicative training, for example, in English, the students develop foreign language communicative competences. Some examples of communicative training assignments in English are set.

Key words: cultural adaptation, social adaptation, educational environment, skills of socialization, multicultural and multiethnic community, communicative competence, communication training.

1. INTRODUCTION

Processes of globalization and international integration are dominating in modern society. These processes make great effect on higher education. Learners from different nations study together in the same educational environment having different views on how to behave and act properly in the environment of a modern university where they can’t easily follow hard and stiff rules of their national and cultural customs and traditions and have to create and improve cross-cultural and interethnic relations between the representatives of different nations integrated in a common student group. Development of new educational paradigm determines the necessity to adapt the process and terms of education to the changing demands of society.

The above-mentioned processes of globalization and international integration require appropriate socialization skills from the students of different cultures. We believe the better skills of socialization have been developed the more effective interpersonal interaction of the students is. And consequently the more successful and motivated general education and professional training will be. This issue is especially urgent for former school children who have just entered a university and have started their professional education in unfamiliar environment which includes another curriculum, time-table, and various ways of communication between the participants of the educational process. Having entered a university any student faces a lot of difficulties: the variety of subjects, the style and methods of knowledge presentation and transfer. The emphasis has shifted from standard regular transmission of
information and data to their processing in order to create knowledge with individual professional view.

So the development of socialization skills between the participants of a university group can be considered as one of the goals of primary importance for modern education. Social adaptation of former school children to a new educational environment of a modern university is realized together with the professional training of the first-year students who study in multi-cultural groups.

2. ASPECTS OF ADAPTATION

Adaptation as a phenomenon and its aspects are investigated from different sides. To consider the variety of the definitions from different approaches is supposed to be quite essential for our research. From a philosophical point of view, adaptation is a change in behavior of a person or group in response to new or modified surroundings, it’s a quality of any creature existing in nature, a human being including. This quality manifests itself any time when the relationship between a man and the environment changes. As a man and the environment are constantly changing, adaptation becomes a basis for the existence (Blackburn 2008).

The Dictionary of Psychology considers adaptation as a term referring to the ability to adjust to new information and experiences, to acquire new rules and stereotypes of behavior that allow us to cope with all changes. Psychological atmosphere at university is significantly different from the atmosphere of a secondary school; first of all, students possess a relatively high level of independence while learning. Psychological adaptation is determined by activity of an individual. The most stable psychological state of an individual to new conditions is the better result of the adaptation process is. Indicators of adaptation are a low level of anxiety or its lack in general (Reber, Reber, Allen 2009).

Under a social adaptation, i.e. the adaptation of a person to social problems, an ability of an individual to live and work in new environmental conditions, mutual coexistence of the individual and the environment are considered. Social adaptation is also defined as an adjustment to live in accordance with interpersonal, social, and cultural norms. In this case, the adaptability indicators are positive emotions in relations with others (Stedman 2008).

For a long time social adaptation has remained an object of study, which largely explains the dynamics and diversity of development trends of modern society. The researchers note that "social adaptation is one of the mechanisms of socialization that allows a person be actively involved in various structural elements of the social environment. Describing the social adaptation as a process of interaction between an individual and a social group with the environment, experts point out that during this process the requirements and expectations of its participants match. A matter of great importance is that an individual not only uses the social experience but also discovers new ways of treating and solving problems.

Another kind of adaptation is cultural adaptation that some researches define as the evolutionary process by which an individual modifies his personal habits and customs to fit in to a particular culture. It can also refer to gradual changes within a culture or society that occur as people from different backgrounds participate in the culture and share their perspectives and practices. Generally speaking, adaptation refers to accommodation, change and evolution. Culture comprises of such areas of life as language, history, dress, food, holidays, traditions, religion, music and other forms of art. Culture is the way we do life (Moran, Keane 2009). Thus we can say that to adapt to other culture we should change our way of life in this or that way.
Based on the analysis of the publications we are convinced that despite of some differences between the social, physiological, psychological, educational, social, cultural and other kinds of adaptation, they are particular aspects of a single process. The problems of adaptation to a new educational environment of a modern university seems to be urgent to consider as educational environment of modern universities is correlated with cultural and ethnic diversity of society as a whole. People’s Friendship University of Russia can be set as an example of multicultural and multiethnic community of students.

Being different in quality, all aspects of adaptation are interrelated and interdependent and, in our opinion, are realized in the following:

• preserving ethnic culture identity,
• developing a common cultural space for integration of different cultures,
• objective cultivating a friendly multicultural environment in different areas (learning, science, communication).

However the task to form a sense of respect for all nations should be preceded by another task, namely, to cultivate the ability of communication with people of different nationalities. In practice the adaptation to unknown conditions of learning, unfamiliar fellow-students, new relations with teachers etc. is traditionally realized with a technology of training.

In addition, social adaptation of a specialist in interpersonal and multicultural interaction is provided by a communicative adaptation both in a mother tongue and in a foreign language. Accordingly, the process of learning a foreign language in a higher school can be considered as one of the terms of communicative adaptation.

Communicative adaptation of the participants of social and cultural interaction implies an adequate perception, understanding and evaluation of social objects (other people, themselves, groups, social communities, etc.) by individuals as well as an interpretation of social interaction subjects. Communicative adaptation, along with professional and organizational kinds, is regarded as a structural and functional component of the professional integration of a specialist, which starts with his first days at university and is over with the transition into the professional environment (Dictionary 2009).

3. DEVELOPMENT OF COMMUNICATIVE COMPETENCE

Communicative adaptation is closely connected with communicative competence. We can suppose that efficiency of adaptation depends on the level of communicative competence development. Having started to study in a new educational environment, learners should form skills of conscious and purposeful polylogue with other members of international multicultural community at university. In this situation a foreign language communicative competence can be regarded as an instrument of communicative adaptation both to the new educational environment within a multicultural educational group, and to the foreign language culture. This approach is relevant to foreign language and culture studies.

Consequently, the development of foreign language communicative competence of students helps their adaptation to the conditions of the new educational environment during their first year at university. To enhance the foreign language communicative competence of students different techniques and methods of teaching are used. The integrated nature of educational problems causes the unity of
various techniques and methods of teaching. Modern linguodidactic research pays considerable attention to technologies of interactive learning of foreign languages; it integrates communicative, sociocultural, professional-focused approaches to teaching. In particular, special attention is paid to the following technologies: task-based learning; contextual learning; project-based learning; case studies.

The question arises how to integrate the above-mentioned educational technologies into the processes of a foreign language learning and teaching. In our opinion a technology that, on the one hand, develops the foreign language communicative competence of the first year students and, on the other hand, integrates educational technologies is a communication training. Training is considered as a way to impact on the learner and his development of certain skills, competencies, abilities to feel adapted in a new, dynamic environment. Besides communication training is a form of interactive learning, it realizes an activity approach to learning, produces the situation of social interaction, and suggests an active influence on a student. The discussion of training technology has gained great popularity in connection with intercultural communication skills in the native language: (Triandis 1989, Brislin, Yoshida 1994).

The theory of communication training is developed both for the native and a foreign language teaching. It is realized in the context of the social communicative approach, it takes into account the development of professional, social and personal competences of an individual. Some communication trainings include psychological games, exercises, and texts for discussion, which help teachers, trainers and psychologists to make educational process more effective and motivated. Some researches work out the communication training course for the skill development of positive relationship with the members of the university group (Stinson, Hawkins 2007, Byram, Flemin1998, Green, Galford, Maister 2002).

4. COMMUNICATION TRAINING

The concept of communication training in foreign language learning has the goal to support the development of students’ competences in communication and professional fields. The components of the training include self-assessment, carrying out definite tasks, monitoring and evaluation of new diverse strategies in learning (Cohen 1998). Communication training in a professional field provides emergency psychological support, establishes mutual understanding and contact, and correlates negative and positive feedback from a partner.

The assignments of the communication training in a foreign language help to enhance the level of communicative competences of students. To achieve this goal successfully the assignments should be done regularly, at least twice a week. As the communication training deals with the problems that are of great importance to learners (cultural shock, time sharing, their relationship with parents or mates), they are eager to share their opinions on different matters of their life and studies. They compare points of view of their fellow students, try to persuade or dissuade them on some decisions. Besides, students learn much about the life of the students from other countries. They have an opportunity to find out what is in common and what is different in the way they learn. As all discussions are made in a foreign language, students develop such foreign language communicative competences as linguistic (knowledge of grammar rules, lexical units, phonology), socio-linguistic (skills to choose language patterns that match the situation of communication, intentions of the speaker, his communicative goals), discourse (the ability to create completed logical utterances of different functional styles both
orally and in writing, to interpret texts while reading and listening), socio-cultural (awareness of national customs, rules and norms of speech behavior of foreign language speakers) and others.

Among the assignments of the communication training that caused great interest of the students and developed their communicative competences are such as: making a crossword of the student’s names; making charts with rules of behavior obligatory both for a teacher and students; speaking about students’ likes and dislikes, their personal values; discussing national and international stereotypes and others.

Sometimes young people are involved in discussions on the topics: “Teaching does not necessarily lead to learning”, “The more a teacher does, the less space there will be for the learner to do things”, “Culture is a pattern of response to customs, language, behavior and values”, “Culture shock is primarily a set of emotional reactions to the loss of any support from one’s own culture, to new cultural environment and to the misunderstanding of new and diverse experience”, “A good language learner must be a risk-taker” etc. (Capua, Wintergerst 2004, Hess 2007, Hewitt 1996).

Naturally the implementation of the communication training in practice implies that students should acquire some linguistic background in the language studied at least on the level A2 according to the European classification (Common European Framework 2004), i.e. they can participate in discussions of some definite topics and have skills and habits of speaking.

The application of communication training in practice showed that the communicative competences of students have been enhanced. It was proved in the course of experimental learning at law faculty of People’s Friendship University of Russia. One part of students was taught in a regular way without any communication training application. The other students carried out the assignments of the communication training twice a week at their English classes during their first year at university. The assignments of the communication training were integrated in the curriculum of the English language learning, they were correlated with lexical and grammar topics studied at classes.

At the beginning of the experiment the students of both groups were tested to estimate the starting level of their communicative competences in English. For this purpose Cambridge University Tests were used. The results obtained in the tests were approximately the same. Then in the course of the year and consequently in the course of the experimental learning the students’ communicative competences were evaluated two more times with the help of intermediate and final tests. This time the results were quite different: the students of the experimental group got better marks in all parts of the test. And by the end of the experiment period the gap between the levels of the communicative competences achieved was even greater.

Moreover the students of the experimental group could be characterized as more motivated, more involved, energetic and active. They were eager to participate in any fresh updated activity. The relations among the students of this group were friendly, they were more helpful. Regular discussions of various task-based situations helped our learners to become a team of colleagues sharing ideas and views of each other instead of being a group of individuals. Students were ready to discuss various difficult questions and find appropriate decisions during discussions. Novelty and unpredictability of the task-based situations raised their motivation, working capacity and adaptability to the terms and conditions of learning in unfamiliar educational environment of a modern university.

So we believe that students starting their education at a university need some period of adaptation as they come into unfamiliar educational environment with quite different rulers and specific features. Adaptation affects all aspects of education: the process of education, the status of learners as part of a system of education and educational technologies. One these technologies is communication training.
When used in foreign language classes it helps to settle not only the problem of adaptation but also develops foreign language communicative competences of the students as all discussions and assignments are made in a foreign language studied.

REFERENCES

EDUCATIONAL MODEL OF ICT INTEGRATION SKILLS DEVELOPMENT FOR PROSPECTIVE TEACHERS OF HOUSEHOLD AND HOME ECONOMICS

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Abstract
Research aim is to create a model of ICT integration skills development for prospective teachers of Household and Home economics. Tasks of research – to find out ways for prospective teachers how to acquire necessary ICT skills; to clear up development levels, criteria and indicators to characterise those, of ICT integration skills; to create a model of ICT integration skills development.

Worked out educational model was evaluated by experts (professors of educational sciences of Latvia University of Agriculture, Faculty of Engineering, Institute of Education and Home Economics), as well as prospective teachers of Household and Home economics has surveyed (first and third course students), to verify dynamic of ICT integration skills development depended from study course.

The model of ICT integration skills development is scientifically grounded and experimentally proved (p-value = 0.000 < 0.05), therefore it is possible (possibility 99.9%) to maintain, the dynamic of ICT integration skills development for prospective teachers of Household and Home economics can be observed by using model of ICT integration skills development in their learning.

Key words: model, ICT, skills, household, integration.

1. INTRODUCTION

In the Latvia Profession standard (approved with instruction Nr.116 of the Ministry of Education and Science (27th February 2004)) – teacher with 5th level qualification has to know how to use different teaching aids, ICT included (Profesijas standarts, 2004). In consider with teachers’ responsibility and variety of using ICT, it is necessary for prospective teachers of Household and Home economics to use ICT as aid to get information, processing it, evaluate it and present, as well as working environment to organize educational process.

Actual and important is cognition of M. Ignatjeva, using of ICT in education counted as successful if there is possible to provide in study process acquiring of important knowledge, skills and competences in accordance with effect of ICT using; things which can’t be acquired without using of technologies (Ignatjeva, 2007). Successful using of ICT in traditional education and lifelong learning means education in abundant environment of ICT (Fig.1).
I. Jung considers that ICT teacher training can take many forms – teachers can be trained to learn HOW to use ICT or teachers can be trained VIA ICT. ICT can be used as a core or a complementary means to the teacher training process (Jung, 2005). Development of ICT skills for teachers is represented in Figure 2.

Approach of humanitarian education in education process is realized in interaction between teacher and students. Teacher is counsellor and assistant, who helps students’ to get understanding about new things and process; offers an opinion about newly discovered information, not discussed in wide society; promotes and supports creativeness in every expression; involves students in study process and develops their highest skills of thinking; ties study process with practical life. Teachers must have
to take into consideration and involved in daily work both variable ICT, and new approaches and standards in education, who demands higher performance from both- student and teacher (Tūna, 2006).

The result of such education- generalist with deep and fundamental knowledge, constant and intellectually creative skills, and ICT skills included. ICT skills is ability focused and effectively to find and choose information, to evaluate it and to administrate in accordance with nominated tasks, aims, demands and considerations with help of newest ICT and internet, as well as ability to work with ICT in usage of different application software’s. Schematic interpretation of ICT skills can be found in Figure 3.

By analysis of different researchers about ICT using in education- Apple computer (Apple Computer, 1995), G. Knezek and R. Christensen (Knezek&Christensen, 1999), J. Kortlik and D. Redmann (Kotrlik&Redmann, 2005) research about phases of ICT acquisition; author worked out four main levels of ICT integration skills development for prospective teachers of Household and Home economics (Fig.4.).
Aim: development of ICT integration skills for prospective teachers of Household and Home economics

Tasks:
- Ensuring of the quality of education and development of professional competitiveness.
- Development of ICT integration skills and professional growth.

Teacher

Teaching methods, organization forms, and aids.

Students

Knowledge

Skills

Competence

Levels of ICT integration skills development

Level 1:
Standard skills to integrate technologies
- Skill to use communication aids
- Skill to work with found information
- Skill to use facilities of network
- Skill to work with basic software

Level 2:
Competent integration of technologies
- Presentation skill
- Skill to work in videoconference mode
- Skill to use the latest ICT
- Skill to work with the specific computer software

Level 3:
Integration guided to study courses
- Skill to organize the control of achievements
- Skill to work with e-register or data bases
- Skill to work in pedagogic portals in forum mode

Level 4:
Integration guided to creative pedagogic actions
- Skill to form new software according to subject needs
- Skill to form digital master class
- Skill to form the e-book of subject
- Skill to form the subject in e-studies environment

Result: Acquisition of creative ICT integration to solve pedagogical problems, as well as formation of motivation for self-development, self-education and self-improvement.

Fig. 5 Model of ICT integration skills development for prospective teachers of Household and Home economics
Author worked out criteria characterised ICT integration skills development for prospective teachers of Household and Home economics grounded on ICT integration levels. Summarizing ICT integration skills development levels and criteria, author creates a model of ICT integration skills development for prospective teachers of Household and Home economics (Fig.5.)

Three-stage parameters or indicators (high (+), middle (±), low (−) evaluation) are worked out for each criteria of each level for qualitative description and evaluating of prospective teachers ICT skills’ multifunctional character.

**Level 1: Standard skills to integrate technologies** - prospective Household and Home Economics teacher know how to use ICT. Criteria characterized skills in this level are:

- **Skill to use communication aids** (e-mail, internet and other media resources):
  - + I know all resources;
  - ± I can communicate electronically;
  - − I have no skills in it.

- **Skill to work with found information** (to be aware of own demands, to plan choice of information, to choose appropriate information sources and feel free in informative environment, to evaluate essentiality, reliability and quality of gained information, to pick out unnecessary information, to compare gained information and interpret accordingly to own demands):
  - + I always evaluate essentiality and reliability of gained information;
  - ± I sometimes evaluate essentiality and reliability of gained information;
  - − I never evaluate essentiality and reliability of gained information.

- **Skill to use facilities of network**:
  - + I always use a network;
  - ± I rarely use a net;
  - − I have no skills to use a network.

- **Skill to use basic software** (MS Word, MS Excel, Paint):
  - + I am competent to use software;
  - ± I need a help of lecturer;
  - − I am not competent to use software.

**Level 2: Competent integration of technologies** - prospective teacher of Household and Home economics freely orient in ICT offer, as well as know how to use specific programs. Criteria are:

- **Presentation skills** (skill to use presentation equipment and software MS PowerPoint):
  - + I am competent to use software;
  - ± I need a help of lecturer;
  - − I am not competent to use software.

- **Skill to work in videoconference mode**:
  - + I can work in videoconference mode;
  - ± I need a help of lecturer;
  - − I can’t work in videoconference mode.

- **Skills how to use the latest ICT** (interactive blackboard, digital document camera, interactive teacher monitor, etc.):
  - + I know, how to works with several ICT;
  - ± I can work with only interactive blackboard;
  - − I don’t know to work.

- **Skills how to work with the specific computer software** (Adobe Photoshop, CorelDraw, Movie Maker, Calling Knittig, Pattern Maker, test forming software, etc.):
  - + I am competent in computer software;
  - ± I need the help of lecturer;
  - − I don’t know to work.
Level 3: Integration guided to study courses – prospective household and home economics teacher can organize the study process, using ICT possibilities in his educational activities. Characterizing criteria of skills in this level are:

Skills to organize the control of achievements, by using different test software and by making combined system of evaluation:
+ I am competent to form in different software; ± I need the help of lecturer; – I don’t know how to form.

Skills to work with e-register or data bases and to realize the updating of data base:
+ I know all possibilities of e-register; ± I can to enter marks; – I don’t know how to work.

Skills to work in pedagogic and educational portals in forum mode:
+ I feel free and communicative in pedagogic portals; ± I look for different solutions of the problem; – I don’t use pedagogic portals.

Level 4: Integration guided to creative pedagogic actions – prospective household and home economics teacher can evaluate, choose and technologically demonstrate his pedagogical experience using ICT, that become apparent in progress and purposefulness to achieve outlined goals. Characterizing criteria of skills in this level are:

Skills to form (program) new software according to subject needs:
+ I know several computer languages (Java, C++, Pascal, Delphi); ± I know only MS Visual Basic; – I have not skills to program.

Skills to form digital master class: possibility to learn any matter formation step by step, by teaching in a masterly way somebody, who never have any relationship to this matter. For example, somebody can knit gloves, but in the master class he gets skills to make complicate lace and how to do it twice quickly:
+ I can form; ± I need help of lecturer; – I have not skills to form.

Skills to form the e-book of subject and other interactive study materials:
+ I can form; ± I only know how to save files in PDF or DjVu formats; – I have not skills to form.

Skills to form the subject in e-studies environment:
+ I can form; ± I need help of lecturer; – I have not skills to form.

The educational model of ICT integration skills development is guided on personality development of prospective household and home economics teacher and formation of comprehensive ITC experience that develops by transition from one level to the next (Fig.5).

METHODOLOGY OF RESEARCH (MATERIAL AND METHODS)

The model of ICT integration skills development was evaluated with expert method. Criteria to choose experts were appropriate experience in pedagogy and methodology, household and information technologies. 5 experts – professors of Latvia University of Agriculture Faculty of Engineering Institute Education and Home economics were involved in research. Every expert worked individually
thereby the coordination of views is prevented and it is possible to consider that the conclusions of experts are independent.

The questionnaire of prospective household and home economics teachers was carried out in 2009 (1st Year) and repeatedly in 2011 (3rd Year), where it was necessary for each respondent to evaluate his skills, based on criteria of the model of ICT integration skills development (Fig. 5), according to three-stage indicators (high, medium, low evaluation). 20 respondents took part in research.

The aim of questionnaire was to test the model of ICT integration skills development dynamics depending on study course. By means of contingent analysis, using the computer program SPSS, (Arhipova&Bāliņa, 2006; Paura&Arhipova, 2002), the correlation was determined between evaluation: high, medium, low and the study course. The hypothesis was raised, that the study course and the evaluation (high, medium, low) of ICT integration skills is the relation of independent feature to the development of ICT integration skills.

RESULTS OF RESEARCH

Experts evaluated the worked out model of ICT integration skills development with development levels, criteria and indicators. Experts consider that:

- skills to integrate ICT in household lessons are necessary for prospective household and home economics teachers,
- it is possible to characterize the development of ICT integration skills with development levels, criteria and indicators, worked out by author, that sufficiency widely describes these criteria,
- criteria and indicators creates understanding of ICT integration skills development.

The graphic illustration of ICT integration skills dynamics for prospective household and home economics teachers is given in Figures 6-9.

Fig. 6 The comparison of standard skills to integrate technologies
The results summarized in Figure 6 show, that the first year students their standard skills evaluated as high and medium. The greatest part of respondents (63%) best of all can use the possibilities of network, and then work with found information and basic software (50%), but worse is going on with appropriate using of communication tools (25%). In return all skills of this level are highly developed for third year students (100%). This shows the development dynamics of skills in this level.

![Bar chart showing skill comparison between first and third year students](image)

Fig. 7 The comparison of competent technology integration

The results summarized in Figure 7 show, that in this level first year students don’t know a lot of things, because 75% of respondents gave low evaluation in skills to work in videoconference regime and to work with specific computer software. 50% of respondents evaluated with low and medium skills with specific computer software, but presentation skills have medium and high evaluation. But graduating the third year, respondents evaluated with high and partially medium their competent skills of technology integration. It is not notice low evaluation of skills for the third year students. It shows the development of skills dynamics in this level too.

The results summarized in Figure 8 show, that the first year students rather low evaluated their skills in this level (63%, 88% and 75%). But the greatest part (88%) of the third year students can organize the control of achievements by using different software for testing. The skills to work with e-register or data base and in forums in pedagogical portals were evaluated as medium and high. Also in this level the low evaluation of skills is not observed for the third year students. It shows the development of skills dynamics in this level too.
The results summarized in Figure 9 show, that this is the hardest level of ICT integration skills development, because the evaluation of the first year students is medium (prevalence 37%) and low (prevalence 63%), but also the evaluation of the third year students divides between high, medium and
low. It is understandable, because it is rather hard to form new computer program according to the requirements of subject or the course of the subject in e-study environment, this is proved by low evaluation by 25% respondents. A little bit easier is to form the e-book for the subject; it is proved by high evaluation by 63% of respondents. High (50%) and medium (50%) evaluation was given to skill to form digital master class, because it is necessary to record a text in video file with high quality, for household product making step-by-step.

The following testing of data was carried out using contingency analysis by examining the hypothesis, that the study year and the evaluation (high, medium, low) of ICT integration skills is the relation of independent feature to the development of ICT integration skills.

As the results of contingency analyses, there was worked out data, where the distribution of feature is summarized separately for each study course (Fig.10), as well as mutual comparison of both study courses (Fig. 11).

Fig.10 Percentage distribution in the frame of study year

Summarized results in Figure 10, leads to conclusion, that skills to integrate ICT is in low level for the first year students (44.2%). In return, skills to integrate ICT of the third year students is developed very high (67.5%) in comparison with low level (3.3%).
Summarized results in Figure 11 leads to conclusion, that the skills of the first year students to integrate ICT (91.4%) are substantially lower than the skills of the third year students (8.6%). In return, the skills of the third year students to integrate ICT in education are highly developed (81%) in comparison with the first year students (19%).

By developing contingency analyze, it is obtained, that p-value = 0.000 < 0.05, therefore with probability 99.9% it is possible to declare, that study year and evaluation of ICT integrate skills (high, medium, low) are mutual dependent features.

On this basis it is possible to declare, that it is the dynamics in the development of ICT integrate skills for prospective household and home economics teachers, by using the model of ICT integration skills development in their education.

**DISCUSSION**

According to the point of view of E. Dmitrijeva, ICT plays the great role in the development of personality, because those promote the individualization of educational process, develop knowledge and skills in professional activities as well as increase motivation to achieve high results of learning (Дмитриева, 2011).

S.Rubinstein declares, that the effective method to develop skills is solving of problems. But in the formation of problems, he pointed, that new knowledge and skills develop on the base of existing. For the skill that is grounded in action it is necessary to develop as an operation. The skill develops in action and it is the component of this action (Рубинштейн, 2006). The implementation of separate definite components in new problems strengthens skills.

D. Prett considers that it is possible to express knowledge by words, but the skills need to be demonstrated. It would be ideal, if students will show how they can use the certain skill in conditions as possible like to the real (Prets, 2000).
The author agree, that it is difficult to acquire any ICT skills without exercising, out of practical experience, because when the practical problems are solved frequently and in big quantity, the quality of skills improves. Cognition an activity interactions stimulate the development of skills.

Therefore the author worked out study course Information technologies in education for prospective household and home economics teachers, that successfully get realized as obligatory course for the second year students of Faculty of Engineering Institute of Education and Home Economic with 32 contact lessons, that responding 2 study credit points and include lectures, practical trainings and control works.

The aim of study course is to give knowledge about the usage of the new information and communication technologies in forming of practical lessons an organization of achievement testing. To get skills to choose and use appropriate information and communication technologies in the given pedagogical situation.

Since the standard skills to integrate ICT technologies get acquired in the first year, it is possible to start the study course Information technologies in education with competent development of technologies integration. The following level – integration guided to subject get acquired in full volume, but the last level – creative integration of pedagogical experience partly get acquired in the second year and partly in the third year.

CONCLUSIONS

Worked out model of ICT integration skills development is based on implementation of humanitarian education and integration approaches in study process, as well as on scientific researches about usage of ICT in education and author’s created and lectured study course IT in education. Development levels and those characterising criteria are worked out, each criteria has indicators.

Model of ICT integration skills development was evaluated by 5 experts. They considered: 1) skills to integrate ICT in household lessons are necessary for prospective household and home economics teachers 2) it is possible to characterize the development of ICT integration skills with development levels, criteria and indicators, worked out by author, that sufficiency widely describes these criteria, 3) criteria and indicators creates understanding of ICT integration skills development.

Model of ICT integration skills development is scientifically justified and experimentally approved in year 2009 and repeatedly in 2011 with aim to clear up ICT integration skills development dynamic in dependence of study year. During contingence analysis it is worked out, that the p-value = 0.000 < 0.05, therefore (probability of 99.9%) it is possible to declare, that study year and evaluation of ICT integrate skills (high, medium, low) are mutual dependent features.

On this basis it is possible to declare, that it is the dynamics in the development of ICT integration skills for prospective household and home economics teachers, by using the model of ICT integration skills development in their education.

ACKNOWLEDGEMENTS

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THE USE OF E-LEARNING IN DESCRIPTIVE GEOMETRY COURSE
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Abstract
This research analyzed Moodle e-learning environment and opportunities of its use. From all the opportunities, five were chosen and tested. Animations, handouts, filled-in handouts, and tests and questionnaires were developed for e-learning environment of the descriptive geometry course for students of the Faculty of Rural Engineering (FRE) of the Latvia University of Agriculture (LUA). Students evaluated e-learning materials used at lectures and practical training.

Aim of the research: to ascertain efficiency and opportunities of the use of e-learning materials in descriptive geometry course. Objectives of the research: to establish the frequency of use of textual information, multimedia materials in e-learning, and to ascertain the efficiency of e-learning materials when doing practical tasks.

Students of the FRE of the LUA, who had to acquire descriptive geometry within two semesters and at the end of the course pass a written exam, evaluated the developed e-learning course.

The efficiency and use of opportunities of e-learning is scientifically valid and experimentally tested.

Key words: e-learning, descriptive geometry, electronic teaching aids.

1. INTRODUCTION

In nowadays world, the rapid development time, we need to use faster and cheaper ways to transfer knowledge and skills. E – Learning is one of instruments with the help of which we can solve this problem.

"In the information society, developing and maintaining know-how in organisations is crucial to becoming and staying competitive," noted Viviane Reding, Commissioner for Information Society and Media in a 2009 press statement. "Today it is no longer enough to simply acquire knowledge: we need to transform, enrich and structure it; and then to share and re-use it." (ICT research, online)

One of such ways of transferring knowledge is electronic learning (e-learning). E-learning is a convenient aid how to acquire new knowledge learning at home or at work. Studies take place in online conditions – a learner connects the learning sever with an Internet browser. He/she registers with the given username and password, and starts the course acquisition. The learner chooses the most suitable time, speed, and place of studies. Studying this way, all the study courses are available in e-learning environment. During studies, opportunity to get a teacher’s tutorial is provided. Parallel to e-learning, classroom studies also take place in order to do practical activities and to acquire the course better.

I. Gorbâns has added the following elements to the media digital wave presented by Luis Rodriguez-Roselló in 2006, Warsaw:
1) to analogue part – analogue TV, AM/FM radio, newspapers, books;
2) to digital part – e-books, e-learning, Moodle, Google tools, twitter, Skype, draugiem.lv, facebook (Gorbāns, 2010).

These additions represent the media development more perfectly.

In the world, one of the most popular e-learning environments is Moodle website, an acronym of Modular Object-Oriented Dynamic Learning Environment. Moodle is an Open Source Learning Management System, and for its use, there is no license fee. As statistical data show, by 5 June 2011, in 212 countries there were 53,987 Moodle sites registered. In total, 4,505,258 courses are designed in Moodle environment where 1,119,115 educators are participating and 18,990,019 learners have joined the courses.

Moodle e-learning environment has the following advantages:

- Learning material can be presented as an image, video, audio, text, or animation;
- Various methodological and teaching materials can be worked out – workbooks, lectures, tasks for individual work and tests;
- An individual, complicated or integrated study course can be developed in the chosen discipline;
- Study course can be developed in such a way that students can use it without the teacher’s presence.

Also in Latvian system of education, e-learning aids are more often used so beneficial conditions are created for development of innovative teaching methods. Mainly, such teaching aids are placed in some of the e-learning environments. Latvian educational establishments have chosen Moodle e-
learning environment as the most suitable one. E-learning materials in descriptive geometry were placed in the e-learning environment of the Latvian University of Agriculture (LUA), and during semester, investigations were carried out on the efficiency and frequency of use of these aids.

Fig.2 Reģistrētās Moodle saites (Moodle statistics, online)

MATERIAL AND METHODS
An electronic learning aid in descriptive geometry is designed and placed in the LUA e-learning environment. The teaching aid is divided into modules correspondingly the number of lectures of descriptive geometry. Each module consists of the following parts:

1) A handout (Fig.3 Lecture with blanks) needed during the lecture. This handout is especially developed with unfinished drawings and unfinished theoretical part – textual information. During the lecture, students must finish the drawing and theoretical part. This material students print out from the e-learning environment before the lecture;

2) Animated lecture – especially developed graphical part of the lecture with the help of which the problem advanced at the beginning of the lecture or graphical task is gradually solved. Students can open this part only after the lecture.

3) Material (Fig.4 Completed lecture) that could be developed during the lecture. This material is a completed lecture example with completed graphical drawings and completed theoretical part – textual information. This part is also available only after the lecture.

4) Test (Fig.5 Test) students must accomplish to improve their theoretical knowledge and practical skills but by this test, you cannot detect the student’s level of skills.

5) Questionnaires – after each module a questionnaire is placed with the help of which the students’ opinion on a certain module is found out.
Forty-nine students of the Faculty of Rural Engineering of the Latvia University of Agriculture evaluated these materials during semester. To ascertain the effectiveness and frequency of the use of electronic teaching aids developed for descriptive geometry course, students had to evaluate each module. Questionnaires were prepared in e-learning environment, and students filled them in after each module, as well as the final questionnaire (Fig. 6) the results of which showed the students’ opinion about the e-learning course materials. The obtained results of the final questionnaire were
analyzed with $\chi^2$ criterion to verify the compliance of number of quality sample observations with the division of theoretical observation number.

RESULTS OF RESEARCH

By using a questionnaire, it was found out what teaching materials students used most often to do the practical work in association with e-learning aids. Figure 6 shows that 52% - 55% of all students used handouts filled in during the lecture, 23% - 29% of students used the lecture presentation material that was placed in e-learning environment, and 13% - 15% of students used the completed lecture placed in e-learning environment. Textbook and other teaching materials were used by 7% - 15% of students. In addition, the division of use of teaching materials presented in Figure 6 is typical for two study programs – Landscape architecture and planning (AAP) and Environment and water management (VŪS).

In the final questionnaire, students answered to the following questions associated with e-learning environment:

1. Is the use of e-learning environment convenient and easy?
2. Is the layout and structure of themes in e-learning environment understandable?
3. Is the volume of material in e-learning environment sufficient for the course acquisition?
4. Is it possible to acquire the course theoretical part independently by using e-learning materials?
5. Is it possible in e-learning environment to complete the graphical part of handout “Lecture with blanks” independently according to “Lecture presentation”?
6. Is it possible in an e-learning environment to complete the theoretical part of handout “Lecture with blanks” independently according to “Lecture presentation”?

7. Is the theoretical part of material “Completed lecture” sufficient to be prepared to answer the questions at practical classes?

8. Is the graphical part of material “Completed lecture” and material “Lecture presentation” sufficient to complete the graphical tasks?

Fig. 7 Summary of the final questionnaire, %

A hypothesis was advanced for each question that the number of respondents’ answers among the offered answer versions (yes; rather yes than no; rather no than yes; no; hard to say) would have an equal division with insignificant differences.

According to the $\chi^2$ criterion test results, all versions of the offered answers with probability 95% differ significantly as p-value $= 0.000 < 0.05$. It means that the answer version yes predominates significantly over all other answer versions in each question.

Ninety-five per cent of students positively (yes; rather yes than no) evaluated the use of e-learning environment convenience; it demonstrates that the structure of material in Moodle environment is sufficiently good.

The structure of descriptive geometry course was evaluated positively for 100%. This, in turn, allows concluding that such developed e-learning course is sufficiently effective.

The volume of material placed in e-learning environment was also evaluated positively for 100%, and it shows that the use of materials is efficient.

A positive opinion about independent acquisition of descriptive geometry course materials placed in e-learning environment expressed 73% of students.

If a student, due to some reasons, was not able to complete the graphical task during the lecture, he/she can finish the task at convenient time and place in e-learning environment. On question: “Is it possible
to complete the task independently without the educator’s presence?” 95% of students had answered positively.

Completion of the lecture theoretical part independently also 95% of students evaluated positively.

As the sufficiency of materials placed in Moodle environment to prepare for theoretical part, 100% of students said “yes” and “rather yes than no”. It suggests that the use of materials placed in e-learning environment is effective.

In Moodle environment placed material for completion of graphical tasks 87% of all students considered as useful and effective. It is connected with variety of examples at practical classes; lecture examples are different from those at practical classes.

**DISCUSSION**

_E-learning_ most often is connected with independent work and self-education.

G. Rudžītis has indicated that self-education and independent work is done at home without a direct participation of educator: “As independent work might be considered any type of individual and group learning form at lessons, lectures, consultations, and tests as well as at home without a direct participation of educator, but taking into consideration educator’s instructions and recommendations” (Rudžītis, 1998).

“Self-education is a person’s self-fixed, planned and conducted systematic action of cognition the aim of which is to improve his/her knowledge and skills. Self-education is carried out both at educational establishment and outside it. Self-education promotes self-upbringing but without self-upbringing a successful self-education is impossible” (Rudžītis, 1998).

The main advantages of information description for the independent work in e-learning environment is compactness, many and various means of expression of teaching materials, for instance video, audio, animations, as well as interactivity. By using e-learning materials, students may independently organize their acquisition, save time, while the educator’s task is to advise and coordinate students. Depending on the study course specificity, you can place in e-learning environment the most different materials needed for the acquisition of the study course, and they must be especially structured.

To understand better, how independent work is organized in e-learning, we analyzed several definitions.

_E-learning_ is a type of studies that is based on the use of computer and internet (RTU tālmācības studiju centrs, online).

_E-learning_ is a specially organized study course where electronic technologies are used – telecommunication and computer websites, multimedia CD-ROM, as well as radio and TV broadcasting, audio/video records, interactive TV and other technologies (tālmācība un e-studijas, online).

Although the exact definition of the term _eLearning_ is a hotly debated topic, it can broadly be defined as the process of sharing information and creating knowledge using an electronic medium. In other words, eLearning enables you to use the massive advances in technology such as the internet, learning management systems (LMS) and CD’s to create interactive materials that increase productivity through increased knowledge retention. The benefits of eLearning include factors such as global access, lower costs, increased training speed, better performance, greater flexibility and more effective
accountability. In addition, eLearning allows you greater flexibility in terms of deployment options (CD, DVD, LMS, Internet and intranet) and greater user interactivity (audio, video, interactive text, animations, and graphics). Clearly the advances in technology can be extremely beneficial. However, the important thing to realize is that eLearning is a specialized field that requires cross functional expertise. In other words vendor selection is a key consideration when thinking about developing an eLearning program (eLearning, online).

E-learning comprises all forms of electronically supported learning and teaching. The information and communication systems, whether networked or not, serve as specific media to implement the learning process (Tavangarian & Leybold, 2004)

The term will still most likely be utilized to reference out-of-classroom and in-classroom educational experiences via technology, even as advances continue in regard to devices and curriculum (E-learning, online).

The term “e-learning” has many connotations and forms. In this study, ECAR focuses on three types of e-learning courses:

- **Online distance-learning courses.** The instructor conducts class sessions online — not via mail or telephone. This usually requires no face-to-face meetings between students and instructor either in the classroom or via video during the course.

- **Hybrid courses:** In these courses the instructor combines elements of online distance-learning courses and traditional courses. Online forums or Web-based activities may replace a portion of classroom sessions.

- **Traditional courses with technology elements:** These courses are traditional in that the instructor teaches all sessions in the classroom but with the occasional use of technology, such as Web-based activities, multimedia simulations, virtual labs, and/or online testing (Arabasz, Pirani, Fawcett, 2003).

**E-learning** is a distance learning using electronic technologies – telecommunication and computer websites (including Internet), radio and TV broadcasting, audio/video records, interactive TV and multimedia CD-ROM. Informatics and telecommunication technologies, audio and video equipment can provide new former non-existent learning opportunities. In narrower sense, e-learning is considered as on-line learning in computer site. A significant indication of e-learning is a specially organized virtual learning environment, interactive learning materials for self-education, self-assessment opportunities and study support (e-studijas, online).

Distance learning and e-learning philosophy and methods are based on three closely related principles: opportunity to learn in distance, openness, and flexibility (tālmācība un e-studijas, online).

In compliance with the Latvian Law of Education, “distance learning is a kind of part-time studies characterized by especially structured teaching materials, individual speed of learning, especially organized assessment of knowledge achievements, as well as use of various technical and electronic means of communication” (likumi, online).

**Distance education or distance learning** is a field of education that focuses on teaching methods and technology with the aim of delivering teaching, often on an individual basis, to students who are not physically present in a traditional educational setting such as a classroom. It has been described as “a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both” Distance education courses that require a physical on-site
presence for any reason (including taking examinations) have been referred to as hybrid or blended courses of study (Honeyman & Miller, 1993), (Tabor, 2007), (Vaughan, 2010).

The use of tests in e-learning is also connected with programmed learning thus in preparing them the principles of programmed learning should be taken into consideration.

As the distance education is a programmed learning then test-type tasks can be introduced: gap filling in sentences; true false statements; multiple choice. With the first task, mainly memorizing results are tested. It contributes little to the development of methods. More effective is second type of tasks, as their completion requires deep knowledge and quick thinking. Third type of tasks is often used in sociology research as different tests (Zelmenis, 2000).

E-learning is connected with programmed education; therefore the material to be placed in e-learning environment should be divided into small logical structured doses.

Programmed learning is a teaching method advanced by professor B.F. Skinner in 1954.

The aim of the conceptions is to increase the efficiency of education management system basing on cybernetic approach. Programmed learning is learning by some program. The educator’s role in this process is to follow the student’s psychological condition, efficiency of systematic acquisition of the teaching material, and in case of necessity to regulate the programmed activities. In this association, various schemas and algorithm schemas of programmed learning were developed – linear, branched, combined etc., which could be realized by using computers, programmed textbooks, or methodological materials. Didactic principles of programmed learning are as follows: 1) gradualness, 2) availability, 3) systematic, 4) independency (Программированное обучение, online).

CONCLUSIONS

According to the results of $\chi^2$ criterion the following conclusions may be drawn:

1. Respondents could use e-learning environment conveniently and easy. Arrangement and structure of themes placed in e-learning environment were understandable and the volume of materials was sufficient for the course acquisition.

2. Respondents considered that by using materials placed in e-learning environment it was possible to acquire the theoretical part of course independently, as well as to complete the graphical part of “Lecture with blanks” according to the developed materials “Lecture presentation”, and to complete independently “Lecture with blanks” theoretical part according to the developed materials “Lecture completed”.

3. Respondents were of the opinion that the theoretical part of material “Lecture with blanks” was sufficient to be able to prepare for questions asked by educator at practical classes. In addition, the graphical part of materials “Lecture completed” and materials “Lecture presentation” were sufficient to complete the graphical tasks.

REFERENCES


SEARCHING FOR THE PERFECT SCM CURRICULUM – COMPARATIVE STUDY OF SCOR AND APICS COMPETENCE MODELS AND RENOWNED SCM MASTER’S PROGRAMS

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Abstract
Supply chain management (SCM) is an evolving management concept reaching across business functions and entities to utilize major market and technology trends, such as outsourcing or innovative IT-solutions, to full extent. These trends are also changing the critical skill set and competences expected from supply chain professionals. As a result, universities are obliged to update their SCM curricula for optimal coherence with labor market needs.

The article presents first steps in developing modern SCM master’s program using comparative analyses of state-of-the-art SCM skill and competence models and world best practices. This approach obtains input data from SCOR skill model, APICS competence model and selected renowned SCM master programs. The paper aims to find out whether these models provide suitable coverage for curriculum design and whether there are notable differences between models and SCM programs from our sample pool of five SCM programs.

Key words: supply chain management, SCM master programs, curriculum design, APICS competence model, SCOR skills.

1. INTRODUCTION
This paper discusses a study conducted in winter 2011 as part of a project to develop a new SCM masters program in Estonia. The study included comparative analysis of APICS supply chain manager competency model and SCOR model of SCM-related skills, to determine their suitability as a basis for curriculum development. As suitability was identified, the following study was comparing five existing SCM master programs to the APICS competency model to find out to what extent some of the renowned programs of SCM are corresponding to the general framework.

The paper is divided into five sections. First we substantiate the situation requiring a new SCM MSc program in Estonia. Secondly we review the literature on what has previously been found concerning SCM and curricula development. Third, we explain our methodological approach in our studies. Fourth, we present a detailed comparison of APICS and SCOR models. Fifth, we analyse selected SCM programs and conclude with relevant findings for understanding the situation in current SCM higher education as well as for our MSc program’s purpose.

2. BACKGROUND
The field of supply chain management has been in rather dynamic development since the beginning of formulating the concept back in the 1980s in the works of Oliver, Houlihan and others (Houlihan
1984; Oliver 1982). For this articles purpose, it is first important to understand the driving forces behind the dynamics. The main type of factors inducing SCM development have been practical considerations - business needs and environments have changed considerably in almost every business sector and progress in technologies, especially in IT sector, have made possible ways of doing business that were unheard of still only 30 years ago. Nevertheless, it is not only business practices that alter the understanding of supply chains, but also theoretical reflection on conceptual level about how various concepts should support practice, what aspects should be covered in concepts and how certain terminology should be used. A good example on the terminology would be the debate on the relationship between concepts of logistics and supply chain management. Over the years the scope of supply chain management has witnessed plentiful research (for example Cooper et al, 1997; Lamming et al, 2000; Mentzer et al, 2001). What is relevant for this article, however, is the understanding that, unlike back in the 1980s, SCM is today widely accepted as a higher level concept than logistics (Christopher, 2005).

These theoretical and practical considerations present important challenges also for higher education and especially, such as in our case, to universities that have previously trained only logistics professionals, but also aim to launch a SCM program to guarantee that a gap in the labour market could be effectively filled with professionals of dedicated SCM skill set. Most recently, a study concluded that although the levels of logistics and supply chain qualifications are changing constantly, it is the human factor that is the current bottleneck in further development of supply chains and is hindering the potential that has been made possible by new generation information technologies (Kisperska-Moron 2010).

Of course, education in this field is far from being just simple „teach X or Y“. In both logistics and supply chain management, there are endless ways to combine training programs with different focus points to cater for different needs on the labour market. Still on some level they should all adhere to current understanding of relevant modern concepts. Whether the current state of understanding of SCM can be called a true paradigm or not is a debate we’d like to avoid in this paper, but good points on the issue have made by Giannakis and Croom (Giannakis and Croom, 2004).

The initiative for research presented in this article started with a goal to develop a first dedicated supply chain management master’s program in Estonia. For background, Estonia is a small country with a population approx. 1.3 mln. Although not many local industries have world class complexity operations nor the power to make decisions across their entire supply chain from original suppliers to end customers, there is a clear understanding in the region of the priority of developing exports to clients everywhere across the globe and of another strategic priority to maximise sustainable value-adding benefit from our rather fortunate geographical location for facilitating east-west transit.

Without doubt a general form of supply chain education should be present on higher education level with such market characteristics. Up until today, the supply chain managers of Estonian companies have mostly general business administration degrees. Naturally, developing a generation of supply chain experts takes time, which means that due to the dynamic nature of supply chain management, short training programs and modules on modern topics are also needed on the local market. This meant for us that parts of the new curriculum must also be applicable as separate training courses.

In the project for developing a new SCM curriculum, the first milestone was to develop a vision of the ideal centerfield SCM program, which could then as a next step be reflected on industry experts and adjusted to specific Estonian labour market needs. Because of that, one of the first steps was to research Europe’s leading SCM master’s programs for their range of topics, focus and more specifically, the learning and teaching methods. The latter unfortunately falls out of the boundaries of
this article, but is certainly a fascinating process of continuous discovery. This paper deals with the 
scope of topics in SCM and SCM programs. The most important question that this article attempts to 
make way to answer is whether a full coverage of all SCM aspects in a university program is actually 
practically feasible or is a certain extent of compromises and narrowing down the focus of the program 
inevitable.

3. LITERATURE REVIEW

While the scope of composition of SCM has seen much discussion as referenced earlier, the studies on 
teaching SCM are rather scarce. On a more general level of analysing feedback to business higher 
education programs, various authors have pointed out the mismatch between theoretical approach and 
practical business needs, the inability of students to use some of the theoretical concepts as busin ess 
decision-making tools and the need for applying more feedback into curricula improvement process 
(Clayson and Haley, 2005; Lynne and Brennan, 2007).

Recently, Benjamin, Lewis and Thompkins from Florida A&M University studied stakeholder 
expectations on local SCM curriculum (Benjamin, Lewis and Thompkins, 2009) and applied a Quality 
Function Deployment (QFD) framework for that purpose, stressing continuous improvement 
philosophy and customer-focused approach in curriculum improvement. The authors pointed out the 
importance of including various stakeholders (alumni, MBA students, industry professionals) in 
curriculum planning process and noted that the goals of higher education in SCM field are multi-
dimensional, difficult to quantify and often conflicting. Benjamin et al had the stakeholders identify 
seven fields of SCM core competencies via focus groups and then related each existing course (both 
undergraduate and graduate courses) to the competencies by identifying to what extent the courses 
contributed to achieving the competencies. Such approach provided them with a clear understanding 
of priorities in curriculum as well as main gaps to supplement the program.

In another development project of a SCM curriculum, Godfrey and Manikas from the University of 
Wisconsin Oshkosh studied 19 SCM and ope ration management undergraduate programs in the US 
(Godfrey and Manikas, 2009). Although the authors’ focus was mainly only the sustainability-related 
topics in curricula, the study showed notable differences in composition and topics in programs 
studied. For example, sustainability topics were according to the study only included in one program. 
In the comparison process, Godfrey and Manikas also gained new insight into courses with novel 
concepts and obtained ideas concerning other areas of SCM to implement into the curriculum.

In 2007, a group of authors from College of Charleston, South Carolina used both QFD and 
benchmarking analysis to improve local undergraduate SCM program (Gonzales et al, 2008). The 
authors collected data on supply chain industry specialists’ expectations and then used Dynamic 
Analysis Reduction Process to determine 29 key expectations of the program. After applying 
Customer Window Quadrant technique on the key areas, it was found that 5 expectations – quality 
engineering, certification, multilingual, customer relationship skills and global knowledge – belong to 
the A quadrant – low current satisfaction and high importance to customers. In a quantitative survey to 
industry professionals, the SCM skills with highest importance were found to be communication, 
teamworking and decision making skills along with knowledge on Asian supply. Additionally, the 
authors divided all the analysed skills into four areas and applied it as a framework of benchmark 
analysis to four regional SCM programs. The result suggested that the programs analysed were not 
equal but each with some strong areas as well as weak spots. The authors concluded that valuable
information was obtained for developing more appropriate courses and that the key to curricula
development lies in studying specific customer expectations.

A critical angle to SCM curricula was given by Larson and Halldorson, who studied academia with an
aim to evaluate and classify topics in SCM courses (Larson and Halldorson, 2004). One of the main
findings from that study was that there is notable variation in SCM curricula and numerous programs
are basically yesterday’s logistics programs with a slight revamp or even just pure relabelling, leaving
space to suggest that the shift in higher education towards the supply chain management that had just
born in theory had not been reflected in teaching practices yet.

Probably the widest research of all SCM curricula related studies is currently carried out by Laura
Birou and Heather Lutz, who are researching a rich database of 226 syllabi, both on undergraduate and
graduate levels, in the field of SCM focusing on operations, purchasing and logistics management
(Birou and Lutz at Oxford Business and Economics Conference, 2010). The study, with aims to
benchmark all SCM programs and analyse a wide range of topics via content analysis from course
composition to teaching methods, textbooks and assessment, began in 2007 and up until today only a
selection of results have been published. Nevertheless, the authors’ research seems to indicate that at
least in operations management topics, there is still high variation in curricula.

4. METHODOLOGICAL APPROACH

The literature review indicated that SCM is taught in notably varying composition. Our research
presented here is in essence a comparative study between a few selected world-class SCM MSc
programs and two foundational standardised approaches to supply chain management competencies as
theoretical framework.

As there is no truly objective ranking system for SCM master’s programs, we considered five main
criteria in searching for best practises. Firstly, the program has to award a master’s degree and be
equivalent to at least 90 credit points in EU education system. Secondly, the university has to be
officially approved in EU. Thirdly, and that is indeed a subjective criterion, various academic
specialists were asked for their recommendations. Furthermore, the research needed reliable
information and unfortunately not all university programs are in detail publicly available on the web.
The comparison of programs can be a taunting task because of the risk of misinterpreting the available
information on selected curricula, so we aimed for minimising that risk already in the selection
process. Last but not least, it was important to us to find curricula with a general approach to supply
chain management – programs without defining narrower focus like maritime logistics or purchasing
and supplier relations or production management. This was decided for both theoretical and practical
considerations. In the end of the selection, we settled with the programs in table 1.

To ensure the comparison of curricula is as objective as possible, a well-defined standard of supply
chain management skills is needed. For such purpose we used two main international approaches: the
Supply chain manager competency model by APICS (The Association of Operations Management,
2009) and Supply Chain Operations Reference model SCOR 10.0 (Supply Chain Council, 2010). The
goal of this article is firstly to compare the two frameworks of supply chain topics to determine
possible gaps in both approaches and secondly to analyse selected SCM master’s programs from
the same aspect. As far as the authors are aware, such comparison between APICS and SCOR
standards has not been carried out before as they are both relatively young, however, they
should allow for a more objective basis of SCM curricula benchmark than some of the approaches
described earlier (Benjamin et al, 2009; Gonzales et al, 2008).
### Table 1. List of supply chain management programs studied

<table>
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<tr>
<th>University</th>
<th>Program title</th>
<th>Source of information</th>
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<tr>
<td>Lancaster University</td>
<td>Logistics and SCM</td>
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<tr>
<td>BEM Management School Bordeaux</td>
<td>Global SCM</td>
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</tr>
<tr>
<td>Rotterdam School of Management, Erasmus University</td>
<td>Logistics and SCM</td>
<td><a href="http://www.rsm.nl">http://www.rsm.nl</a></td>
</tr>
<tr>
<td>Kingston University London</td>
<td>International Supply Chain and Logistics Management</td>
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</tbody>
</table>

The comparison aims to be as objective as possible, though it has to be noted that the structures of APICS, SCOR and selected curricula vary to some extent. The APICS model is offering a better structure for comparison as it is composed of tiers of competencies, including both foundational competencies, which are more related to general analytical thinking and abilities, and profession-related competencies, which deal with technical competencies of relevant processes and main knowledge areas in supply chain management. The SCOR SCM skill model is basically a compiled list of skills. That is not to say that there is no structure in SCOR skills. The structure of SCOR skills is based on complex system of supply chain processes, which are also defined in the general framework of SCOR model. The main issue for this article’s purpose, however, is that SCOR structure is too complicated to give a good visual overview of the relations of various supply chain manager skills. Instead it is practical to start comparing the SCOR list skill by skill to APICS framework and this is the approach used in this article. The goals of the comparison are firstly to study possible differences in the two approaches in defining the scope of supply chain management competencies and secondly to identify the gaps in both approaches in order to reach better understanding on what are the competencies a true supply chain professional ought to develop. To put it more simply – this study is really all about finding out how big is the “big picture” that every supply chain manager should be trained to see, including all the necessary details in the puzzle pieces.

### 5. THE COMPARISON OF SCOR AND APICS MODELS

In this paper we used the supply chain manager skills list from the version SCOR 10.0, as the process of preparing SCOR 11 at Supply Chain Council, including updates to skills list based on feedback, was still ongoing in time of writing this article in the beginning of 2011. The skills section of SCOR 10.0 aims to provide “standard definitions for skills required to perform supply chain processes”, whereas a skill is defined as “capacity to deliver pre-determined results with minimal input of time and energy”. (Supply Chain Council, 2010). The model lists 161 skills, which are coded HS.0001 to HS.0161 (human skills) and are similarly presented for easier reference in this article. The number does not represent any priority whatsoever, but is used just as a unique identifier. SCOR also lists required aptitudes and experiences for each skill, which fall outside the main scope of this comparison, but can still be used for gaining more insight in interpreting the results of this study and taking the next steps in curriculum design. Likewise, SCOR framework recognises 5 commonly accepted competency levels: novice, beginner, competent, proficient and expert – defining the target levels for each skill is also an unavoidable step in curriculum design, though SCOR does not by itself suggest
required competency levels on the grounds that the expectations can be vastly different in different
business environments.

In studying the SCOR skill list, we found that the strong aspects of the model are describing every
skill in detail and linking it to adequate aptitudes and experiences. The SCOR skill list covers skills
from all operating and management levels, for example from customer communication to ID &
damage inspection to benchmarking. While some of the skills are strictly involved in a particular
business operation or process (for example payment processing, safety stock calculations or reverse
logistics) then skills with more general approach to competence in a certain field, such as engineering,
production or risk mitigation, on in a certain concept, such as 6 sigma or LEAN, are also present in
the model. On one hand it makes the model less homogeneous, yet on the other hand it certainly
disproves the threat that the model is purely oriented in operational activities and is of lesser use as an input to
curricula design (which perhaps could be suggested from the aforementioned SCOR definition of
“skill”).

Still, there are some grounds to ask for better harmony regarding certain skills in SCOR 10.0. For one
example, the list includes skills H.0099 Production, H.0101 Production Planning, H.0102 Production
planning capacity utilisation and H.0103 Production scheduling. For similar example, SCOR includes
HS.0132 Sales and Operations Planning and HS.0130 S&OP Plan Communication. While there is no
doubt all the aspects are relevant, the issue is with overlap and missing subsets. This perhaps shows
the SCOR approach is not yet completely mature, although it is practically very relevant and keeping
such overlap in the model is probably even authors’ intention. Often repeating important aspects from
another angle serves as a reminder and this is especially true when dealing with models of such wide
scope. For example, skill HS.0141 is titled Supply Chain Management, which, it can be argued is not
by far a particular skill or a competence, but is still present in the list to remind us of the importance at
the end of the day to manage a network of interconnected businesses involved in the provision of
product and services required by end customers.

What also show the value of SCOR model for curriculum design are the references to relevant
technologies, such as RFID technologies, CAD, ERP, and management concepts (LEAN, 6 sigma).
While it can be that in 20 years, when today’s students are managing global supply chains, all such
current hot topics are long forgotten, they all include the aspects of demonstrating the ever-changing
technological and business environment (eg MRP VS ERP, RFID VS Barcodes) and in a way, when
approached correctly in teaching/learning, they contribute to a general ability of lifelong learning and
hence using the technologies and concepts of the future more proficiently.

The APICS supply chain manager competency model is structured into seven tiers, in which first three
tiers are foundational skills (T1 – personal effectiveness, T2 – Academic competencies, T3 –
workplace and leadership). The next three tiers are representing more specific profession-related skills
(T4 – operations management technical competencies, T5 – supply chain manager knowledge areas,
T6 – supply chain manager technical competencies) while the highest tier essentially adds the
certification requirement (T7 – specific requirements). This means that a true professional should have
an academic degree, join Supply Chain Industry Association and be officially certified (eg by APICS
or by CPSM certification by Institute of Supply Management). The model allows for a supply chain
specialist in principle not to have specific supply chain degree, although it is not relevant in this case.
For our purposes, tiers 1-6 give much needed input on supply chain manager competencies and the T7
reminds us of the importance of developing all the skills listed in previous tiers in the supply chain
curricula (at least to the extent that is physically possible).
One important aspect of APICS is the way it is built on previously well-developed concept of operations management. The model shows clearly, how operations management forms a subset of supply chain management and it is described as such in T4 of the model. The side effect of such approach, however, is in describing the other part of supply chain management essence, which is higher than operations management or outside the scope of it (in T5 and T6). While the authors have surely done great in emphasizing different management levels and knowledge areas in T5 and T6, there is still some overlap with T4 competencies. Hence, to better suit the comparative aims of this article and avoid unnecessary fragmentation, we have taken the liberty of doing a minor change in the APICS structure by:

- joining sections “lean management” from T4 and “applying lean tools” from T6
- joining sections “enabling technology” (T3) and “enabling technology application” (T4)
- joining sections “warehouse management” (T5) and “warehousing” (T6)
- joining sections “supply chain management” (T4) and “supply chain synchronisation” (T5)
- removing subset “supply chain fundamentals” (T2) on the grounds that it didn’t seem rational to have a separate section located somewhere on the border between sections “foundations of business management”, “operations and enterprise economics” and “supply chain management” – appropriate SCOR skills were divided between these sections.

Such changes simplified the skill-based comparative analysis as well as made the results more visually compact. For better clarity and wider approach, even more adjustments could be made to APICS structure to develop a new holistic model of SCM skills and competences; however, this was currently not our intent.

The content of each tier in APICS is thoroughly described in the official document, which we have only briefly summarised in the comparison tables below for better visualisation of main relations. It is however important that the tiers are only generally linking a subset of competencies together and under each tier there are numerous competencies different in both their nature as well as the ways they can be taught and developed. Furthermore, as noted earlier, the borders of tiers themselves should never be taken as brick walls. By nature, every model is a simplification of reality and in that aspect APICS is no different, meaning that for curricula purposes, skills of many tiers are often developed together and no university course should ever be built on a single competence/skill only or taken purely out of general supply chain management context. In that sense everything is cross-linked in supply chain management. One of the historical lessons from supply chain management practices is that sometimes strict function-oriented management can fragment the supply chain up to the point where local decisions of departments, while trying to optimise the situation from their narrow perspective, are actually causing the entire supply chain to be worse off. We think this lesson is crucial to curricula development as well – every course, while of course having main goals on specific targets, has to be well connected with other courses and the full view on supply chain. This is by no means a criticism towards the APICS model, rather than the opposite – cross-links are present throughout the model and only a blind person would leave them undetected.

From linkages and possible overlap perspective, APICS and SCOR are similar. The notion of relations between tiers in APICS model became apparent for us in full light when we started dividing SCOR skills under APICS model subheadings and found that for most of the skills, the relation was not
singular but fitting under two or in some cases three tiers. While at first it seemed a bit intimidating for research purposes (and indeed there were long disputes in little details), we came to realize that this should not be avoided but instead encouraged to determine even more linkages between skills and competencies. So the tables presented in this article with APICS and SCOR comparison include about one third of all SCOR-model skills under more than one APICS headings (even after the simplification of APICS structure noted earlier. We feel that pointing out the multiple relations are relevant and make way for better understanding of the relations inside supply chain management subtopics both for use in our curriculum design as well as for other competency-related projects that can benefit from such information.

While comparing SCOR skills to APICS tiers of competences, it became apparent that many areas of APICS are not covered in SCOR. This is mostly due to essential differences of the models – SCOR aims to list all the skills needed in practical supply chain processes while APICS includes also various general competencies. This is especially true for APICS T1 competencies, such as creativity, effective communication, continuous learning and interpersonal skills. For curricula purposes, T1 competencies can never be forgotten as every course has to contribute something in that regard, in fact these competencies are generally embedded to some extent into every sensible education system. T1 competencies have a support-role to make learning and working generally more effective. However, in the tables below this tier is not included due to the fact that SCOR does not contribute anything specific to it (and on the other hand every skill is in a way related to such general characteristics).

The other parts of APICS model not covered with selected specific SCOR skills are subsets “reading and writing comprehension” from T2 and “problem solving and decision making”, “teamwork”, “accountability and responsibility”, “planning and organizing” and “conflict management” from T3. Again, they serve more as basic aptitudes, which are not related to particular business process. The same logic would apply to T2 subset “math, statistics and analytical thinking” and to T3 subset “customer focus”, however, we decided to keep it and reiterate the most important skills, which require this foundation. Similar situation is with APICS section “performance trade-offs” from T5, which is not related to any specific process, but is present in processes across all management levels and in virtually every supply chain decision.

All the remaining APICS subheadings along with their explanations (shortened from the official version) and their respective SCOR skill counterparts are listed in tables 2-7. In most cases, the match between a given SCOR skill and APICS section was strong, leaving only a small number of skills for the second round of discussion. Skills with more than one location are marked in italic.

In table 2, the technology section should be pointed out. While there is a notable share of jobs in supply chain management that requires only main understandings of some supply chain technologies, then on the general level SCM field is rather tech-heavy. Balancing engineering and business aspects in teaching supply chain managers is probably the greatest challenge of every university in that field. The list of technology topics listed here is probably far from complete, but even the current state demonstrates the extra insight that such comparison yields by pointing out all the various technologies students have to be acquainted with.

Tier 2 competencies should belong to a bachelor / undergraduate level for curricula development. However, it is important to realize that there are practical cases where people come to study logistics or supply chain on a higher level without proper background in general enterprise economics. The competencies and skills of the subsections in table 3 should give a better understanding what is the scope of such entry level.
Table 2. SCOR model skills in relation to tier 3 of APICS SCM competency model.

<table>
<thead>
<tr>
<th>APICS - Workplace Competencies (Tier 3)</th>
<th>SCOR 10.0 skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer Focus (Internal &amp; External)</strong></td>
<td><strong>H4: Advertising Methodologies</strong></td>
</tr>
<tr>
<td>• Understand organisational orientation towards satisfying the needs of potential and actual customers</td>
<td><strong>H12: Benchmarking</strong></td>
</tr>
<tr>
<td>• Ensure the whole organisation, not just the frontline, puts clients first</td>
<td><strong>H28: Customer Order Management</strong></td>
</tr>
<tr>
<td>• Ensure activities are built around customer</td>
<td><strong>H29: Customer Relationship Management (CRM)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H31: Customer Repair and Return Policy and Process</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H32: Customer/Supplier Communication</strong></td>
</tr>
<tr>
<td><strong>Enabling Technology</strong></td>
<td><strong>H9: Bar Code Handling/RFID</strong></td>
</tr>
<tr>
<td>• Provide means to generate performance leaps and new capabilities of using equipment and methodology</td>
<td><strong>H33: Data management</strong></td>
</tr>
<tr>
<td>• Possess knowledge of hardware and software components which, when properly integrated, enable a specific process to be realised</td>
<td><strong>H42: Enabling Technology</strong></td>
</tr>
<tr>
<td>• Understand that all technology enables something</td>
<td><strong>H46: ERP Systems</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H49: ID &amp; Damage Inspection</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H51: Installation Requirements</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H52: Installation Scheduling</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H53: Installed base management</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H61: Item Master/BOM/BoL Interpretation</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H79: MRP Systems</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H80: MSDS/CoC/BoL/Environmental Interpretation</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H81: Office automation tools</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H91: Planogram usage and strategies</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H98: Product Information Management</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H123: RFP/RFQ Management</strong></td>
</tr>
</tbody>
</table>
Table 3. SCOR model skills in relation to tier 2 competencies in APICS SCM competency model.

<table>
<thead>
<tr>
<th>APICS - Academic Competencies (Tier 2)</th>
<th>SCOR 10.0 skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Math, Statistics, Analytical Thinking</strong></td>
<td><strong>H33: Data management</strong></td>
</tr>
<tr>
<td>• Practice applied mathematics in collecting and interpreting quantitative data</td>
<td><strong>H67: Linear programming</strong></td>
</tr>
<tr>
<td>• Ability to scrutinize facts and thoughts into strengths and weaknesses</td>
<td><strong>H117: Requirements justification</strong></td>
</tr>
<tr>
<td>• Think in discerning way, analyse and solve problems and apply information</td>
<td><strong>H118: Requirements syntax, attributes, &amp; baselines</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Applied Science and Technology</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H15: CAD/CAM</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H43: Engineering</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H45: Environmental Requirements</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H80: MSDS/CoC/BoL/Environmental Interpretation</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H114: Requirements change control &amp; change notification</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H115: Requirements criteria, verification methods</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H116: Requirements defect notification</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H148: Technical Manual Reading</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H149: Test Stand Operations</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Foundations of Business Management</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H10: Basic Finance</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H25: Creating and Management of Business Rules/Company Policies</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H29: Customer Relationship Management (CRM)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H41: EHS regulations (environmental, health, and safety)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H44: Enterprise Business Process</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H50: Import/Export Regulations</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H55: International Trade</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H66: Legislation and Standards</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H72: Performance Management</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H73: Manufacturing Resource Commitment</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H111: Regulatory Policy Management</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H137: Strategic Planning</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Operations and Enterprise Economics</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H3: Accounting</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H6: Asset Management</strong></td>
</tr>
<tr>
<td></td>
<td><strong>H10: Basic Finance</strong></td>
</tr>
</tbody>
</table>
the market that have more value
- Determine success and failure rates of business projects
- Employ break-even analyses
- Find best operating level
- Use cost accounting systems

<table>
<thead>
<tr>
<th>H16: Capacity Planning/Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>H24: Cost/Price Analysis</td>
</tr>
<tr>
<td>H26: Credit/Collection Management</td>
</tr>
<tr>
<td>H44: Enterprise Business Process</td>
</tr>
<tr>
<td>H54: Intellectual Property/Proprietary Data</td>
</tr>
<tr>
<td>H63: Labor Costs Verification</td>
</tr>
<tr>
<td>H78: MRO Management</td>
</tr>
<tr>
<td>H82: Optimization</td>
</tr>
<tr>
<td>H92: Pricing Management</td>
</tr>
</tbody>
</table>

Table 4. SCOR model skills in relation to tier 4 of APICS SCM competency model.

<table>
<thead>
<tr>
<th>APICS – Operations Management Technical Competencies (Tier 4)</th>
<th>SCOR 10.0 skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy Development and Application</strong></td>
<td></td>
</tr>
<tr>
<td>• Answer the questions „Where are we going?” and „How are we going to get there?” and create a specific and purposeful path, create strategies including values, mission and vision</td>
<td>H12: Benchmarking</td>
</tr>
<tr>
<td>• Determine core competencies, develop priorities, goals and action plans</td>
<td>H25: Creating and Management of Business Rules/Company Policies</td>
</tr>
<tr>
<td>• Acceptance testing</td>
<td>H72: Performance Management</td>
</tr>
<tr>
<td>• Strategic Planning</td>
<td>H137: Strategic Planning</td>
</tr>
</tbody>
</table>

| Process Improvement/Six Sigma                                 |                   |
| • Understand the systematic approach to closing process or system performance gaps through identifying non-value-adding activities | H2: Acceptance testing |
| • Perform periodic evaluation to processes, establish KPIs, benchmarking targets and continuous process improvement initiatives | H12: Benchmarking |
| • Enterprise Business Process                                  | H44: Enterprise Business Process |
| • Six Sigma                                                    | H133: Six Sigma |
| • Total Quality Management (TQM)                               | H150: Total Quality Management (TQM) |

| Execution Planning, Scheduling, and Control                   |                   |
| • Determine the need for material and capacity to meet demand, execute the resulting plans and update planning of financial information to reflect the results | H2: Acceptance testing |
| • Plan management function by defining goals for future performance and decide on the tasks and resources needed to attain those goals | H3: Accounting |
| • Schedule a timetable of events                              | H13: Blanket purchase order process |
| • Control and check errors, take corrective action             | H28: Customer Order Management |
| • Defective/Missing Product Reporting                         | H31: Customer Repair and Return Policy and Process |
| • Delivery Balancing                                          | H34: Defective/Missing Product Reporting |
|                                                               | H35: Delivery Balancing |
so that deviations from standards are minimised and goals are achieved in desired manner

H36: Delivery Scheduling
H56: Interpreting Specifications
H83: Order Management
H87: Payment Processing
H93: Prioritization
H95: Product and Configuration Validation
H104: Progress & performance reporting
H106: Property Control and Disposition
H112: Requirements acceptance criteria
H113: Requirements allocation
H119: Return Management
H138: Subcontracting Types (FFP, CP, CPAF…)
H155: Verification Strategies
H158: Warranty Return and Repair
H160: Waste Management

Project Management

- Plan and manage resources and define activities for specific goals.
- Achieve project goals while honouring constraints (scope, time, budget)
- Optimise the allocation and integration of inputs

H14: Build Schedule Evaluation
H38: Design/Engineering Schedule Development
H76: Milestone/Performance Payments
H105: Project Management

Lean Management

- Identify and reduce or eliminate waste across the supply chain, calculate the total system cost of delivering a product or service
- Develop systems for producing perfect results

H65: Lean Manufacturing

The comparison presented in table 4 shows that supply chain management is at least by comparable amount building on operations management as it is building on logistics. It is notable that relatively modern concepts as 6 sigma and LEAN are represented in both approaches, proving each over more relevant among the more generally worded competencies. Probably the most problematic section here was “execution planning, scheduling and control”, which does not appear to be in great cohesion with other sections. It could be said that all the skills currently under this section, mostly operational level skills, could be divided under other sections of the model.
Table 5 includes the joined APICS sections of “supply chain management” and “supply chain synchronisation” and serves as a good core to our analysis. It appears that this is a section where SCOR skills are adding great more detail to the APICS definition.

Table 5. SCOR model skills in relation to core SCM skills of APICS SCM competency model.

<table>
<thead>
<tr>
<th>APICS – SCM core competencies</th>
<th>SCOR 10.0 skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Demonstrate ability to manage the network of interconnected businesses involved in the ultimate provision of product and service packages required by end customers</td>
<td>H5: Assembly Process Design</td>
</tr>
<tr>
<td>• Understand that supply chain management spans all movement and storage of raw materials, work-in-process inventory and finished goods from point of origin to point of consumption</td>
<td>H37: Demand Management</td>
</tr>
<tr>
<td>• Balance supply with demand, considering lead time and variability</td>
<td>H48: Forecasting</td>
</tr>
<tr>
<td>• Collaborate and communicate with supply chain partners</td>
<td>H58: Inventory Management</td>
</tr>
<tr>
<td>• Mitigate the bullwhip effect</td>
<td>H64: Lead-time validation</td>
</tr>
</tbody>
</table>

H58: Inventory Management
H64: Lead-time validation
H69: Logistics Management
H70: Logistics network modeling
H74: Master Scheduling
H77: MPS Methodologies and Techniques
H85: Outsourcing
H99: Production
H101: Production Planning
H102: Production Planning Capacity Utilization
H103: Production Scheduling
H107: Push Systems
H108: Quality Management
H120: Return Plan Aggregation
H121: Returns strategy development
H122: Reverse Logistics

H124: Risk and exception management
H130: S & OP Plan Communication
H131: Safety stock/replenishment calculations
H132: Sales and Operations Planning (S&OP)
H136: Specific fabrication knowledge based on product
H140: Supply Chain Leadership
H141: Supply Chain Management
H142: Supply Chain Performance Measurements
H143: Supply Chain Planning
Again it is notable that from the abundance of skills, every last one being important in their own right, each supply chain manager uses probably only a small part of skills in their everyday tasks. It could be said that conflict is both a blessing and a curse for supply chain training – blessing in a meaning that in case it is actually feasible to prepare specialists in all the skills, the possibilities in the labour market for such person are practically endless, curse in a sense that there is a serious risk that trying to be too wide in scope, the training lacks detail, which results in a generalist who has to go through additional training for most available jobs.

From table 6, it is interesting to note that while there is a huge scope of competencies under logistics, both in general meaning of the term and in these models, then there is nothing specific to that term left because all the skills are already listed under various other sections. It could be said that the most sensible suggestion on that issue would be to avoid the term in supply chain management context in general as it has numerous meanings with hugely varying scopes.

**Table 6. SCOR model skills in relation to tier 6 of APICS SCM competency model.**

<table>
<thead>
<tr>
<th>APICS – Supply Chain Manager Technical Competencies (Tier 6)</th>
<th>SCOR 10.0 skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Locating Facilities</strong></td>
<td></td>
</tr>
<tr>
<td>• Apply quantitative and qualitative approaches in location decisions from total value and total cost perspective.</td>
<td>H70: Logistics network modeling</td>
</tr>
<tr>
<td><strong>Distribution</strong></td>
<td></td>
</tr>
<tr>
<td>• Choose shipping methods, transfer goods, plan consolidation and dividing loads.</td>
<td>H89: Physical Distribution Systems</td>
</tr>
<tr>
<td>• Obtain and distribute materials in proper places and quantities</td>
<td>H13: Blanket purchase order process</td>
</tr>
<tr>
<td>• Develop and implement a strategy for logistics</td>
<td>H58: Inventory Management</td>
</tr>
<tr>
<td></td>
<td>H69: Logistics Management</td>
</tr>
<tr>
<td></td>
<td>H70: Logistics network modeling</td>
</tr>
<tr>
<td></td>
<td>H71: Logistics/Freight</td>
</tr>
<tr>
<td>H83: Order Management</td>
<td>H50: Import/Export Regulations</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>H87: Payment Processing</td>
<td>H55: International Trade</td>
</tr>
<tr>
<td>H96: Product checkout process</td>
<td>H66: Legislation and Standards</td>
</tr>
</tbody>
</table>

**International Regulations**

- Regulations on distribution, customs, tariffs, security, taxes, free trade zones etc

**Strategic Sourcing and Supplier Relationship Management**

- Locate and source key material suppliers while analysing total cost
- Focus on developing and maintaining long-term relationships with trading partners
- Integrate automation of business communication
- Establish methods of reaching customer satisfaction goals

- H19: Change Notice Development
- H20: Competitive Bidding
- H21: Consignment Agreement Development
- H22: Contract Management
- H23: Controls and Compliance
- H24: Cost/Price Analysis
- H60: Issue Proposal/Quote
- H85: Outsourcing
- H94: Procurement
- H97: Product Development (PDR, CDR)
- H134: Solicitation Methods
- H135: Solicitation/Competitive Bidding Process
- H139: Supplier Relationship Management (SRM)
- H147: Technical Evaluation
- H157: Warranty process and policy

**Customer Relationship Management**

- Analyse marketing information to support customer needs, measure customer satisfaction and develop loyal customers

- H4: Advertising Methodologies
- H28: Customer Order Management
- H29: Customer Relationship Management (CRM)
- H31: Customer Repair and Return Policy and Process
- H32: Customer/Supplier Communication
With all our suggested rearrangements to APICS structure, tier 5 has seen the most changes and is now in table 7 consisting of three sections – warehousing, transportation and risks. From model point of view there now appears to be less reason to keep this as a separate tier, as tier 6 is mostly continuing with various supply chain manager knowledge areas.

**Table 7. SCOR model skills in relation to tier 5 of APICS SCM competency model.**

<table>
<thead>
<tr>
<th>APICS – Supply Chain Manager Knowledge Areas (Tier 5)</th>
<th>SCOR 10.0 skills</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Warehouse Management</strong></td>
<td></td>
</tr>
<tr>
<td>- Control the movement and storage in warehouse, material handling, people, technology and process management</td>
<td>H1: 3-way Receiving Match</td>
</tr>
<tr>
<td>- Apply a total systems approach to managing flows of goods, information and services</td>
<td>H7: Availability Management</td>
</tr>
<tr>
<td>- Configure the warehouse, find optimal layout and utilise warehouse space</td>
<td>H27: Cross Docking</td>
</tr>
<tr>
<td></td>
<td>H49: ID &amp; Damage Inspection</td>
</tr>
<tr>
<td></td>
<td>H58: Inventory Management</td>
</tr>
<tr>
<td></td>
<td>H62: Kitting/Packing</td>
</tr>
<tr>
<td></td>
<td>H75: Material handling equipment usage</td>
</tr>
<tr>
<td></td>
<td>H86: Packaging</td>
</tr>
<tr>
<td></td>
<td>H88: Physical Capability</td>
</tr>
<tr>
<td></td>
<td>H90: Picking process / order batching</td>
</tr>
<tr>
<td></td>
<td>H96: Product checkout process</td>
</tr>
<tr>
<td></td>
<td>H110: Receiving</td>
</tr>
<tr>
<td></td>
<td>H161: Wave/batch picking</td>
</tr>
<tr>
<td><strong>Transportation Management</strong></td>
<td></td>
</tr>
<tr>
<td>- Manage transportation operations</td>
<td>H11: Basic Transportation Management</td>
</tr>
<tr>
<td>- Maximise loads and minimise costs</td>
<td>H18: Carrier Selection</td>
</tr>
<tr>
<td>- Ensure efficient use of transportation resources while meeting the needs of customers</td>
<td>H39: Driving certification</td>
</tr>
<tr>
<td>- Integrate movement demands with vehicle resources</td>
<td>H68: Load Building</td>
</tr>
<tr>
<td></td>
<td>H71: Logistics/Freight</td>
</tr>
<tr>
<td></td>
<td>H129: Route planning</td>
</tr>
<tr>
<td></td>
<td>H151: Transport Mode Selection</td>
</tr>
<tr>
<td><strong>Risk Management</strong></td>
<td></td>
</tr>
<tr>
<td>- Accurately identify risks affecting supply, transformation, delivery and customer</td>
<td>H124: Risk and exception management</td>
</tr>
<tr>
<td></td>
<td>H125: Risk Assessment</td>
</tr>
<tr>
<td></td>
<td>H126: Risk Identification</td>
</tr>
</tbody>
</table>
In conclusion of this comparison, we feel that it was a worthwhile experience and the information presented here explained the main differences of APICS supply chain manager competence model and SCOR model. Judging from the viewpoint of SCM concept, it could be said that the models have similar scope – both include a wide range of relevant modern aspects and topics belonging under SCM. The difference lies in the models’ intent. APICS is designed to be a holistic model, including competencies that help in obtaining actual work-level competencies, while SCOR is mostly focused on the skills that are in close touch with business processes. In other words, APICS is more suitable to use as a scope-defining tool and practical for universities, as it shows both doing-, knowing- and thinking-type competencies. Again it is worth pointing out that such mismatch between APICS and SCOR does not mean that there is something inherently wrong or missing in SCOR approach. Instead it shows how the models supplement each other – APICS giving the underlying scope of competencies and SCOR filling in the core points with relevant details, defining more specifically what are the needed outputs (workplace tasks) from supply chain management training. In that sense, SCOR skills also augmented the scope of APICS, though not in a way of pointing out missing sections. It is our view that for curricula development, viewing APICS and SCOR together creates synergy and offers both adequate scope and necessary outputs in skills and is therefore a good basis for SCM curricula benchmarking and development.

For purely academic purposes, SCOR model is missing and APICS is only generally mentioning scientific research skills. This is understandable, as neither model was specifically designed for academic use. However it is worth pointing out how important it is to include such aspects into curriculum development. Especially in our case, the local market is too small for having separate programs for business specialists and research specialists. This of course creates even more pressure on fitting all the training into European higher education 3+2 year framework. On the other hand, it is still very relevant that APICS lists critical thinking as one of the competencies which is really the foundation of all academic skills. The next section aims to study how selected existing SCM programs have interpreted the scope of supply chain management and can the range of SCM topics actually fit into a university master program.

6. THE COMPARISON OF SELECTED CURRICULA TO APICS COMPETENCIES

As previous comparison demonstrated, supply chain management consists of extremely wide range of topics (at least compared to a classical mainstream business administration program). To verify, to what extent such scope has already been achieved in supply chain management higher education field, we selected five SCM MSc programs to compare against the theoretical framework. The most important challenge in such approach is getting information with enough level of detail from the universities, who don’t always necessarily make all curriculum details and course content with well-defined specified outputs publicly available. That is the main reason why comparison on the skill level (ie according to SCOR model) would be superficial at best and impossible in many cases. It is notable (both from the five curricula analysed here as well as numerous other SCM curricula we have encountered previously) that the main study outputs and obtainable skills are either only shortly
described or even missing entirely. Considering the importance of curriculum as a marketing tool, this can be seen in many cases as a missed opportunity. The challenge probably lies in the nature of the skills – an academic study should not only focus on purely practical everyday process-related skills. On the other hand, a lack of skills with practical orientation induces the perception of “ivory tower”. In finding the proper balance between the described extrema, we can safely suggest using the skills defined by APICS for every SCM teaching university. Furthermore, the general framework of APICS offers a suitable and feasible list of topics for benchmarking.

One remaining threat to the objectiveness of our brief benchmark, which we acknowledge, is that the curricula descriptions are also marketing instruments for the universities and hence it can happen that sometimes more comprehensive wording is used in course programs and study outputs than the actual study content can cover. Nevertheless we hope we have minimised this risk by selected SCM programs with a long history and international acclaim as promise without the quality delivery is mostly only a short-term strategy (and should not present in higher education, at least where scientific objectivity and integrity are valued).

In the current comparison we used similar sections of supply chain manager competencies from the APICS SCM competency model as in the previous analysis with SCOR. However, we left out the APICS sections “mathematics, statistics and analytical thinking”, “foundations of business management” and “operations and enterprise economics” as they are comprised of competencies that are covered before master level and are also usually required for the admission into MSc studies. The competencies and knowledge areas used are listed in table 8 below. To determine the match between a SCM program and APICS competency section, we have compared the program (courses, content, outputs) to APICS definitions for every section and given each section a grade, where:

- “++++” – program covers all or nearly all competencies defined in given section of APICS
- “+++” – program covers the majority of competencies defined in the given section
- “++” – only up to 50% of the section scope appears to be covered by the program in question
- “+” – only a few topics or skills appear to be covered by the program or there is no apparent connection with a given section.

<table>
<thead>
<tr>
<th>Supply Chain Manager Competency fields</th>
<th>Chalmers</th>
<th>Lancaster</th>
<th>BEM</th>
<th>Erasmus</th>
<th>Kingston</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Chain Technologies</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Strategy Development and Application</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Supply Chain Management (core topics)</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Process Improvement and Six Sigma</td>
<td>++</td>
<td>++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Execution Planning, Scheduling and Control</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
<td>+++</td>
</tr>
</tbody>
</table>
For the comparison, the easiest parts were courses with enough content description and matching course names. The evaluation was problematic when the course data was scarce and conclusion had to be drawn from sketchy information, but the result should still be relatively valid to make generalisations about SCM curricula composition.

The differences between SCM masters programs presented here appear to be greater than we anticipated before the study. This seems to affirm similar findings from previous studies and hints that a complete supply chain manager curriculum might not be even possible within usual timeframe dedicated to master level studies. Perhaps the “big picture” today is too big - the supply chain field has grown across the feasibility barrier of current higher education framework. It is definitely a challenge for universities to include all relevant aspects even into a full-time master program. While trying to cover all or at least most of the SCM topics, it appears that there is still particular topics in given cases that are only a secondary consideration and presented with considerably less detail. This analysis is not aimed at criticising the selected programs, as the programs only give a limited overview and it is possible the actual teaching process is somewhat different than what is described officially.

Instead we feel it is worth reiterating that every program we included has its strengths and weaknesses. We think the cause lies in the combination of three reasons. Firstly, universities are focusing on their current strengths (people), which allow them to differentiate on the market and facilitate plentiful research in specific fields. Secondly, in some cases the labour market is leaning towards a particular skill set of SCM specialists (a good example is focus on ports and maritime logistics in Erasmus University). While from a standardised point of view deviation is undesirable, it does not have to include negative message to the customers. Thirdly, even if neither people nor market were the constraints, the time limit remains firmly in place forcing universities to trade-offs. To be as efficient as possible, we suggest, where applicable, to develop SCM, operations management or logistics

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1 In the case of project management, it could be assumed to be another undergraduate level topic for a number of universities, but this practice can greatly vary. For other areas, the same issue applies to lesser extent.
related bachelor and master curricula together and consider fully integrated 3+2 approach similar to fields such as civil engineering and architecture.

7. CONCLUSION

In conclusion, our study gave a new basis for benchmarking and updating SCM curricula by offering a joint framework of SCOR and APICS supply chain manager competencies. In comparing selected SCM curricula we reached similar conclusion as Gonzales and Godfrey earlier – supply chain management curricula are quite different (Gonzales et al, 2008: Godfrey and Manikas, 2009).

For our own SCM curriculum development project in Estonia, we have noticed a similar effect to what Benjamin et al described – benchmarking process has produced ideas from fields that were “unknown unknowns” previously (Benjamin et al, 2009). The same applies for APICS and SCOR SCM models – analysing the results from the comparison has made it much more clear what areas are missing from the current courses. However, as it appears, not all SCM topics can fit into single university program, which calls for identifying the highest expectation from the labour market. Essentially, the next step for us now is to define, which areas are the most critical for our stakeholders to make wise tradeoffs. Finally we hope that the joint view of APICS and SCOR supply chain manager competency models finds practical use in future SCM curricula development projects and overall SCM education keeps improving.

REFERENCES


17. The Association for Operations Management (2009). APICS Supply Chain Manager Competency Model.
BEER GAME REVISITED – TEACHING BULLWHIP EFFECT WITH A MODIFIABLE TABLE-TOP SIMULATION GAME
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Tallinn University of Technology, 5 Ehitajate str., 19086 Tallinn, Estonia

Abstract
Various versions of the well-known Beer Game have been used to teach supply chain behaviour and inventory patterns for almost 50 years now. For explaining the nature of bullwhip effect, an interactive approach, „learning by doing“, has certainly proved to be an effective tool. This article aims to share the author’s experience and findings on running a custom-built table-top version of the similar simulation game over the past two years. Modifying the game rules from session to session and collecting feedback has allowed gaining insight into how a student mind works and how to increase learning efficiency to explain more relevant aspects of supply chain mechanisms within a session. The work is by no means finished and the development continues, however, a number of ideas have already fitted into the game practice at Tallinn University of Technology.

Keywords: beer game, supply chain simulation, bullwhip effect, teaching supply chain management.

1. INTRODUCTION
Modern life presents modern challenges. Although general statement applies probably to any field of activity, changes are the most difficult in areas that have used to stable environments. Higher education is probably a good example for such field – development is always ongoing but it is rarely revolutionary. Nevertheless, current internet technologies are bringing about the biggest and rapid change in teaching – or at least the situation demands for it. Today’s students have immediate access to whatever information and are expecting the same from university. Being personally responsible for analysing business administration students’ feedback in Tallinn University of Technology, I know from first-hand experience that the main competitor for universities is not so much another universities anymore but the internet – specialised content webpages but mainstream venues like YouTube as well.

Such demand for immediacy calls for a revamp to all teaching methods, but especially effects traditional lecture. From students point of view there is often a choice between a 90-minute lecture and googling for key terms and getting the most important pieces of information in 20 minutes, which includes watching a 12-minute video clip. Of course from the teacher point of view, our hypothetical lecture offered way more information and insight – so the key question actually is how to affect student perceptions so that they apprehend the value of studying and learning. In case this problem is not solved, universities begin losing ground and credibility, however, I’m optimistic this problem can be solved; the only question is how exactly in any given case. All this area has of course seen a lot of research in recent times and also the answers are well known – utilising technologies and implementing novel teaching and active learning methods to increase the efficiency of learning, delivering material in small chunks, the practical relevance of which can straight-out be understood, encouraging creativity and critical thinking, requiring teamwork and self-management and generally getting students more emotionally involved in the process and maintaining the interest. For
universities, this means teaching needs much more effort than it did 30 years ago and requires not only to train academic staff but also to increase the staff in general as teaching is less one-size-fits-all and more on personal guidance.

From teaching the course of business logistics at Tallinn University of Technology, I can say that everything mentioned previously is easier said than done. However, from personal experience I’ve learned some aspects of student behaviour and this paper aims to share these experiences.

One of the traditional interactive aspects of any logistics or supply chain management (SCM) course is the simulation of a simple inefficient supply chain, which in its original form is known as The Beer Game.² The original version of the game was developed in MIT Sloan School of Management in the 1960s and numerous reincarnations are widely spread representing similar simulation, both in physical and digital forms. A study in 2000 by Johnson and Pyke presented a framework of a typical SCM course and suggested using simulation games and other interactive exercises. A recent paper listed seven versions of the supply chain simulation game. (Feng and Ma, 2009) The true list today would be much longer, as many are home-made for local use. The original game concept and game rules are well-known and will not be repeated in this paper, a good overview was for example given by Heineke and Meile (1995).

In essence, the simulation is simple enough to run without much preparation and even possible, although difficult, without pre-prepared game sheets or software. The main requirement for a game leader is understanding the key issues and the theoretical concept that the game is built to demonstrate – Forrester effect, also widely known as the bullwhip effect – and arranging the game so that various angles of the main problem are clearly displayed and understood after the game and following brief theory session of explanations.

The goal of the game is to show the causes of bullwhip effect, which include both physical and behavioural aspects; a good overview on it is given by Nienhaus (2002). This means that not only the rules of the simulation determine the outcome, but also decisions made by players themselves, which makes the game competitive between teams of different supply chains and engaging. The decision that players across a multi-stage supply chain have to make concerns forecasting on very limited information with a need to keep supply and demand in healthy balance and avoid both stock outs and excess inventory levels. During the game the bottlenecks in such supply chains are identified, which affect the forecasts of demand, schedules of supply and general supply chain performance in terms of inventory costs, availability and customer service. Although the game is a heavy simplification and is far from representing all the complexities of a real life supply chain, playing it should help participants realise, which changes in their supply chain would benefit everyone by the end of the day and how great would the actual gains be. Understanding the need for improvements and the kind of chances feasible in practice is the true learning objective – and these all apply to real life supply chains as well.

Although supply chain management is rapidly evolving and performance levels should continually rise, the bullwhip effect is still heavily present in many supply chains, reassuring the need for a game to raise the awareness of the issue is not diminishing. This suggests that although the physical aspects are somewhat less of a problem, the behavioural aspects remain. A similar idea was recently published by Kisperska-Moron, who studied the skills of supply chain managers and found that although

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² The game has international acclaim so probably only people outside the field of supply chain management would make a mistake in assuming it is a drinking game.
technological development allows for great improvements in supply chains, some of the potential is hold back due to skills and behaviour of supply chain specialists. (Kiperska-Moron 2010)

This paper discusses the findings on how to develop the game to make it more appealing to students and increase the learning value, while still keeping the game in a strict timeframe suitable for scheduled classroom use. Another consideration is the players’ previous knowledge of the game – although experience beforehand definitely makes the game quicker, the greatest learning value to students is from the first run. This means that most of my attention in trying to optimise the game has been focused on undergraduate students. The article also aims to explain my decisions in developing the version that is used currently in TUT and offer new ideas for further updates. I genuinely hope this article encourages even wider use of the game in business training and also seeks to demonstrate that although of course purchasing a ready-to-play version of the game (either manufactured table-top version or a specialised software package) is an easy way, then the basic idea of the game is simple enough to run the simulation with self-made means.

This paper has a simple composition. The next section reviews the literature on supply chain simulation games and their learning objectives and methods while the following section discusses my personal findings from observations and suggests additions to the original Beer Game concept to increase the learning value of the simulation.

2. LITERATURE REVIEW

One update to the original Beer Game was suggested by Forio Business Simulations, called Near Beer Game. The game offers a simple internet interface and ask a player to balance supply and demand within a given situation in as low number of turns as possible. Whereas teaching the similar aspects of SCM as the original game, the Near Beer Game elegantly demonstrates that even with perfect information and even when there are no breakdowns in communication, the players will still experience the bullwhip effect due to delays in manufacturing and ordering process. (Bean, 2006)

In a recent paper, Feng and Ma from South Carolina State University discussed and compared two online supply chain management simulations: Online Beer Game by Jacobs (2000) and Supply Chain Game by Responsive Learning Technology (www.responsive.net). While the learning objectives of the two games are similar, the game composition and process are rather different. The Online Beer Game is built on the main mechanics of the original game - 4 players in a supply chain representing time delays, lack of communication and local forecasting and sub-optimisation are trying to optimise inventory costs where each unit of inventory per game turn costs 1 unit and each unit of backorder costs 2 units. Balancing well between having too much and not having enough is what should give the team the lowest total cost, however, every participant in a chain must understand that the goal is not to minimise local costs but every action inside a company can seriously affect the costs of other companies. The main reason to develop an online version of the game was excessive time of a manual session (about 3h) and finding that much of the time spent could be saved by digital ordering and accounting process, as well as having the computer to provide logs, statistics and charts of progress. Jacobs estimates an online game session lasting about 35 minutes, which leaves more time for analysis and explanations. (Jacobs, 2000) Some aspects of online game versions are also easily modifiable by the game administrator, such as changing demand patterns. For example, another paper presented software components for facilitating Beer Game, which allow for adding order quantity discounts and multiple products with demand substitution. (Kumar et al, 2007)
The alternative studied by Feng and Ma was developed at Kellogg School of Management in 2005. In the Supply Chain Game, students are tasked with designing supply chain inside given parameters to maximise the cash balance at the end of the game. The Kellogg’s game includes aspects of determining optimal production capacity as well as designing a distribution network and setting inventory control mechanisms in production and distribution sites. The game includes various break-even analyses. The main difference from the Online Beer Game is the approach. By using classification of online operation management games developed by Samuel Wood, the Online Beer Game is an insight-type game, whereas Supply Chain Game is an analytic-type game (Feng and Ma, 2009). In insight game, the main objective is to identify certain issues and gain conceptual background while analysis game the objective is to search for an optimal solution to a given problem, form hypothesis and make potentially complex decisions. According to approach suggested by Wood, it is important to understand the type of the game, which depends on its pedagogical objective and which in turn gives input to decisions how a game should be organised, graded and debriefed. (Wood, 2007)

Feng and Ma found the Online Beer Game to be less effective learning tool than the Supply Chain Game both based on student feedback as well as that the former didn’t include any assignments for the class, which meant the participants were not graded. The latter can be easily graded by asking the students to report their findings and solutions. From student feedback, both games got relatively high and comparable results in “helping understanding of basic concepts of SCM”, “I prefer simulation to traditional teaching methods” and “the game increased my interest in SCM” (among other statements). However, there were two important aspects where the Supply Chain Game was valued higher than the Online Beer Game: in “the game improved my decision making and problem-solving skills” and “I cooperated with group members and shared knowledge in game”, which are both understandable from the insight-type nature of the Beer Game (Feng and Ma, 2009). Still, there is no conflict between the two games and they complement each other well. It is worth noting that ideas to add cooperative tactic-building elements to the Beer Game had already been suggested by Hieber and Hartel in 2003.

A similar drawback of the Beer Game – no real student involvement in formulation of strategy – was also noticed by a group of authors leading them to develop a game with wider scope called the Cola-game (Dhumal et al, 2008). The key addition in this game is bi-level demand to simulate seasonality and sales promotion aspects. It is known to players whenever there’s a sale at the store and demand peak and the game has boundaries defined for demand every week, both peak and off-peak. However, inside the boundaries, the demand is random and not known to the retailer before each turn. Another modification to the game is having inventory costs increase per unit when the product moves through the supply chain closer to the end customer. Also, shortage costs depend on the position in supply chain. The game can be played in independent mode, where every participant in a 3-member supply chain receives only information from immediate customer or in cooperative mode where the objective is to minimise the total supply chain costs and where the players focus is on building a perfect strategy for whole chain.

One finding of the authors of Cola-game was when they applied statistical analysis on game performance logs and showed that almost all teams showed improvement during the game – the results in final rounds were statistically significantly higher than from first rounds (inside the same game session). Also the data indicated that people with previous understanding of the game mechanics were able to learn more during the actual game. The cooperative mode of play produced another finding – to optimise the total cost, a certain player had to be willing to accept to let his local cost increase, which teaches a valid point – the benefits of information sharing are usually uneven. From tactic building aspect, it was found that teams were applying varying inventory management tactics, such as target inventory level, EOQ, combining orders of two periods etc., which shows that the game is not
that linear to players, is a good basis for play style discussions and discourages thinking only in short-term. For further development of the game, the authors are suggesting adding different products with different demand elasticity.

Fawcett and McCarter from Brigham Young University have criticised the Beer Game by suggesting that it is more difficult for students to understand the behavioural aspects that hinder the success of supply chains than the physical ones and therefore after the simulation, students assume technology is the key to counter the problems. (Fawcett and McCarter, 2006). To highlight the behavioural aspects of supply chains, the authors suggest another game to supplement supply chain training called the Supply Chain Puzzle Game. In the Puzzle Game, 4-12 teams compete on completing a puzzle from 50-100 pieces, only realizing in the process that some pieces are missing and some pieces are left over and belong to another team. This results in negotiations between the teams and usually cooperation strategies being applied and alliances formed. The game situation is analogy to finding the suitable partners and bargaining for a good deal and is aimed to demonstrate that although every team is motivated by self-interest (ie winning), this cannot be achieved, as in real life supply chains, without collaboration. In the course of the game students learn both the need for information sharing as well as bargaining power. While this game is not related to the main learning aspects of the original game, it can be seen as a good supplement to the lessons of the game, which in its original form only demonstrates the costs created when information is not shared, but does not include actual bargaining moments.

A number of practical changes to the original beer game have been suggested by Reyes in 2007. One of the ideas is to use a random number generator for demand inside predetermined boundaries to make the demand fluctuations more realistic. Another suggestion by Reyes is not to give any demand information from the start but have every participant start from complete darkness to force the students utilise the demand forecasting methods learned in theory classes. Concerning lead-time in ordering and delivery, Reyes is leaning towards shorter ordering delay but keeping the longer delay in delivery processes for more challenge and high magnitude of bullwhip effect. Furthermore, he recommends the first link in the chain to use build-to-forecast approach, which is probably for the similar reason – making life even more difficult for the players. Finally, Reyes feels the first round of the game should not be competitive but just insightful – therefore in the first round there is no need to calculate costs or keep score.

As a follow-up to the initial beer game round, Reyes recommends a parallel interaction approach, which has two customers and retailers, one distribution centre, two manufacturers and three vendors, with a primary goal to demonstrate rationing and gaming effects as additional contributors to bullwhip effect. In the second round, students are more proficient with the mechanics and are ready to understand more subtle issues of SCM. This basis is then used to explain various concepts of SCM: vendor managed inventory, postponement, EDI, point-of-sale information etc. It is notable that Reyes is arranging the game in the beginning of the course – the game develops understanding of the problems as well as the relevance of the SCM course. (Reyes, 2007)

3. OBSERVATIONS ON MODIFYING THE BEER GAME FOR BETTER LEARNING

This section is aimed at contributing ideas to supplement the basic framework of the beer game to facilitate better learning experience. The thoughts presented here are a result of experimenting with various game rules and compositions and gathering feedback from students over the past two years of running a custom-built table-top version of the game with approx. 250 students.
To begin with, it is worth outlining the learning goals which I’ve set to my game. I see the aims presented in table 1 as a foundation to beer game development, similar approach was presented by Kumar et al in 2007, on which I have built my approach trying to clarify the issues to my students. The goals also work as a good marketing tool for the game for attracting more participants. Some of those learning goals are not present in the original beer game (LG 4-6), but from what I’ve witnessed, even minor changes can include those aspects and contribute more to learning as well as to satisfaction from the process. To guarantee effective learning, every aspect of the game should somehow reflect these goals and also suitable assignment and grading system should be included. Grading the participation usually increases motivation to participate and also to work harder. I will later return to that point.

### Table 1. Learning goals for the modified beer game

<table>
<thead>
<tr>
<th>Type of skill</th>
<th>Learning goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>awareness</td>
<td>LG1: Students become aware of the various issues contributing to the bullwhip effect: time delays, forecasts based on distorted information, backlogs, administrative rules, inflexibility of processes and emotional reactions. Students acknowledge the challenges present in optimising supply chains and building a supply chain strategy.</td>
</tr>
<tr>
<td>awareness</td>
<td>LG2: Students understand that sometimes optimising situation locally in a company does not optimise the supply chain performance as a whole but can in many cases be counterproductive instead.</td>
</tr>
<tr>
<td>practical skill</td>
<td>LG3: Students learn to balance the need to minimise inventory costs against minimising the cost of deficit.</td>
</tr>
<tr>
<td>analytic skills</td>
<td>LG4: Students learn to analyse the causes of supply chain inefficiencies and decide on improvement strategies, improving problem-solving skills in the process.</td>
</tr>
<tr>
<td>linking theory to practice</td>
<td>LG5: Students learn to appreciate various SCM concepts by applying them in the game.</td>
</tr>
<tr>
<td>social skills</td>
<td>LG6: Students develop team-working skills and cooperative capacity during the game.</td>
</tr>
</tbody>
</table>

To achieve the learning goals, it is hugely important to keep students interested in the game and maintain competitive nature. For best results, the game needs a mix of negative and positive emotions. As it has often been pointed out, the main emotion created in the game is confusion, which can sometimes end up in disappointment. While to an extent this is needed to explain bullwhip effect, it can sometimes reach a level when student loses interest and is not involved in later stages or in the briefing session, especially if he or she feels the game is already lost. To combat that, the game master should identify those players and give them some explanations of the bullwhip along the way or note discretely that other teams are doing even worse. Additionally, stating LG2 can go a long way to raise player’s spirit and noting that there is no single player to blame for wrongdoings (which is true in most cases). Of course, finding ways to mix in insightful remarks and topical jokes also helps, especially in the grim moments of someone producing 50 units on one week and then halting production for the next 5 weeks. Shouldn’t the workers without work be on strike by now and pilfering the excess of beer instead?

To avoid the negative emotions building up too high, it is probably not worth it to make the supply chain unbelievably inefficient with both ordering and transport delays. This is related to what Fawcett
and McCarter pointed out – with too long time delays students can get the impression that this is the only problem in the chain. What I’ve noticed works good is assuming the order placement and receiving is instant – otherwise players can feel the game is more of a torture device than a model of an ordinary real-life supply chain. Delays in transport are realistic, but not in order transfer. Also, a good idea would be to explain the students beforehand that we are purposefully simulating somewhat of an inefficient supply chain to make sure that players know that some frustration is intended.

Sometimes it can happen that players start blaming their team members on bad performance, usually not aggressively, but more often in teasing. This is not necessarily a problem – and demonstrates the result of a bullwhip effect in full light. Some students even noted that witnessing the members of a competing team argue over whose fault the situation actually is was one of the most entertaining aspect which (either on the spot or later in briefing) turned out to also be a great learning point. So keep them arguing for a little while!

One potential risk in the table-top version of the game is cheating, which can occur in at least three ways: 1) logging points purposefully wrong 2) transporting goods along the supply chain more than one week’s worth at a time 3) trying to obtain more information from both upstream and downstream partners. The first two issues are probably one of the strongest points against a table-top version. However, it can be countered by stating that all the logs will be later analysed for research (which has also been partly true so far) and all teams with erroneous logs will be disqualified. It helps to have an assistant in the game, especially with 4+ teams, to check the actions and give timely explanations. The last issue is an interesting one. It can of course also be avoided by similar threat. The issue here is that it is definitely good to make all the players aware of the gains that would be achieved just by better information – one of the main issues of the game. What seems to work best is to situate the supply chain partners physically in a row (order sheet is passed back over the shoulder and goods are delivered by game assistant), in that case, a little sneak peak is all that is available and is not worth the punishment.

Going into more technical details of the game, I feel it is relevant to three two issues. First one is players’ knowledge of the demand. Although the learning moment here is to demonstrate the problems stemming from lack of information, participants should have a general view on the market developments. One interesting moment is, when students know that the demand for one of the products is going to increase in a long term by a little margin. Usually the reaction here is start preparing larger quantities early on. This can be coupled with another product, which demand is said to be stable, but shows short-term increases in sales in the first game rounds instead. It is interesting that some teams seems to trust the stated “big picture” while other teams go by current demand. The result is, however, that in both ways players usually overbuffer.

Secondly, there needs to be reasonable balance between holding costs and deficit costs. When deficit cost is only twice the holding cost per unit, it can motivate strategies where too much of a backlog is accepted as an everyday business practice from purely the game score point of view, which does not reflect the true situation in many real supply chains. It appears a deficit cost of 3-4 times the holding cost brings about more realistic scenarios.

Thirdly, there is the question of limiting the production capacities for a more realistic game. On one hand it makes sense to impose capacity limits so simulate reality better. On the other hand, players should be allowed to experience the worst of the bullwhip effect. Most extreme case I have witnessed in a game was when factory started producing 60 units when, in reality, customer demand had only jumped to 7 units from a weekly average of 4. Such case basically means the game is lost with one decision and there are no chances to recover due to this inventory weighing on in the system for
months. Perhaps the best way is to set a max capacity to about 25 units – high enough to allow players to learn the lesson the hard way, low enough so it would still keep the game more competitive.

Judging from player feedback, much of the success of the team depends on if players are thinking on the long-term effects of their decisions or are just living one day at a time. Even when team strategy formulating is not possible in the first run, most players apply certain ground rules to the operations either already in the beginning or later rounds of the simulation. The scale of choices ranges all from 100% service approach to pure build-to-order. It is notable that from teams that have finished with the best results, players often point out that the recipe of success was finding a delicate balance between two extremes and applying only careful adjustments judging on at least a few weeks’ data.

How to handle the limited time? My usual game session lasts about 90-120 minutes with a following 20-30 minute of discussion and explanations. A great advantage of the game is that it can end whenever game master feels like most of the main lessons are achieved, be it after 15 or 30 rounds. Even a maximum 3h length of the session is not a huge problem and can be fitted into study schedules. There are two issues with a time limit that need to be addressed. One is that some teams are smart and want to optimise the score so the first link in the chain is tempted to cease production when expected time is almost up. To counter that, the game master should then run the game for a few additional rounds to make sure such opportunistic strategy gets a suitable deficit penalty. Another is that some teams are disappointed when the final round is called for, saying “but we’ve only just started to get things under control”. It should be explained that this was one important lesson – during a game most of the teams already begin to understand the bullwhip mechanics and modify their ordering tactics to avoid the biggest mistake (which is over-buffering the forecast ending up with humongous order quantities), but with the current rules in place, you cannot receive ideally stable supply chain, there is always a little bullwhip present. Still it appears a fair number of players are becoming more knowledgeable of the bullwhip effect during the game and the worst can be avoided in only having knowledge of the effect itself.

There seems to be an interesting behaviour in the game contributing to accumulation of expectations and overbuffering – concerning number of players making the decision at any given company of a supply chain (1-2, 3 in rare cases). In some occasions students have noted that one contributor to higher forecasts was a disagreement in the ordering quantity – it appears more often than not, this dispute is settled not by meeting midway but by deciding on a number closer to safer approach. Again, some players want to have as secure position as possible regardless of actual costs.

Now, moving on to achieving learning goals 4-6, it makes great to have students discuss with their team what were the biggest drawbacks in the simulation and how to avoid it. Although the briefing session covers most aspects, it works well to assign teams to write a report on what they learned from the game. To add analysis into that task, a great way is to tell students another round will be played and in that second round, teams can upgrade their supply chain, but with selecting only one or two modifications based on a list of various scenarios. The options are all addressing relevant shortcomings in a supply chain – for example by decreasing lead time, eliminating certain production process limitations, adding availability of cooperative forecasting or changing other game parameters, which reflect both ways to improve real supply chains as well as give better chances to optimise the score. The challenge from a game master point of view is balancing different upgrades so that teams would not make all similar choices. To further involve students, a reward should be offered – a simple “team with best performance gets a few extra points for grading” seems to do the trick. By presenting students with such options, it forces them to critically evaluate every link in their chain and performance. One potential base for a dispute is that mostly in the beginning players prefer upgrades...
to their parts of a supply chain and it takes time for some teams to understand the true bottleneck of the chain might be somewhere else. Student feedback shows this choice-phase is highly valued and gives a chance to apply the knowledge learned in the first round and briefing. Having such form of two game sessions is the main reason for me to run the game manually, as I because it makes modifications easier. I agree with the supporters of an online version that it would save about half to two-thirds of time, produce automatic logs and ensure the rule of blind supply chain, but to really make it work, a list of various upgrades should also be coded into the program. 

Having done the simulation with both bachelor students and master students without a previous supply chain course, there does not seem to be a difference in team performances. However, the performance increase in the second round of the game is notable regardless of the chosen strategy. I’d even say the main learning point from the game is not so much understanding the bullwhip effect mechanics itself but developing analytical and critical thinking by visualising various concepts and practical improvements and uniting analytical task with fun factor.

Finally, I have found great teaching value in asking students after the game – can you imagine what could have been your end score if the entire supply chain would have been integrated under one decision making. This makes it a great place to explain the concepts of vertical integration and virtual integration and to summarise one of the main learning points.

4. CONCLUSION

This paper commented on issues concerning running a modified version of the beer game and increasing the learning value from the simulation and following assignment. The modifications were partly based on previous criticism towards the beer game (for example by Fawcett and McCarter in 2006, Feng and Ma, 2009), partly due to personal observations and student feedback with an aim to increase emotional involvement in the game as well as adding an analytical team-working task. The game is definitely serving as a good learning tool to demonstrate students the key aspects: conflicts between local and global optimisation, information distortion, forecast errors and that there is always a delicate balance between supply chain costs and performance.

REFERENCES

FORMATION AND DEVELOPMENT OF ENTREPRENEURIAL LABOUR MARKET IN RUSSIA

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Abstract

In a civilized society, the division of labor into wage-forced and free labor seems an anachronism. At the current level of development of human civilization, it is more important to discuss the various degrees of freedom of work activity, which includes two major concepts: wage labor and entrepreneurial labor, with the dividing line being the ways of incorporating them into the labor process. The entrepreneurial labor market is a totally new segment of the national labor market, which can be regarded as an independent socio-important market, which has a huge impact on the national economy as a whole.

Key words: entrepreneurial labor, entrepreneurial labor market, entrepreneurial owner, entrepreneurial employee

1. INTRODUCTION

The conditions of the market are one of the indicators that help to judge national welfare, stability, effectiveness of socio-economic reforms. The restructuring process of economy amid the current crisis is placing new demands on the quality of labor resources, their vocational and qualification structure, and their qualification level, as well as exacerbating competition between workers, and stipulating the actuality of problems dealing with employment, unemployment and labor force competitiveness since their effective solutions do influence the level of people’s living in a country.

Labour market as a system of economic mechanisms, norms and institutes, providing reproduction of labour-power and its use, is an essential component of the market system and represents an aggregation of “socio-economic relations between free able-bodied owners of labour power, seeking for employment, and individual or corporate owners of production means, providing demand on labour-power associated with allocation, reallocation, employment and integration of labour-power into the process of public production.” (Tomilov, 2005)

The formation of the labour market marked conversion of human labour-power, and the labour afterwards, into a commodity. The class of owners of productions means (land, instruments, etc.) began its development in the times of slave ownership and feudalism, but it would be improper to associate the labour market formation with the two epochs – in slave-markets, there were slaves and serfs but not labour force available for sale. Only under conditions of firm capitalist relations, a class of untrammelled owners of their ability to labour – employees (dependent on wages) - was formed, and labour market occurred with the labour power converting into a commodity. In the current situation, which is the development of socially-oriented economy, it is preferable not to study the labour market but study the market of labour resources with the objective being neither a labour-force as a human capacity for labour nor a person as its owner but an aggregation of physical, intellectual,
The global financial crisis strongly exacerbated the situation in the market of labour resources defining a “point of no return” – many people lost their jobs due to job cuts or being placed on enforced leave, many entrepreneurs became “exes” and have been trying either to launch a new business or find some “work for hire” in the new situation. The current crisis vitally differs from the existing experience in the fact that it is worldwide (in contrast to the Russian crisis in the 1990’s) and is accompanied by quantitative and qualitative misbalance of demand and supply of labour resources.

To overcome the current crisis and come out of it with minimum losses, it is essential to start with rethinking the very ideology of future social development. Market relations will successfully function only when it becomes possible to connect, correlate and use four types of resources – human, informational, financial and technological ones, – and, for this reason, to define a minimum of socio-economic measures which make the effective progress impossible.

The second main task is that the state must deal with developing a program of unified education and personnel policy based on creating an information base of data on a situation of supply and demand on labour resources, and monitoring of the current situation at the market of labour resources, and education on a real-time basis, and on-line decision-making about current processes in accordance with the verticals of management structures.

Thirdly, a particular attention must be paid at the market of labour resources under current conditions to enhance the role of mediators, that may become coordinators, contributing not only to understanding but to visualization of educational and personnel policy unity, the end product of human resources management; furthermore, there exists a particular background.

Fourthly, it is essential to speak about the necessity to develop the entrepreneurial labour market due to the change of attribute characteristics of wage and entrepreneurial labour:

- market forces are reduced; the government begins to regulate the reproduction process;
- the framework of socialization of a large private fund is broadened - a proprietor neither works only for himself nor commands the labour results monopolistically, but at the same time he is also controlled by other owners;
- funding of properties puts the entrepreneur under control of the society;
- employees perform ownership of the means of production in security papers, personal accounts, etc.;
- appearance of intellectual from of property as an essential and more-and-more prevailing element of productive forces, when the owner of intellectual capital works for hire.

And if the performance of the entrepreneur at the market of labour resources used to be associated directly with his entrepreneurial activities and, in this respect, he used to be a person creating working places and giving employment to people, then nowadays his market role is being changed – today he can perform not only as an employer but also as an employee.
2. ENTREPRENEURIAL LABOUR MARKET

When manual labor prevailed in society, all of the active functions of people were performed either by free labor (i.e., employees, owners of the means of production) or wages (i.e., forced labor). From the standpoint of the concept of Marxism-Leninism, the functions of entrepreneurs were limited only to the “exploitation of workers” and were treated with purely negative attitudes (Lenin, 1977; Marx, 1973).

In a civilized society, the division of labor into wage-forced and free labor seems an anachronism. At the current level of development of human civilization, it is more important to discuss the various degrees of freedom of work activity, which includes two major the concepts: wage labor and entrepreneurial labor, with the dividing line being the ways of incorporating them into the labor process, the types of employment, and the ways to establish business relationships and change the role of employees in social production in general.

Wage labor is based on people providing their labor at the disposal and/or for use by employers in exchange for compensation or payment and in compliance with other conditions as determined by agreement among the parties. Wage labor does not mean non-free labor. In cases when the employee’s abilities coincide with the opportunities offered by the society for employee development, there is a connection between the form and the content. The results of labor overcome spatial, temporal, and national borders; social order in this case is irrelevant. Employees may be employed and also free in their actions, as with, for example, employees who provide intellectual labor (Shakhovskaya, 1995).

At the same time, entrepreneurial labor that is free from exploitation can be and often is forced, as it depends on external factors, such as the state.

The entrepreneurial labour market can be represented as a domestic market of labour resources of a special kind, functioning as a separate independent submarket and being a system of continuously reproduced socio-economic relations between its subjects due to the use (purchase and sale) of entrepreneurial labour – between entrepreneurial owners of production means who demands or wants to launch a new business; entrepreneurial employees partially owning production means (top-managers, inventors, marketing specialists, coaches, merchandisers, etc.) seeking for a work for hire; ex-entrepreneurs; various state bodies, public institutes and mediators providing demand on entrepreneurial labour associated with allocation, reallocation, employment and integration of labour-power into the process of public production as well as providing opportunities for development and operation of a new entrepreneurial structure (Shakhovskaya and Akimova, 2010).

Relationships, associated with “purchase and sale” of entrepreneurial labour, are different from their classical interpretation at the market of labour resources. At the entrepreneurial labour market, there is not a direct act of purchase or sale of capacity for entrepreneurial labour but formation, development of a new entrepreneurial unit or cessation of the existing one, or conversion of entrepreneur into employee of a special kind, which marks the process of nominal performance of this act. Any economic agent coming to the entrepreneurial labour market decides to perform as an entrepreneurial owner but not all of those, who make such decision, occurs to be an entrepreneur in actual practice and starts a new business as every new entrepreneur, regardless to a kind of his activity, must do the registration procedure in various bodies of state authority or get the support of definite social institutions or mediators of the entrepreneurial labour market; hardly every entrepreneurial manager or employee exercises his right to labour . If a government, public institutions and entrepreneurs themselves provide such support, then entrepreneurial labour “hiring” takes place; if they do not, neither happens “hiring” (in this case an entrepreneur can migrate into the shadow sector, however, he cannot be considered as a current market participant).
The entrepreneurial labour market has several features. First of all, entrepreneurial labour is a commodity of a special kind, productive and creative characteristics of which determines the effectiveness of competitive economy, possibilities to create high quality goods and convenient services, scope and rates of scientific and technical and organizational reforms. The prevailing solidarity in interests of entrepreneurial labour and its consumers – national economy, the state, business – is the most important feature of the current social-oriented market economy, which creates a firm humanistic basis for the development of the society in whole. For this reason, the entrepreneurial labour market can be generally represented as three main segments:

1) Entrepreneurial owner of production means - wants to launch a start-up, that means “firstly, readiness to change his living habits; secondly, desire to do a prestige business; thirdly, confidence in success of creation of such business since there are obligatory outer and inner prerequisites” (Carsrud, 1986). The peculiar features of the entrepreneurial owner are independence, responsibility, readiness to take risks, initiative, creativity, innovative abilities, self-actualization, strong will helping to overcome not only the inertness of own and public thinking but also the environmental resistance, ability to see a business through, ability to band people together around himself, an amount of start-up capital.

2) Entrepreneurial employee (internal corporate entrepreneurship) - partially owns means of production (as a rule, an owner of intellectual capital) and works not only for himself but for entrepreneurial employee, therefore not exclusively using results of his labour (top-manager, inventors, marketing specialists, coachers, merchandisers, etc.) The peculiar characteristics of entrepreneurial employee are not associated with an ambition to get a higher salary and routine performance of his duties but with a creative, initiative and innovative approach to work, flexible thinking, analytical attitude of mind, ability to think and generate ideas including commercial ones, gumption, wide world-view, and ability to find no routine decisions.

3) Ex-entrepreneur – wills to launch a start-up in a new sphere or field of work “for hire” (either in entrepreneurial or other sphere). The entrepreneur as a valuable personnel resource expertly involved into a commercial organization, on the one hand, can give it a great advantage in competitive struggle, and, on the other hand, he, unlike employee, is used chiefly to be self-oriented, and follows his own interests and personal profits. Unlike employee, private entrepreneur is initially oriented towards solving a large set of problems. For the manager his professional activity is part of life, whereas the entrepreneur perceives his life as a part of this activity (Gaidukov, 2009).

The current entrepreneurial market can be divided into primary and secondary one. In the primary market, first-time nascent entrepreneurial owners, entrepreneurial managers and ex-entrepreneurs seeking for “work for hire”. The secondary market is represented with ex-entrepreneurs, nascent entrepreneurial managers or owners seeking for “work for hire”.

The largest, rather heterogeneous and diversified group at the entrepreneurial labour market includes qualified work force of capacity for labour being part-time or nonworkers due to various conversion processes in industry, science, education, etc, and, therefore, of need in thorough analysis and assistance on the part of public institutions. New participants come to the entrepreneurial market from trade sector, household services, and other different services, and they are more adaptable to market conditions and possess basic minimum of special knowledge and skills. A dynamically rising group at the entrepreneurial labour market consists of young people who have failed to find work in their specialization after universities and decided to “start a business”, as a rule, lacking essential knowledge and training. However, they are young people, who constitute the most perspective social
group of citizens at the entrepreneurial labour market due to the possibility of their active participation in economic life of the society, and are of need in national assistance (Moseiko, 2001).

In general, a problem of the balance between quantity and quality (due to the qualification level) of entrepreneurial labour, and employment possibilities is extremely urgent. Russia have passed the period of market economy formation and business development, which now evidences a level of professional education, being low for business performance. Current entrepreneurs, as a rule, lack competence, management culture, psychological stability, own ability to function in crisis and extreme situations. Formed in previous conditions of management, traditions and knowledge, abilities and skills of most managers and specialists occurred to be a huge obstacle for economic and organizational innovations. Besides, the main reasons of such negative tendencies deal with lack of special educational programs for entrepreneurs, defects of training methods, lack of choice of educational establishment with the alternative of other numerous educational structures without guaranteeing educational quality, deficiency of a material base of educational establishments and qualified teaching staff.

Nowadays, in this country, the Academy of Management and Market (Moscow) has been executing a large-scale project on qualified specialist training for market-based economics and assistance to small enterprises, for unemployed people with a will to launch a private business, developing investment program implementation methods (Tomilina, 2000). However, with all these aspects in consideration, it is, no doubt, insufficient. The key factor for the appearance of a new generation of entrepreneurs is a lifelong education and further qualification training.

The entrepreneurial labour market refers to the group of socio-important markets, as well as the employment market – these are two pair inter-related markets, at which a capacity for work or entrepreneurship not only being sold but being reproduced. The correlation mechanism of the two socio-important markets is always mediated with public institutions prevailing over private and social ones, but the success of this inter-relation is predetermined by the state but not the market since both subjects (entrepreneurs, employers) and the objects of purchase and sale (competencies and entrepreneurship talent) in the interaction process are oriented not to the market-set equilibrium price but to the demand price, which is consciously set by the state and determined at educational markets, also referred to socio-important ones, at which quality of in-stock commodity (capability for work, entrepreneurship talent) being formed.

Labor and entrepreneurial activity together describe the various aspects of entrepreneurship from the birth of a business idea to the function of the entrepreneur in various forms and at different levels of an economic system. This allows people to distinguish between two separate but interacting markets: entrepreneurial labor market and the entrepreneurial activity market. Included in the process of professional activity (leaving, thus, the entrepreneurial labor market), entrepreneurs independently pursue their own professional competences and become the subjects of the market of entrepreneurial activity. This market can be represented as the system of economic mechanisms, norms, and institutions that provide the effective function of entrepreneurial abilities.

The market of entrepreneurial activity is a system of relations between entrepreneurs-owners, entrepreneur-wage-employees and employees, suppliers, partners, various government bodies, public institutions and so on relative to the use or reproduction of entrepreneurial abilities for implementation of entrepreneurial activity aimed at the production and sale of goods and services, satisfaction of different needs of the population in terms of a market economy that is achieving the intended result by making the best use of capital (property) and resources (financial, logistical, and labor) by cost-
isolated subjects of the market economy who carry the full material responsibility for the results of its activities and obey the laws of the country in which this activity was registered.

In the competitive environment of a market economy, if the entrepreneur gives up and works less intensively, the business will die. Entrepreneurs cannot afford to back off of their activities and may achieve better results by motivating employees to more efficient and productive work (having a certain power over them). As leaders, entrepreneurs must pay attention to that fact that workers should not feel envy of each other for wage disparities.

In modern conditions of economic development, the most important factors for success of an entrepreneur are intangible incentives and noneconomic labor motives. The activity of an entrepreneur should be socially responsible. The motives and targets of the entrepreneur’s labor and employees must be aligned to ensure the interdependence of internal and external motivations. Employees should be interested in the results not only of their labor but in the activity of the enterprise as a whole. Entrepreneur-owners and their employees should exist as a single organism that aims to achieve a common goal of effective operation. Why many modern Russian entrepreneurs are going bankrupt? Not only because of the crisis or lack of support from the state but because they do not care about their employees, their materials, or their moral (spiritual) well-being and development. The gap between the incomes of wage earners and entrepreneurs is too large. In such circumstances, employees have no incentives for effective activity.

The concept of business motivation in modern business environment must be based on the theory of coaching, aimed at creating an effective dialogue between the entrepreneur-owner, entrepreneur-manager and the employees in the course of their motivation and functioning of the organization. Coaching allows entrepreneurs to objectively look at themselves from different angles, to better understand how certain actions affect the situation and the environment, find out where the hidden reserves for development are and realize their own potential to the full. An entrepreneur is involved in the business venture which they created, and which is from then on associated with their name. If their business is successful and beneficial to the society, then that success should be fairly divided between the entrepreneur and the employee/s, hence the emergence of economic resonance, when at the lowest cost it is possible to achieve great results.

At the present days, the entrepreneurial labour market is at the very beginning of its institutional formation and development. Different entrepreneurial associations and groups are appearing, with the aim to protect not only of entrepreneurial owners but also of entrepreneurial employees. Otherwise, in order to let the market function as a private institute to its full extent, this factor is not sufficient, and here occurs the necessity of precisely-regulated partnership between all subjects of the labour market and those of entrepreneurial labour, entrepreneurial public employment service, enterprise administrations, and employees; this would be the main basis for achieving a higher occupational level, effective economy performance and formation of the “middle class”. As these are the mutual understanding, trust, “honesty, intelligence and total informativity”, which provoke creation of interaction, a complex of some actions, activities, providing achievement of managerial aims.

One of the valid methods to establish partnership relations is creation of “community”, unique consumer clubs, involvement into which extremely raises the loyalty of the market subject and provokes a closer correlation. Exhibitions, conferences, seminars, amateur club meetings, social networks (ex., for future and current entrepreneurs) offer on-line communication format, when every communicator receives confirmation of own appraisal, influences the formation of public opinion since the ability to listen and understand provides the success of any innovations. Besides, there is the
possibility to create a special department in the structure of employment service with the following key functions:

- monitoring of the environment of the entrepreneurial labour market and forecasting of its changes;
- sociological analysis of data on entrepreneurial owners and entrepreneurial managers, both being currently unemployed, to reveal their abilities and for their further adaptation;
- collection of sociological information for further recommendations on creating new working places in small and medium business sector;
- analysis of public opinion on entrepreneurs and opportunities of their “employment”; and
- conduction of unusual and exploratory research at the entrepreneurial market, etc.

The subjects of the entrepreneurial labour market have a chance to achieve their goals by presenting their interest in public opinion, by gaining a reputation, and by creating positive image. Without the developed system of institutions, that protect rights of every labour-relations participants (including the state), the current market is not able to function successfully. Therefore, the entrepreneurship market development is impossible without formation and development of the entrepreneurial labour market being the most important private institute. Entrepreneurial labour is associated with functioning and activities of a certain person to achieve his goal and become an entrepreneur; and the entrepreneurial activity is an objective complex of constantly reproducing and changing situations, where various models of entrepreneurial behavior of individual, contractual-group and contractual-organizational types.

Thus, the entrepreneurial labor market is a totally new segment of the national labor market, which can be regarded as an independent socio-important market, which has a huge impact on the national economy as a whole. At the current level, in Russia, the real prerequisites have been created to start the creation of a solid background for economics, based on education.

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ECONOMIC COMPETENCIES IN TRANSPORTATION ENGINEERING CURRICULA

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Abstract
In accordance with the decisions of the European Union, the graduation documents issued by all universities from 2012 will include a reference to the level of the European Qualification Framework (EQF) with which the respective diploma or graduation certificate is in compliance. The Estonian regulations stipulate that the qualifications granted at completing higher education must relate automatically with the national qualification framework and thereby also with EQF.

The objective of this article is to demonstrate how should be competencies in the field of economics obtained in the curricula of road engineering, considering the regulatory basis described above. The article uses comparative analysis of the Estonian qualification standards and curricula with the practice of Estonia and other countries. The outcome of the study is presenting a model of the integrated BSc and MSc curricula of road engineer’s studies that indicates the links between teaching economic competencies and the basic skills and knowledge required by the professional qualification standards.

Key words: European Qualification Framework, transportation engineering curriculum, occupational standards

1. INTRODUCTION
Transport systems are closely related to socio-economic changes. The mobility of people and freight and levels of territorial accessibility are at the core of this relationship. Economic opportunities are likely to arise where transportation infrastructures are able to answer mobility needs and insure access to markets and resources. International, regional and local transportation systems alike have become fundamental components of economic activities. A growing share of the wealth is thus linked to trade and distribution. However, even if transportation has positive impacts on socio-economic systems, there are also negative consequences such as congestion, accidents and mobility gaps.

Transportation is also a commercial activity derived from operational attributes such as transportation costs, capacity, efficiency, reliability and speed. Transportation systems are evolving within a complex set of relationships between transport supply, mainly the operational capacity of the network, and transport demand, the mobility requirements of an economy (Rodrigue et al., 2009).

Courses on economics and business are always included as part of the program of studies in all engineering degrees. There is no discussion on this point, as all professionals agree on the importance of economic feasibility in any engineering discipline. Despite this, the educational experience shows that engineering students are sometimes reluctant to study this kind of courses, not so closely related to technical disciplines (Sanchez et al., 2010).
Meanwhile, it is unavoidable, considering that high-quality and pertinent engineering education, and quality-assurance mechanisms are imperatives for creating a knowledge-based economy (Morell, 2008), which assumes obtaining competencies in various very different areas. Previous studies have shown that in the current globalised economy employers expect from engineering graduates industry-oriented professional competencies in such areas as financial management, accounting, marketing management etc. (Yeh, 2011). Thus, globalisation and the growth of offshoring have changed the landscape of the engineering and technology profession and will have a major impact on engineering and technology education (Ayonkambi, 2011), incl. in the field of transportation engineering.

The objective of this article is to demonstrate how should be competencies in the field of economics obtained in the curricula of road engineering. The article uses comparative analysis of the Estonian qualification standards and curricula with the best practice of Estonia and other countries.

2. CURRENT TREATMENT OF TRANSPORTATION ENGINEERING

Economics involves production, distribution and consumption of goods and services. Transportation, on the other hand, is responsible for the development of civilizations from very old times by meeting travel requirement of people and transport requirement of goods. Therefore, transportation engineering is a very diverse and multidisciplinary field. It comprises of four major areas that are briefly described below (Mathew and Rao, 2007a and 2007b).

- **Transportation Planning** – essentially involves the development of a transport model which will accurately represent both the current as well as future transportation system.

- **Geometric Design** – deals with physical proportioning of transportation facilities, in contrast with the structural design of the facilities.

- **Pavement Design** – deals with the structural design of roads, both bituminous and concrete, (commonly known as flexible pavements and rigid pavements) respectively.

- **Traffic Engineering** – covers a broad range of engineering applications with a focus on the safety of the public, the efficient use of transportation resources, and the mobility of people and goods. Traffic engineering involves a variety of engineering and management skills, including design, operation, and system optimization.

In addition to the four major areas of transportation engineering, there are several other important disciplines that are being evolved in the past few decades. One of the most important among them is Financial and economic analysis. The economic analysis of transportation project tries to quantify the economic benefit which includes saving in travel time, fuel consumption, etc. This will help the planner in evaluating various projects and to optimally allocate funds. On the contrary, private sector investments require monetary profits from the projects. Financial evaluation tries to quantify the return from a project (Mathew and Rao, 2007a).

If we generalise what has been said above, we could say that today's fundamental competences of engineers include several competences in the field of economics. The ones mentioned in the literature (Dunwoody et al, 2006; Wright, Ashford and Stammer, 2003; Lucena et al, 2008) include knowledge in the field of basic entrepreneurship, project management, strategic planning, socio-economic and economic cost/benefit analysis, financing of construction projects, assessment of external costs of transport, etc. The author will use the Estonian example to analyse how the economic competences are reflected in the existing curricula of transportation engineering.
3. CURRICULUM

3.1. Legal environment

The EU member states have agreed that since 2012 all diplomas and graduation certificates will include a reference to the respective EQF qualification level (EP, 2007). EQF has eight levels of competency that are described through the scope of knowledge, skills, independence and responsibility. Estonia is about to complete the process of linking the National Qualifications Framework (NQF) with comparative EQF. Estonia is a good example in the context of this article, as based on the political decision made in 2008, the qualification level descriptions applicable in Estonia are identical to those of EQF (Professions Act, 2011).

Qualifications to be incorporated into the NQF belong to the following types:

- Higher education qualifications
- General education qualifications
- Vocational education qualifications
- Professional qualifications.

The two first qualifications in this list form the National Educational Framework (NEF). It has been agreed in Estonia that the formal educational qualifications obtained in the end of a higher education programme are in correlation with NQF and thus automatically with EQF (see Fig. 1).

Fig. 1. Relations between educational and qualifications frameworks: the Estonian example (Hamburg and Kööma, 2009)
The Higher education standard (2011) serves as a framework standard for higher education qualifications. This standard describes the credit system based on ECTS (European Credits Transfer System), the principles of accrediting previous experiential learning, formulates generalised learning outcomes and assigns the NQF and EQF levels to the higher education qualifications. The qualifications framework for higher education has three levels. The first level contains two qualifications assigned to the sixth level of the NQF/EQF: Bachelor's degree and applied higher education diploma. The second level contains Master's degree assigned to the seventh level of the NQF/EQF and the third level contains doctorate degree assigned to the eighth level of the NQF/EQF.

The Framework requirements for medical studies etc. (2010) stipulate inter alia requirements for educating construction engineers in Estonia and determine the total scope of studies, conditions for beginning and finishing studies, study outputs, requirements for curricula, competencies obtained after completing curriculum, as well as requirements for instructors. According to this document, the nominal period of studies of construction engineering is 5 years and the curricular volume of studies 300 ECTS-credits. A person graduating construction engineering studies must have obtained the following economic competencies:

- Sufficient knowledge in order to comprehend the relations between engineering and social, economical, environmental and ethical problems and tasks, and know methods for solving such problems;
- Sufficient knowledge in the field of construction economics and construction planning;
- Knowledge for assessing, analysing, managing and planning construction projects;
- Knowledge for analysing economic activities of a construction company, preparation and assessment of business plans.

The framework requirements contain also a list of compulsory subjects that the curriculum of construction engineering must contain in order to achieve the required learning outcomes. There exists only one subject foreseen for obtaining economic competencies: Economics (in basic and general studies). The reality shows that in Estonia there is a need for including more subjects dealing with economics in the engineering curricula (see the following section).

3.2. Transportation engineering curriculum in Tallinn University of Technology

The only educational institution in Estonia providing academic higher education in the field of road engineering is Tallinn University of Technology where this specialty is taught by the Faculty of Civil Engineering. The faculty has a long history – it has been born together with the University in 1918. Currently the faculty has good reputation in the national and international construction markets and all syllabuses, incl. Transportation engineering, are there internationally accredited (Sutt and Lill, 2009). In the following, the author will analyse the transportation engineering curriculum of Tallinn University of Technology.

The transportation engineering students of Tallinn University of Technology can choose between three main specialities:

- Engineering survey;
- Bridge engineering;
Road engineering.

This article will focus on road engineering. The structure of the respective curriculum by module types (basic, general, core, special and free choice studies) and modules is depicted on Fig. 2 (see next page). The share of module types is determined by the statutes of the curriculum of Tallinn University of Technology that also provides a list of mandatory subjects for the basic and general studies in the field of technology.

The mandatory economy related subjects of the road engineering curriculum of Tallinn University of Technology consist of two subjects: micro- and macroeconomics, and economics in construction enterprise, which together give 8 ECTS-credits, as required in the curriculum statutes. In addition, the students can take under core and special studies three more courses in the field of economics: management economics, assessment of construction cost, as well as transport network and fundamentals of logistics, the last two being elective courses. In total these subjects give 14 ECTS-credits, thus it can be concluded that the graduates of the transportation engineering curriculum can obtain economic competencies for the maximum of 22 ECTS-credit (not considering free choice studies) i.e. ca 7% of the total curriculum.

The economic competencies obtained are described in the study output of models as follows:

- Understanding the nature of economy, the aims, problems and controversies in macroeconomics;
- Knowledge about the role of economy in society; behaviour of an industry, firm or household;
- Knows the guidelines of Estonian and EU transport policy;
- Knowledge about the enterprise for understanding to estimate business activity in economy to the building firms;
- Students have got acquainted with the methods of construction estimating and are able to use them in practice;
- Knows the main concepts and methods of accounting;
- Knows how to calculate the unit price of road works and offer price;
- Knows road management cost categories and their calculation principles;
- Knows how to perform profitability calculations of road construction investments;
- Knows the basic theory of logistics;
- Knows how to use the main techniques of logistics in his/her professional activities.

Leaving aside the inconsistent descriptions of study outputs, the students of the transportation engineering curriculum of Tallinn University of Technology obtain a relatively insignificant part of the competencies that arise from the current treatment of transportation engineering. The areas uncovered include, for example, financial analysis, assessment of external costs of transportation, planning national socio-economic development, etc.

Whilst comparing the curriculum of Tallinn University of Technology with the transportation engineering speciality of the civil engineering curriculum of University of California (Berkeley), USA, then it is obvious that the latter focuses much more on obtaining competencies in the field of economics. The core studies’ subjects, for example, include a subject called Transport Policy and Planning that deals with such topics as transportation finance, pricing and subsidy issues. Special studies’ subject Infrastructure Planning and Management is also economics-based, including topics of supply, demand, and evaluation. The special studies’ subjects include also such subjects as Transportation Economics (application of micro- and macro-economic concepts to transportation
systems, project and program evaluation, social welfare theory, analysis of social cost, investment analysis and pricing theory, economic impact analysis, role of economic analysis in decision making) and Transport Finance (economic and financial dimensions of urban transportation systems, including highway finance and user fees, toll financing and congestion pricing, transit finance, and fare and subsidy policies).

Fig. 2. The structure of curriculum of transportation engineering’s main speciality, road engineering, in Tallinn University of Technology (OIS, 2011)

Teaching of all the subjects listed above is coordinated in the University of California by the faculty of construction. Meanwhile, the study process is organised in close cooperation with the faculty of economics of the same university that offers to engineering majors special courses in economic theory, econometrics, supply chain management, etc. In Tallinn University of Technology other economical subjects can be learnt only as a part of optional studies, the module of which is relatively small in size (see Fig. 2). Therefore, cooperation between different faculties of the university is extremely important in educating road engineers with competencies needed in the modern environment.

3.3. Road engineer’s professional standards in Estonia

A professional standard is a document which describes professional activities and provides the competency requirements for professional qualifications and their levels. To be more precise, the professional standard is:
• the basis for compiling curricula and training programmes which meet the requirements of the labour market;
• the basis for assessing competence;
• a useful tool for employers when promoting and describing jobs, recruiting employees, writing job descriptions, defining staff’s qualifications requirements, planning training;
• a tool to help an employee understand their current skills levels and deficiencies, provides opportunities for planning their development and career, and is a basis for lifelong learning;
• a tool for trainers, learners, parents, advisors and other stakeholders when gathering information and intelligence on labour market trends;
• the basis for comparing professional qualifications certificates internationally (EQA, 2011).

The professional standards consist of three parts marked with letters A, B ja C. Part A describes the work areas and professional titles, as well as requirements for professional education. The professional titles and relations with NEF contained in the professional standards of Estonian road engineers are the following (EQA, 2011):

• Road Engineer (RoadEng) – 4-year applied higher education course and at least one-year experience as a professional engineer, plus vocational training;
• Diploma Road Engineer (DiplRoadEng) – 5-year academic higher education course and at least 2-year experience as a professional engineer or researcher immediately prior to applying for professional qualification, plus vocational training;
• Chartered Road Engineer (ChartRoadEng) – DiplRoadEng’s professional qualification, at least 2-year experience as a professional engineer or researcher and developer immediately prior to applying for professional qualification in the same profession for which the professional qualification is applied and continuous improvement of professional knowledge and skills. A chartered road engineer can apply for the professional title of European Engineer (EurIng).

Part B describes competency requirements that are divided into four groups (see Table 1), which are divided into different areas. During the professional standards’ reform, the competency groups listed in Table 1 are replaced by descriptions of knowledge competencies and professional competencies and the appendices to the professional standards will be supplemented with a list of mandatory subjects of the road engineering curriculum. The author is not aware of any subjects in the field of economy being included in this list.

Whilst comparing the economic fields described in the professional standard with the learning outcomes of the road engineering curriculum of Tallinn University of Technology, it becomes obvious that a graduate of engineering studies entering the labour market has not obtained any significant knowledge in the basics of company management, salary system or transportation economics.

If we compare the Estonian professional standards with the requirements for the first level of road engineering professions in USA laid down by the Transportation Professional Certification Board (ITE, 2011) and National Council of Examiners for Engineering and Surveying (ASCE, 2011), it appears that a licensed engineer must among other things have knowledge about discounted cash flow (incl. internal rate of return, net present value), incremental, average and sunk costs, breakeven and benefit-cost analysis and risk assessment. The qualification exam of a professional engineer contains such topics as cost estimating, optimization and/or cost analysis, traffic impacts, value engineering and
costing, combined with checking applicant's knowledge in road construction management, traffic planning, traffic accident analysis, etc.

**Table 1. Economic competencies in the professional standards of Estonian road engineers** (EQA, 2011)

<table>
<thead>
<tr>
<th>Personal skills and aptitudes</th>
<th>Generic skills and competencies</th>
<th>Core skills and competencies</th>
<th>Special skills and competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basics of Economic Activities</td>
<td>Management and Organisation of Work</td>
<td>Organization of Road Construction</td>
<td>Transportation</td>
</tr>
<tr>
<td>Principal Economic Terms</td>
<td>Resource Planning</td>
<td>Strategic and Operative Planning</td>
<td>Logistics</td>
</tr>
<tr>
<td>Basics of Financial System</td>
<td>Assessment of Work Results</td>
<td>Economic Assessment</td>
<td>Transport Economics</td>
</tr>
<tr>
<td>Basics of Entrepreneurship</td>
<td>Project Management</td>
<td>Standardisation</td>
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<tr>
<td>Methods of profitability analysis</td>
<td></td>
<td>Inventory management</td>
<td></td>
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<tr>
<td>Basics of Marketing</td>
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<td>Salary System</td>
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</tbody>
</table>

3.4. *Model of curriculum considering economic competencies*

The circumstances presented in sections 3.2. and 3.3. allow to conclude that the road engineering curricula starting from the basic studies should be built using the so-called matrix method. The four vertical modules of basic studies (transportation planning, geometric design, pavement design and traffic engineering) are linked with horizontal measures providing economical competencies (see Fig. 3). The latter include financial and cost accounting, investment analysis, management of finances, etc.

Each road construction project requires project management from three different perspectives: that of the client, the designer and the builder. Although they will share a common knowledge of project management, they will also have specific knowledge of their own fields of management (Sutt and Lill, 2009). Therefore, it is necessary to include a project management module in the road engineering curriculum in addition to the other modules in the field of economy.
The suggested solution considers also the requirements for the basic skills and knowledge of road engineers laid down in the professional standards. The knowledge, for example about geometrical and pavement design, are obtained in linkage with resource (i.e. land, capital, labour) calculation, transportation planning and traffic engineering in linkage with capital budgeting, both at national and road construction company’s level. Such approach is also supported by the fact that the competencies supporting analytical thinking are obtained already in course of general and basic studies.

The suggested solution allows using in the process of educating engineers such progressive teaching methods as cooperative learning, problem-based learning, case-based learning, as well as E-learning. It has been claimed (Morell, 2008) that an engineer is a perfect person to solve problems. The author of the present article is of the opinion that compared to those obtaining classic economic education, an engineer who has obtained economic and technical competencies in an integrated manner has much better prerequisites for finding adequate solutions for solving problems at both national and company level.
4. CONCLUSIONS

The article studied some of the problems arising from the implementation of the common European Qualification Framework in the field of road construction. The author became interested in this issue because he is currently lecturing economic subjects to the transportation engineering students of Tallinn University of Technology and also because Estonia is one of the first European countries that has unified national professional and higher education standards, linking them also to the European Qualification Framework.

During the preparation of the article the author analysed the road engineering curriculum of Tallinn University of Technology and the professional standards applicable for road engineers in Estonia, and compared them with the respective materials used in the USA – the leading country of the world in educating engineers. The analysis showed that the curricula and professional standards of the USA focus in addition to technical competencies also on economic competencies. Therefore, the author is of the opinion that the legal environment regulating university studies in Estonia considers insufficiently the modern trends in educating engineers.

Based on the considerations above, the author presented a model of curriculum where economic and technical competencies are obtained in an integrated manner, using progressive teaching methods.

REFERENCES


THE IMPORTANCE OF THE LITERARY IDENTITY FOR A VILLAGE / PLACE

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Abstract

Literary tourism is a type of cultural tourism which can be based on tourists visiting the places where the story from a book takes place, but it can also be based on tourists visiting the places where the author was born, where he lived, where he died. We believe that through literary tourism the visited destination receives another identity that is different from the "real" one. On the case of the Slovenian village Vrba, where the most important Slovenian poet France Prešeren was born, we will try to show the connection between literary tourism and national / cultural identity. The main question will be, how is Vrba presented to the visitors. What is Vrba literary identity like and how important this identity is? And for what? We assume that literature as a media gives the reader a certain picture of the place that may differ from the actual site. But this new identity is not necessary bad for a village / place, on the contrary, it can be very useful for the local cultural development, as it helps to strengthen the national identity, and economical growth, especially because of new work places, for example in museums, souvenir shops etc.

Keywords: literature, tourism, literary tourism, birthplace, birth house, Prešeren, France, poet, Slovenia, culture, identity, legacy

1 LITERATURE AND TOURISM

In the last years many researchers have been studying the relationship between literature and space. This relation is very complex and is interesting especially from the cultural and geographic point of view. Many authors fascinated and still fascinate readers not only with ideas and views, but also with “suggestions” where and how to travel. Many tourists also like to visit the places where their favourite poets or writers were born. Travelling to the places that are closely connected to the author's life can become a sort of pilgrimage (Anderson in Robinson, 2002, 10-12).

Let us see the case of the village in which the most famous Slovenian poet France Prešeren³ was born. People were visiting his hometown Vrba even before it became a tourist attraction. Most of the visitors

³Prešeren was born in the village of Vrba near Lake Bled in Gorenjsko to peasant parents. This was at the time of Napoleon's wars, when the French for a time occupied parts of central and southern Europe which had been for centuries under the Austrian rule. Prešeren finished his law degree in Vienna, the capital of Austria, but was unable to open his own office until two years before his death in Kranj. His request to do so was rejected five
wanted to feel connected to the author, maybe understand better his poems, so they went looking for answers in a place which was considered to be very important for the development of the writer's identity.

And because the place was of high importance for the author's identity, the author's legacy became very important for the identity of the village. Now Vrba is known only because a great literate was born there. In the following article we will present Vrba and we will see how the birth house became a museum. We will also analyze a questionnaire to see what is the first thing students think about, when they hear the name Vrba. We will also see what students of tourist studies think about literature and the effect it can have on the village.

2 TYPES OF LITERARY TOURISM BY NIKOLA J. WATSON

A reader can visit many places that are connected to literature in different ways. Maybe an author was born there, grew up, lived or died there. We can also visit places where our favourite book was written, or places where the story takes place (Watson, 2006). The experience is even stronger if the actual and literary places are the same. This usually happens when an author is writing about his home town.

A literary tourist does not see the place objectively, his view is affected by the interpretation and the emotions he feels when reading. Without the emotions and the personal / individual interpretation the literary site would lose most of its value (Watson, 2006).

The literary tourism is part of the cultural tourism as it takes you to the sites that have a cultural value. There are many different types of literary tourism. One of the most interesting and the one we used as a basis for our work is the classification made by Nikola J. Watson. Based on English literature and literary sites the author speaks of literary tourism that is connected to memorials, graves, birth houses, literary landscapes and fantasy lands.

2.1 Memorials and graves

Literary tourism developed as a sort of religious pilgrimage, which became, due to changes in society and religion, less important. It all started in the first decade of the 18th century when a memorial for the poet Thomas Shadwell was built in Westminster Abbey in London (Watson, 2006). The interesting thing was that the poet was actually buried in another town, in Chelsea. Another important fact was that a nonreligious memorial was built in a religious place. This was a clear sign that the understanding of religious and nonreligious had changed. This practice continued and today literary tourist can visit the Poets' Corner in the Abbey (Watson, 2006).

In 1760 the Poets' corner was mentioned for the first time as a tourist attraction. Soon the Corner was not just an attraction for literature lovers, but became a symbol of the English nation. The memorial was strongly connected to national feelings. When the feelings became an important link, worshiping the memorial was not enough. The relationship between readers and physical remains of the authors was emphasized. Consequently the graves of the authors' became the right place to visit. The Abbey started to lose its visitors, so they changed strategy. Instead of just making the memorials, they buried
the authors in the Abby. It went so far that in some cases they did not respect the wish of the dead author (Watson, 2006). Nikola J. Watson points to the case of Thomas Hardy, whose hart remained on the cemetery in Stinstord, but his ashes were brought to the Abby. Even if they tried really hard, the Abby did not manage to keep their tourists. Real literary tourists were bothered also by the fact, that the Abby was a public place, which was visited also by people who were not interested in literature. The Abby was not intimate enough. Because of the stronger emotional connection and experience the literary tourists tried to place the author in a specific town that was connected to his life (Watson, 2006). In this way the practice of visiting graves and graveyards also called necro-tourism developed. This kind of literary tourism was mainly based on religious pilgrimage. In the Enlightenment came the secularization of pilgrimage and the saint's relics were replaced with the author’s remains. A general interest for this type of literary tourism developed especially after biographies became popular between writers and readers (Watson, 2006).

2.2 Birthplace

In the late sixties of the 18th century, the first public celebration of Shakespeare's 200th birthday happened (Watson, 2006). The event took place in the author's home town Stratford-upon-Avon and it totally changed the village. It became one of the most important touristic sites. The celebration did not only affect Shakespeare's town, but it also became a starting point for a new type of literary tourism. Slowly also the birthplaces of other authors became popular touristic spots. The celebration itself was a precondition for the idea of the author's birthplace. From 1769, when the celebration took place, visitors of Stratford-upon-Avon did not visit only Shakespeare's grave, but also the so called birth house on Henley Street (Watson, 2006).

Tourism based on birth houses is similar to the tourism based on visiting graves connected with the literary work of the author. It is an experience which is on one hand independent and on the other hand influenced by literary work. Because of his work an author becomes interesting. Literary tourists would not care or visit a birthplace of an author, if he would not write interesting novels, short stories, dramas or poetry (Watson, 2006).

2.3 Writer's houses

“A birthplace is of course in some sense a 'writer's house', but it is almost never the house in which the writing has actually been done, the workshop of genius, the apogee of literary tourist sites” (Watson, 2006, 90). Watson makes a clear distinction between the houses where the writers were born, grew up, and where they wrote. Of course, Watson points out that in some cases the house where the author was born was the same as the one where he worked, as in the case of Thomas Hardy. However, for the Slovenian poet Prešeren the statement mentioned above is true, as he left his home when he was very young. The reason he left was his education, but he never really came back, so he never wrote there.

In the book The literary tourist Watson presents to the reader a famous “writer's house”, which is in fact the first such house. “Abbotsford, the most famous of Sir Walter Scott's many homes […] is of critical importance in the development of the writer's house as a place to visit because it is the first house in Britain to have been shown as the site of the writer's work; indeed, it was the first house consciously designed by a writer to display the income and status derived from authorship, to exemplify and epitomise his writing, […] and to be visited by admirers from the outset” (Watson, 2006, 91). As it is pointed out the important thing in such houses it is not only the author as a person, but his legacy, his writing that comes in contact with his life. And if the important thing for birthplaces is the knowledge about roots of an author, which definitely influences his writing, the important thing for a “writer's house” is the writing itself and the condition in which the literary work saw the light of
day. The “writer's house” also tells us about the writer’s status and how his life developed from childhood, what was his life like.

2.4 Literary landscapes – sentimental landscape tourism

As Watson explains the first three types of literary tourism are governed by biography and the next types by fiction. The interest in “places populated by purely fictional characters and where purely fictional events had taken place emerged at the end of the 18th century” (Watson, 2006, 132). The interest was sparked by Jean Jacques Rousseau's Julie: ou, La Nouvelle Héloïse (1761), which is a revolutionary novel of sentiment. As Watson notes, a new way of looking at landscape was born, and also a new way of living with reading. Tourist would search for sites that would awaken the emotions associated with stories, characters and literary events. Tourists would try to re-experience the feelings they felt while they were reading, they would also search for a new interpretation of what they read. However, it sometimes happened that the reader / tourists could not find the sentimental spots, so they were disappointed. But as Watson says, disappointment is also part of the experience and it was brought forth by the “failure to find the sentimental spot at all outside the confines of the text because it had either been obliterated or had never existed in the first place” (Watson, 2006, 132). What is important is the fact that with the publication of Julie, a new tourist experience becomes popular, and that is, to go to a place one has read about with passion and live an emotional experience, which can be positive or negative (Watson, 2006).

2.5 Literary countries

Sentimental landscape tourism was the starting point for the development of the notion of literary “countries”, which reached its peak at the end of the 19th and beginning of the 20th century. Its inception can be found much earlier with Walter Scott's works and can still be found today. Between 1880 and 1920 many publications were published, such as About England with Dickens (1883), Glimpses of the Land of Scott (1888), A Week's Tramp in Dickens Land (1892), The Thackeray Country (1905), The Charm of the Scott Country (1927). On the other hand there were many articles about literary tourism published at that time, for example Literary Geography (1904) by William Sharp. In it there is a sort of a list of literary countries: “The Country of George Meredith”, “The Country of Stevenson”, “The Country of George Eliot”, “The Brontë Country” etc. (Watson, 2006)

“In the purest form […] literary countries […] typically tie verifiable topography, whether rural or urban, primarily to an author's works, rather than to authorial biography and they are almost invariably associated with novelists” (Watson, 2006, 169). Although, Watson points to the connection with novels, we can say that there is a bit of literary geography connected to Prešeren. In his poems he often writes about his homeland and hometown. The main point of literary countries is the placement of characters and events from all the works of one author across “the whole range of realist settings that the author has exploited” (Watson, 2006, 170). The difference between the sentimental landscape tourism and the literary geographies is that this one goes beyond emotions. Literary countries are based on the need to naturalise a text to a certain place and on the relationship between the author's work and a vast part of real places on the map.

2.6 Fantasy lands

Although the need to place the author and the text in real places was born in the 19th century from the increased interest in biographies and popularity of realistic fiction, it is still here today. The most extreme form is the expansion of tourism sites associated with fantasy literature. “… the power of the desire to map the imaginary onto the actual has meant that even the 'nonsense' of Alice in Wonderland (1865) could eventually come to be mapped within Oxford” (Watson, 2006, 201). The readers wish to
revive the emotional interpretation so they search for places that are in one way or another connected to the fictional story. They want to connect the fictional with the real. The wish to do so grows with the fantasy. The more fantastic the story, the bigger is the need to find it in the real world. Until now, no one has found the hole in which Alice fell, but they have located the doors that lead to the garden, where Alice found the hole, and the bank on which she got bored before she found the hole (Watson, 2006). Alice was more or less successfully placed in to the real world, because of the connection between the literary locations, characters of the story and the author's biography.

Something similar happened to the collection of books for children about the famous bear Winnie-the-Pooh. Even if in the books there is no mention or tip about concrete places where the fictional events happen, the topography was created additionally, on the base of the author's biography (Watson, 2006).

3 THE HOME OF A WRITER

The place or better the house in which an author was born has a special value for understanding the writing, because the roots of a person can define their personality. In their writing many authors return to the place where they were born, and this is the place where many readers find a connection with the author and can, if they understand the environment in which the author was born, understand better the author’s work. However, the first step to appreciating the place of birth is to celebrate the birth itself.

“The celebration of a poet’s Birthday is the precondition for the invention of the idea of a birthplace, and by extension, the conversation and display of a house as a Birthplace …” (Watson, 2006, 56). To be able to cherish the place where the author was born, a reader has to know about the author’s heritage. The biography is very important, as a reader can understand the background and the relationship an author has to different places. The biography also gives the reader on important fact, and that is; the author was born in certain time and certain place. The awareness that the author is a person that is not whole without his background, his birthplace, forms a conversation between the reader, the author’s works and the home.

The nation has an important role when it comes to a birthplace and it value. “... to make a birthplace into a memorial of the author’s physical existence requires a substantial effort of the collective imagination” (Watson, 2006, 57). Side by side with collective imagination walks collective memory that consists of pillars that hold a nation. National literature is one of those pillars, as it is a point of remembering for all people of the same nationality. And on this ground we can say that the birthplace can be a connection between the poet and the soil of a nation. In this way an important part of a national / cultural identity is formed.

But why is a birthplace as a memorial that is as important as the author’s grave, which is a tangible signature of a writer’s presence? Because also writer’s homes can provide tangible connections “between the created and the creator” (M. Robinson and H. C. Andersen, 2002, 15) and in this way the visitor / tourist can feel different emotions and live emotional experiences. The place where the author was born can be in such a way a setting that allows the tourist to connect with the author and reinterpret his work. With the help of this connection, ordinary rooms are transformed into palaces of imagination, feelings and memories.

Another point in favour of the birthplace is the role it had in the life of a writer. As all people personalities derive in part from their roots, the birthplace can give us a glimpse on what was once part of an author. “The home of the writer provides a focus for pilgrimage, because it is assumed to have
been a central influence in the generation of the writers creative works, almost as a reflection or extension of their character” (M. Robinson and H. C. Andersen, 2002, 16). This is true especially for writers who write about their birthplace. The Slovenian poet Prešeren is one of such authors, whose writing is strongly affected by his Vrba. He writes poems about the village, which are full of emotions and nostalgia.

4 THE VILLAGE – VRBA

Vrba is a village in the northwest part of Slovenia. It used to be a relatively big village, but during the time its population has declined and now there are only a few families living there. Although it seems to be insignificant, Vrba has an important role when it comes to the Slovenian national but most of all cultural identity. In 1800 the greatest Slovenian poet was born there – France Prešeren.

There are many things that define a person, and his birthplace is definitely one of those things. Even if Prešeren spent only a short period of time in Vrba, he liked to remember it with nostalgia. He often travelled home, and often wrote about his birthplace. He wrote a sonnet entitled Vrba and also an epic poem that takes place in the surroundings of this village.

It the sonnet dedicated to his birthplace, Prešeren directly complains about the fate that took him away from his Vrba. If he had stayed in Vrba, he would have most likely inherited his father's farm, and probably married a girl from the village (Kos et al. 1999). As we know the poet’s life was most turbulent, so he connected Vrba with a better life, a life that he missed.

If we consider the geography, Vrba lies between the towns of Lesce and Žirovnica, but is accessible also from south, from a village called Breznica. Vrba is a compact village, which was built in the prehistoric times. The Slovenian historians think it is one of the oldest villages in Slovenia (Kos et al. 1999). It was first mentioned in the year 1247 in the text of the local bishop. Through time the villagers were mainly farmers and they were always ruled by different lords. Although they had to answer and work for lords, the villagers were quite inventive and never had problems with authorities. Consequently they had a good life and were able to send their sons to schools (which was quite a privilege, because the villagers from other Slovenian villages were mostly poor and could not afford schooling their children, unless the sons got a scholarship from the church – this situation lasted until the second half of the 20th century). In 1848 things only got better, because the villagers of Vrba were released from under the lords’ power, they gained their freedom.

4.1 The birthplace – the house

Prešeren's birth house is one of the oldest houses in Vrba. The original building was built in the 16th century and was mostly made of wood (Kos et al. 1999). It was renovated many times, but around 1850 it got its current appearance. In 1856 a huge fire spread through the village and many houses were destroyed. Fortunately only the outbuilding and the roof of Prešeren's house were destroyed.

From 1850 the house was owned by a family named Vovk. As the Prešeren's image in the Slovenian public grew, so did the importance of the house where he was born. In 1872 the Slovenian writers' association put a plaque on the outside wall of Prešeren's house. From then on the house became a

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4 Prešeren wrote The Baptism on the Savica in 1834. The poem of 500 verses tells the story of the clash between pagan and Christian Slovenes in the Bohinj valley in the year 772, and the defeat of the pagan rebels in the battle.
popular spot for patriotic tourists and the poet’s worshipers (Kos et al. 1999). It quickly became clear that the house needed a special status, as it was still the home of the Vovk family and a cultural and touristic site at the same time.

The question how to solve this problem became a leading theme in the intellectual circles in the thirties of the 20th century. A famous Slovenian writer Franc S. Finžgar wrote: “It is not right, that the whole Slovenian nation does not know yet, that is its duty to preserve this house as a national preciousness and transform it into a sort of Prešeren’s museum” (Finžgar 1937; cit. in Kos et al. 1999). Finžgar spoke with the Vovk family and at first they wanted to give the house to the nation and build an extension for the family. However this would be a rather expensive solution and it would also destroy the image of the house. At the end it was decided that the family would give the house to the nation, in exchange for a house that the government would build close by (Kos et al. 1999).

A special committee was formed which took care of the purchase, the reparations, the new accessories for the house and the inauguration. The committee was also in charge of raising money for the museum. The raising itself was a major step for the Slovenian people. The costs for the purchase and renovation would be too much for the government alone, so the committee was looking for other possibilities. They decided that it would be wise to include the young people who were attending schools. There were about 200,000 children and youngsters in the schools at that point. If each of them gave one dinar (din) they would gather 200,000 din, and they needed 250,000 din. The gathering of money began on the 1st of December 1937 and in the next few months the committee received 151,995 din (Kos et al. 1999).

After the house was bought, it needed some reconstructions to be done. The committee decided that the museum would not present only Prešeren but also his time. The house has an entrance hall, a bedroom, and two rooms where they worked during the day. A special spot is the old kitchen, called black kitchen, due to an open fireplace and the black walls. In other rooms we can find furniture and other accessories that are about 200 years old and also Prešeren’s cradle. Some of the objects exhibited are also from other periods of the poet’s life. There is also an exhibition of documents that presents the poet’s life and work. They were brought there after the museum was opened. Prešeren’s birth house was inaugurated on 21st May 1939. Ten years after the opening of the museum Finžar wrote: “Thousands and thousands Slovenians and fine people from other nations visited the house since it was opened. It makes us all proud as the house in which Prešeren was born and as the representative Slovenian home. At the same time it is an evidence for foreign people, that we know who we are, that we live as a cultural nation and that we want to live as such” (Finžgar 1949; cit. in Kos et al. 1999).

4.3 Questionnaire

As we tried to discover the identity of Vrba, we prepared a questionnaire for the students of the language classes at the University of Tourism Studies. We wanted to know, what was the first thing they thought about, when they heard the word Vrba. We wanted to see if the literary heritage has a meaningful effect on Vrba’s identity, the identity that is given to the village by people who do not live there. We asked the students how they would promote the literary heritage of the village. As we can see in the results listed here, most students from our group think that literary heritage is an important aspect of tourism.

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5 The dinar was the currency of the interwar Kingdom of Yugoslavia (1918–1941).
There were 62 students, so the group was too small to make any general conclusions valid for the whole Slovenian population. However, we can get an idea about the way the students, who will someday work in the tourist sphere, think about literary tourism and national / cultural heritage.

4.3.1 Question 1: What is the first thing that comes to your mind when hearing the word Vrba?

The students had four possibilities to answer this question. They could choose between literature, culture, tourism and also give other answers. 27 students which 43.55 % chose literature, 14 or 22.58 % of students chose culture, 3 or 4.84 % chose tourism and 18 or 29.03 % gave other answers.

Answers to the question: What is the first thing that comes to your mind when hearing the word Vrba?

The other answers given in the questionnaire were that the first thing they think about is a tree (vrba is also the name of a type of tree called willow in English) / that they think of a small village / they think of poetry / they think about France Prešeren / they think about the sonnet Prešeren wrote about his birthplace, which is entitled Vrba.

4.3.2 Question 2: The cultural inheritance is important for a town, because ...

The possible answers were: it is part of a country's identity / it can be a good basis for tourism / other. 45 or 72.58 % of students answered it is part of a country's identity, 16 or 25.81 % answered it can be a good basis for tourism, and the rest, which is 1 or 1.61 % gave another answer.
Answers to the question: The cultural inheritance is important for a town, because …

The one other answer was: *it is a visitor’s ticket to the town itself*, which most likely means, that without the cultural inheritance the town would not be interesting for the tourists.

4.3.3 Question 3: Do you think tourist enjoy visiting places that are related to literature?

The possible answers for this question were yes, no or other. 37 or 59.68 % of students answered yes, 19 or 30.64 % no, and 6 or 9.68 % gave another answer.

Answers to the question: Do you think tourist enjoy visiting places that are related to literature?
The 6 answers that were given by the students were: it depends on the tourists’ interests / age / it is interesting only for cultural tourists / it is part of school trips / only a minority of tourist enjoys visiting such places / only people who like to read visit such places.

4.3.4 Question 4: Have you been in Vrba?

The students had to answer the question, if they ever visited the village Vrba. 27 or 43.55 % of students have visited Prešeren’s birthplace, the rest – 35 or 56.45 % - have not been there yet at that time.

4.3.5 Question 5: Have you gone there ...

The students that answered yes to the previous question and had gone to Vrba, had to answer this question. They had three options; they either went to Vrba alone (private organization), with their school or in any other way, such as an agency or faculty etc. 5 (18.52 %) students visited the village alone, 22 (81.48 %) visited Vrba on a school trip. No student gave any other answer.

This question was also for the students that have not been in Vrba. They had to answer with yes or no or give another answer. 36 (58.06 %) students thought that, yes the people visiting such a place are interested in the author’s work afterwards, 15 (24.19 %) students did not agree with that. The rest 11 (%) chose to give another answer.

11 students gave only two different answers under the option other. The first one is that it depends on the interests of the people visiting the town, and the second is that it might happen that the visitors become interested in the books.
4.3.6 Question 6: Do you think that people who visit such places are interested in the authors work afterwards?

Answers to the question: Have you gone there …

… alone.
… on a school trip.
… other.

Answers to the question: Do you think that people who visit such places are interested in the authors work afterwards?
4.3.7 Question 7: How would you exploit the town's literary inheritance to make it grow as a tourist destination?

This last was a question of an open type. The students had to write their own answers. 6 (9.68 %) students did not answer and 3 (4.83 %) wrote that they had no idea about how to exploit the town's literary inheritance to make it grow as a tourist destination. 17 or 27.42 % of students from the group thought that publicity is the key. If we want to use the literary inheritance of a town to attract tourists, the publicity of the author, his works, and his village must be very good. It is important to let people know that something is happening in the town and that it is connected to the literature.

The answers that followed were also connected to publicity, but were more concrete suggestions about how to make the town known. 10 or 16.13 % students wrote that literary festival would be a great idea and 5 or 8.06 % thought that literary events (like poetry readings, poetry workshops, etc.) were an option. 4 or 6.45 % student thought that a way of promoting literary towns is by lowering the prices of books written by the authors connected to the towns. 2 (3.22 %) students thought that the visits of literary tourists would increase if more Slovenian books were translated in other languages. 1 (1.61 %) student wrote that a way of promoting the village Vrba is to promote the Slovenian writer’s Path, and maybe promote other similar paths. Another student suggested that more films about the author should be made.

5 students thought that there should be more museums about the author’s life, time, and work. Other 5 students wrote that the schools should include more trips and other events connected to the national literary heritage in their program. 2 students wrote that there should be more investments made in literary tourism. And 1 student thought that the literary destination should be connected to other non-literary attractions that would attract the visitor.
5 CONCLUSIONS

Prešeren to us Slovenians is as Shakespeare is to Great Britain. Most poems that Prešeren wrote are gathered in the book entitled Poems (1847). His poems gave new perspective to other Slovenian poets that followed. Prešeren brought the Slovenian language to a new cultural level. His verses are very emotive, sensitive and original. He also had a strong sense of patriotism, as he showed in some of his poems, one of them being the Slovenian anthem Zdravljica (A Toast).

Prešeren is not just a poet for the Slovenians. He is a symbol of Slovenian cultural life. Professors lecture about him in elementary and high schools and also at some faculties. A feature film about his life was also made.

In Slovenia we also celebrate the so called “Prešeren’s day” on 8th February. This is the day on which Prešeren died. Today this is a holiday and a day dedicated to culture. Part of this celebration are also the Prešeren prizes that are awarded to the most prominent poets, writers and other artists.

After Prešeren died he was forgotten for about two decades. Then a poet named Josip Stritar edited the first reprint of Prešeren’s poems. That is when Prešeren surfaced again and became a strong symbol of Slovenian art, literature, language and culture. As such he contributed to the development of the Slovenian nation as we know it today.

As we can see Prešeren is not just a Slovenian poet, he is the Poet that represents the Slovenian national identity, pride and heritage. That is way his birthplace is an important part of our cultural life, starting with schools. Based on the importance and the emotional connection Slovenian people have with the poet, the house in which he was born was transformed into a museum, but not a classical one. In the museum the realistic style prevails. As Robinson and Andersen say it is a “lived-in” setting. So the house of Prešeren’s family looks like it did when the original family was still there. All the furniture is still in the same place, even the 200 years old cradle in which Prešeren slept as a baby. In this way the visitor can feel a stronger connection with the author, with the touch of romance and history.

From the results of our questionnaire, we can sum up, that the students from our group are aware of the importance of Prešeren, his birthplace. Even those students that are not interested in literature or even do not like literature are aware of the value of Prešeren’s legacy. They are also aware that Vrba is a sort of a place of pilgrimage, even if they did not point it out explicitly. The students also concluded that such a heritage, with strong symbolic value, can be very useful for tourism, not only national but also for foreigners. Prešeren is a part of Slovenia and if you want to know the country, you have to know its cultural identity.

As the students pointed out the publicity is of high importance, if we want to attract visitors to a place connected with literature. However, Vrba has enough publicity if we consider that all schools take their students to see the village and the museum, and that all students learn about Prešeren at some point. The bigger question is how to attract foreign visitors. The students gave some very interesting propositions, like literary festivals (which was very successful in Shakespeare’s case), other literary events (like poetry readings, poetry workshops, etc.), translating literary works into other languages, lowering the prices of the books. They also emphasised that investments are crucial for the development of a literary destination. Although the cultural programs in Slovenia can apply for different sponsorships form the ministry of culture, money is still a problem and is holding back the possible development. More investments would be also useful for the promotion of the village and the museum.
Therefore, even if the resources for development are lacking, Vrba as a village went a great and long way, since the time before Prešeren was born. At the beginning of the 19th century in the time of Napoleon’s wars it was a small but rich village. At first the farmers were serving the Austrian lords that controlled that part of Europe, but with the reign of Maria Theresa the farmers were freed, which meant that they had free hands to work only for themselves. The village prospered. Then, at the beginning of the 20th century the museum was opened. Consequently Vrba became a village visited by thousands of people every year. If we consider that every elementary school brings its students to Vrba at least once a year than we can imagine how many people visit Vrba. This also means that through the years the infrastructure of the village had to change, and it did in such way that the local people could get the most from the visits of tourists and other visitors. In the vicinity of Prešeren’s birthplace there are three hotels and one spa centre now. There are also at least six guesthouses and bars. An important economical asset is also the museum’s shop.

In addition to the museum there are also many different literary and cultural events in Vrba, especially around the time of Prešeren’s birthday and the day on which he died. For example, various Slovenian and foreign writers and poets are invited to present their works or to read Prešeren’s poetry. Another thing that is interesting and attracts many tourists is the Path of cultural heritage. Hundreds of people walk this Path every year. It leads you to the birthplaces and memorials of many Slovenian artists, writers, poets. One of the villages you go thorough is also Vrba.

To conclude we can say, that Prešeren’s birthplace became an attraction after the poet, twenty years after he died, gained his reputation as a national symbol. Today Prešeren is the greatest element of Slovenian culture. So tourists visit Vrba because they are looking for reminiscences of nationalism, cultural engagement and enlightenment.

On the bases of this case we think that the tourism sphere should research more the possibilities of literary tourism and use the literary heritage of a nation to attract visitors, and thus increase the income from tourist sources. Not only would the tourist sector profit from this, but also the national economy in general.

REFERENCES


EFFICIENCY OF INVESTIGATION OF SCIENCE GROUPS WITH SPECIALISTS,

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Abstract

A growth of modern science technologies requires attraction of specialists which have knowledge in different science areas. During 15 years the Laboratory of Laser Information System (LLIS) based on N.E. Bauman Moscow State Technical University uses these principles of forming science groups consisting of specialists, PhD students and students with different specialization. Such way to form a science group allows obtaining new results, technologies and knowledge in adjacent science areas. Due to these principles the development of new methods of investigation is more effective than standard way of staff choice. Thus people from different science areas will sum their knowledge. In this article we will present some results of a project which requires knowledge in the following areas: laser location, neural networks, correlation functions of light irradiation, quantum effects of irradiation registration, optimization methods, solution of non-correct tasks and other knowledge which allow to create new investigation methods of small-sized objects at long distances.

Key words: Scientific work group; Original solution; Combine specialization

1. INTRODUCTION

At this moment it is known a lot of operative methods of “how to solve a task fast”. The known operative methods are “Brain storm”, “The double team-ideation method”, “Fishbone” and other. These methods are based on creativity of members who solve the task. These methods are also based on the work of psychologist who decreases inertia in thinking and enhances a creative imagination. If investigation is stopped a science group can use the operative methods also they are applicable on some steps of the project, but unfortunately a science group is needed to complete a project.

In this article we will talk about how to form a science group and solve a task efficiently. It is significant to note, that it’s prohibited to exclude the possibilities of operative methods on some steps of the projects.

2. FORMING SCIENCE GROUP – MAIN IDEAS

It’s well known that successful research and scientific work is determined not only by creativity of researchers who are working together at the project but also by a broad-minded person, the possibility to create a new idea and hypothesis, experience in a practical work and absence of that experience too. The principles of working group forming appear to be not so difficult in theory but very complicated in practice. So, we have formulated some principles which would help to form a group able to solve difficult scientific task:
The first principle is evident but not so important – work group should be created for implementation of one project which has the main aim and long term plan of innovative work;

The second principle is important and indispensable condition – the level and experience of the main specialists should correspond with difficulty level of the task. Also specialists should have knowledge which corresponds to the main aim of the project;

The third principle is the most important – all members of the group must be interested in successful implementation of the project. This interest should have cognitive but not only financial character.

The group consists of students and PhD students whom we will call junior members and experienced specialists (e.g. PhD) whom we will call senior members. Certainly, supervisor should control activity of the group members and especially junior members. It’s important to direct them and to stop their activity if they have begun to work in non-effective direction. At the beginning of the project, supervisor should pay a lot of attention for interaction between junior members and senior members. It means that supervisor distributes the main task of the project among the members thereby everybody know his own task. If group was recently formed the supervisor must control relations between members of this group to suppress some timidity and to help in solving some non-understandable questions. Also at the initial step of project implementation supervisor should permanently interact with junior members because sometimes it allows obtaining original ideas which can seem not so clever at the first sight of the group members’ majority.

Members of the group which have science degree and more experienced in science research should distribute tasks among junior members and supervise their works. Supervisor can perform the task distribution himself.

During work at the project the senior members will interact together to find a reasonable solution of projects’ tasks.

3. RESULTS OF SCIENCE ACTIVITY AND ENGINEERING

This approach to group creation brings a good result in development of new technologies and allows receiving new knowledge in adjacent science areas. Thereby, we have created and checked in experiments these new methods:

- Object recognition by range image;
- Reconstruction of object’s surface at multi position registration of range image;
- Reconstruction of small-sized object’s surface by usage of the scattered light field correlation function parameters (this method applicable when the size of object is out of optical resolution);
- Generation and registration of short irradiation pulses and investigation of specific properties of generated irradiation in laser resonator with laser diodes pumping of active elements;
- High-precision distance measurement methods which consider small intensity scattered light field registration quantum nature.

Below we will present some results which were obtained by group of students, PhD students, engineers, and doctor of science. These results prove the efficiency of group organized from
specialists and students with different specialization. The full description of obtained results is out of scope of this article. We would like to concentrate your attention at the main results we have obtained.

4. THE MAIN RESULTS WHICH HAVE BEEN OBTAINED BY SEVERAL DIFFERENT SCIENTIFIC GROUPS

4.1. Object recognition by its range image

It is necessary to estimate an overall dimension for solving tasks of remote small object’s identification. Suppose, the object which has a surface $\Omega$ will be observed in a left Cartesian coordinates (CC) – $XOYZ$. Axis $OZ$ has the same direction as a vector of observation $V$; point $O$ is coinciding with a center of location system transceiver. A set of overall dimensions $x_{\text{max}}$, $y_{\text{max}}$, $z_{\text{max}}$ of observed part of surface $\Omega_v$ which is observed in the direction $V$ and can be used for objects identification or in some other cases to determine a spatial orientation of object with respect to CC of observation.

Pulses of laser irradiation $P(t)$ are used in case of object position determination. If pulse duration is comparable with propagation time of plane wave along the surface $\Omega$, then information about magnitude $z_{\text{max}}$ can be taken from analysis of pulse shape scattered by $\Omega_v$. The pulse shape can be registered by wideband photodetector in the vicinity of a point $O$: 

$$I(t, \alpha, \beta) = P(t) \otimes A(t) \otimes g(t, \alpha, \beta) \otimes A(t),$$

where $I(t, \alpha, \beta)$ – intensity of detected irradiation, $\alpha$ and $\beta$ – angles which indicate orientation of the object in CC of observation, $A(t)$ – atmospheric channel pulse characteristic, and $g(t, \alpha, \beta)$ – object scattering pulse characteristic. A signal $U(t)$ on the output of photodetector (photodetector and amplifier were wideband) is determined by the following equation:

$$U(t) = A_0 \cdot I(t, \alpha, \beta)|_{\alpha, \beta} \otimes u(t),$$

where $A_0$ – proportional coefficient, $u(t)$ – pulse characteristic of photodetector.

Integral transformation $U(t)$ is used to design systems of the informative attributes which allow to solve a task of automatic recognition of $N$ objects with known $\Omega_1, \Omega_2, ..., \Omega_N$, where $N >> 2$ as it was shown in the works [1 – 6]. The recognition can be performed in a case when the main characteristics of scattering of individual areas of surface $\Omega$ will not lead to the loss of individual properties of $U(t)$.

Practical realization of neural network optimum configuration finding procedures and its training requires considerable computing resources. Thus, time required for single neural network training on modern PC can take hundreds hours. Alternative decision is to use distributed computing environment for neural network training. It can be built of several PCs, connected via local area network. Efficiency analysis showed that optimum PC number, which provides high performance, is determined by training attribute vectors number, each PC performance and communication channel characteristics.
Distributed computer environment was built on Ethernet technology. We used 1…5 nodes to implement neural network training algorithm and several nodes for statistical modeling working in parallel. Experimentally shown, that one iteration run time was decreased in several times. Distributed computing environment is indispensable when statistical modeling of recognition process is used for neural network training state parameters estimation.

In spite of the theoretical proof of range image object recognition was obtained sufficiently quickly, the necessary power of staff was spent to check it experimentally. One of the serious problems we met was in generation and registration of a short pulse (pulse duration time less than 5 ns) of laser irradiation (fig. 1). Special equipment was developed to solve this problem.

![Figure 1. Semiconductor laser radiation pulses: pulse for standard generation regime of semiconductor laser (a); radiation pulse of this laser at ultra-short pumping current pulse (b)](image_url)

Usage of known physical effect - avalanche breakdown delay in semiconductor - permits to generate pumping current pulses through matrix semiconductor laser with duration less than 5 ns and current amplitude of more than 120 A with frequency more than 1 kHz. Such huge amplitude of current requires taking special measures for compensation of noise which appears in circuits of photodetector.
The noise level was decreased in about ten times due to the reciprocal compensation of magnetic fields in the discharge circuit of modulator. Additional noise compensation method is based on the registration of output PD signal with opened (fig. 2b) and closed (fig. 2a) shutter.

Figure 2. Pulsed magnetic noise compensation: opened shutter (a); closed shutter (b); signals subtraction result (c); resulting signal (d)
We have obtained a spatial orientation recognition system of the test object (diffuse scattering cone with height 0,9 m – fig. 3) with respect to optical axis with step of 10 degrees.

Figure 3. Investigated object – the diffuse scattering cone

It is worth noting, that training of neural network which have been used as a classifier was performed on a model realization of signal (fig. 4). Thus the suggested method of object’s recognition and the mathematical model adequacy were confirmed.

Figure 4. Theoretically calculated range images for uniform (a) and non-uniform (b) object’s surface radiation.

This research has required integrating knowledge and experience of members in different areas of science. It’s present in the table 1.
Table 1 – Recognition object by range image

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Participation</th>
<th>Original solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio physicist</td>
<td>Obtains representative stable intensity counts realization of pulse irradiation scattered by object</td>
<td>Method of compensation of laser modulator magnetic field influence to a photodetector</td>
</tr>
<tr>
<td>Radio engineer</td>
<td>Idea and implementation of location system in the whole</td>
<td>Method of large vision field implementation for receiving optical system. Neural network method for signal processing</td>
</tr>
<tr>
<td>Physicist</td>
<td>Generation of high-current pumping pulses for high-power laser based on laser diode bars</td>
<td>Design of high-voltage modulator providing reciprocal compensation of magnetic fields in high-current circuits</td>
</tr>
<tr>
<td>IT specialist</td>
<td>Implementation of distributed computed environment</td>
<td>Optimal computer amount determination criterion to decrease duration of neural network training</td>
</tr>
</tbody>
</table>

4.2. *Reconstruction of objects’ surface by multi position registration of range image*

Multi position registration of range image (RI) allows getting information about the shape of the object surface. There are two cases of RI registration. In the first case, different photodetectors (PD) in a matrix register light irradiation which scattered from the different parts of the object surface. In the second case, one PD registers a light irradiation which scattered from the whole object [6]. Registering a lot of RI of an object at different spatial orientation by PD matrix looks like making photo of an object. This method has the same disadvantages as a photo registration: a distance between object and registration system is decreased because of low signal energy on a PD of matrix: all signal energy is distributed among all PDs of matrix. Besides, RIs are not invariant to object's rotation relative to vector V. In this case the signal/noise ratio for any PD is significantly greater than for CCD matrix. For every element of PD matrix with Cartesian coordinates \((i \Delta x, j \Delta y)\) of observation different power and non-power estimations of parameters \(U_{i,j}(t, \alpha, \beta)\) can be built.

However, RI depends on orientation of object (angles \(\alpha\) and \(\beta\) ) with respect to location system and so realization of optimal procedures to estimate parameter of signal in every channel of PD matrix is difficult and ineffective.

Alternative procedures for presentation of irradiated object's surface geometry and obtained image can be a combination of different heuristic signal processing algorithms with adaptation parameters. It is more informative to use this method.
Figure 5. Images of aircraft surface

The images are presented in figure 5 was built in a result of multi position registration of RI with high spatial resolution and additive Gaussian noise.

Development of this method and its testing require knowledge of specialists in four different areas of science. In table 2 is presented all specialists of all qualification who worked at this project. Original solutions appeared during work in discussions of experimental results.

Table 2. Multi position registration of RI

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Participation</th>
<th>Original solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio engineer</td>
<td>Location model development</td>
<td>Method of RI analysis at multi position registration</td>
</tr>
<tr>
<td>Mathematician</td>
<td>Fast algorithms of location volume visualization development</td>
<td>Continuous method to obtain numerical solution of location volume</td>
</tr>
<tr>
<td>Physicist</td>
<td>The idea to combine method of single position registration of RI and method of building image of location volume</td>
<td>Advantages of located object image prevail above the problem of rising noise in every element of resolution</td>
</tr>
<tr>
<td>Optician</td>
<td>Multi position registration of RI method realization</td>
<td>Application of fiber-optic system for unification of PD elements</td>
</tr>
</tbody>
</table>

4.3. Small-sized objects’ surface reconstruction using parameters of scattered light field correlation function when object size is out of optical resolution

It is easy to determine object’s overall dimensions $x_{\text{max}}$, $y_{\text{max}}$ when its image can be reconstructed. If object’s size is out of optical resolution then image registration is impossible, but system of parameters of the fourth order correlation function of scattered irradiation field allows solving this task. If the field of intensities is homogeneous and random then immediate estimation of CF can be obtained by calculation of spatial convolve of intensities [7, 8]:
\[
\hat{F}^{(2,2)}_{S} (\delta r, \tau) = \frac{1}{S} \int I(r, t) \cdot I(r + \delta r, t + \tau) d\tau,
\]
where \( S \) – square of flat surface in observation range where intensity of scattered irradiation is registered, \( I(r, t) \) - intensity function, where \( r \) – radius-vector determining a position of point on a surface limited by \( S \), \( t \) – time. If a distance \( R \) to object is large (\( R^2 >> S \) and \( S \perp \overline{n}_z \)) then for flat object \( \tau \approx 0 \). The following expression can be used for an axisymmetric object:

\[
\hat{F}^{(2,2)}_{L} (\delta r, \tau) = \frac{1}{L} \int I(\overline{r}, t) \cdot I(\overline{r} + \delta \overline{r}, t + \tau) d\tau,
\]
where \( L \) – randomly selected segment on a surface \( S : (\overline{r}, \delta \overline{r}) \in L \).

Estimation \( \rho_0 \) of the first zero of CF \( \Gamma^{(2,2)}_{1,2} (\delta r) \) is connected with angular size of object \( \gamma \), which allows determining a maximum linear size of cross line of object \( l_{\max} = \gamma R \) at unknown distance \( R \) to one. Keeping in mind a small error of estimation it can be obtained \( x_{\max} = \gamma_x R \) and \( y_{\max} = \gamma_y R \) previously finding magnitude \( \gamma_x \) and \( \gamma_y \) [6] for two types of \( L \) orientation: 1) \( L \parallel \overline{n}_x \); 2) \( L \parallel \overline{n}_y \) at location of an object without axis symmetry. Note that system of \( \gamma \) estimations, obtained for different orientations of \( L \), makes possible the reconstruction of a contour \( L_\gamma \) of projection \( \Omega_\gamma \) onto the plane \( XOY \). The family of calculated estimations of 2\(^{nd} \) order complex correlation function allows reconstructing the surface contour of the observed object, which could not be obtained from image by the optical facilities.

The system of angular dimension estimations \( \xi(\varphi_j) \), where \( j = 1, 2, \ldots, n \), allows [7] to obtain model of contour which is convex figure with \( 2n \) edges (fig. 6) that can be used for automatic classification of objects.

Model contour coincides with contour \( \Omega \) when \( \Omega \) is circle or ellipse. When contour \( \Omega \) is convex-concave the contour model is substantially distinguished from the original. It’s important, that orientation of \( \Omega \) in system XOY (fig. 7) can be detected (with some restriction which is determined by symmetry of \( \Omega \)).
Figure 6. Object contour shape determination

Figure 7. Results of the plane objects contour reconstruction by the set of angular overall dimensions estimations
Table 3. Plane objects’ contour reconstruction.

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Participation</th>
<th>Original solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio engineer</td>
<td>Determination of 4th order CF parameters of scattered light from counts of intensities field by spatial convolve calculation</td>
<td>Cumulants of CF calculation algorithm providing requirements for minimal necessary amount of counts of intensities field</td>
</tr>
<tr>
<td>Physicist</td>
<td>Development of method for CF of 4th order parameters analysis by the restricted number of intensity field realizations</td>
<td>Extrapolation of method of angular dimensions of lighted objects at the laser location area</td>
</tr>
<tr>
<td>System Engineer</td>
<td>Hardware system realization for radiation field counts of intensity registration</td>
<td>Thermal stabilization of photosensitive elements to provide high-repeatable results</td>
</tr>
</tbody>
</table>

4.4. Statistics of photo counts analysis providing determination of angular dimensions of objects at maximum possible distance from the laser location system

In case of object location which is at hundreds kilometers from laser location system, scattered field intensity in optical detectors area is low. Radiation influence on photo detector result is current pulses forming at the output, which can be considered to be separate equivalent occurrences – photocounts. Photocounts registration in time period $T$ probability distribution law $P_s(n,T)$ depends on dimensions of object surface part which has been irradiated. Scattered intensity field number of degrees of freedom $M$ to a first approximation counted as quotient of coherent radiation area in detector aperture area $S_c$ to this detector area $S_b$:

$$M = S_c/S_b$$

For the most of real object’s surface scattered radiation obey the Lambert law, therefore

$$S_c \sim \frac{\lambda^2 R^2}{S_\Omega},$$

where $S_\Omega$ is $\Omega$ objects surface projection area on a perpendicular to vector of observations plane. Photocounts $\langle n_{ch} \rangle$ depend on background radiation on photodetector effect. Photocounts $\langle n_{ch} \rangle$ depend on objects surface scattered radiation on photodetector effect. If average counts $\langle n \rangle$ are less than average of photocounts $\langle n_{ch} \rangle$, then

$$P(n,T) = \frac{\Gamma(n+M)}{n!\Gamma(M)} \left(1 + \frac{M}{\langle n \rangle}\right)^{-n} \left(1 + \frac{\langle n \rangle}{M}\right)^{-M}$$

To determine a kind of distribution $P(n,T)$ and scattered field radiation number of degrees of freedom estimation $M$ on the basis of experimental observations, we must ascertain time interval start $T$ in which we register scattered pulse. If object location conditions are known, one can find radiation scatter type of object, which overall dimensions are known to, by obtained $M$ value. One also can get
diffusing disk (flat model $\Omega$) radius $r_l$ estimation, for which radiation scattered field statistic characteristics are equivalent to radiation field characteristics diffused by $\Omega$ by the same $M$ value. We must provide experimental photocount samples representativeness to determine $M$ value correctly. Necessary number of location cycles is determined from radiation propagation conditions [9] and required errors of object dimensions estimation.

Experiments being carried out proved the method efficiency. Radiation passed through rotating matted disk and replacement aperture with known diameter was detected by a photomultiplier tube. Fast AD converter and PC connected with it provided signal amplitude counts estimation, which are proportional to photocounts number, registered in observation time interval $T$. After signal amplitude counts estimations passed statistical processing, registered photocounts distribution was calculated and radiation field number of degrees of freedom was determined. Obtained number of degrees of freedom corresponds to object physical model dimensions.

<table>
<thead>
<tr>
<th>Specialty</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Radio engineer</td>
<td>Mathematical models of signal registration, estimation of degree of freedom for registered irradiation field. Modeling of object surface shape</td>
<td>Combination of principles for accumulation of signal count and temporal-interval encryption</td>
</tr>
<tr>
<td>Mathematician</td>
<td>Development of the model for photocounts registration</td>
<td>Recursive algorithm for calculation photocounts realization</td>
</tr>
<tr>
<td>Radio engineer</td>
<td>Hardware implementation for registration and accumulation of photocounts</td>
<td>Algorithm and circuit of pipeline convolver to provide the calculation of samples of signal convolution with sampling interval time of 10 ns in real time</td>
</tr>
</tbody>
</table>

4.5. Reconstruction of distant object’s contour using a set of the 6th order CF parameters of scattered field of laser irradiation

Relationship between functions of radiation intensity $I_\Omega(r_{\Omega})$ ($r_{\Omega} \in \Omega$) on object’s surface $\Omega$ and reciprocal intensity in area of observation is set by Van Cittert-Zernike theorem [1]. The method which is based on this relationship uses correlation of intensity of the radiation. It has been offered by Hanbury Brown and Twiss [2]. This method is used for high-precision estimation of angular sizes of lighting astronomical objects. The main limitation of this method is necessity of radiation registering during long time interval so it is not applicable for pulse location.

In summary case the reconstructed $L_\Omega$ contour does not show features of surface of location object. Nevertheless, in summary case the reconstructed contour is not show feature of surface of location object [10]. Rather, accuracy reconstruction $L_\Omega$ can be obtained as a result of usage estimation of CF of 6th order of contour of intensities field [11].
Table 4. Reconstruction of distant objects’ contours using a set of the 6th order CF parameters of radiation scattered by object.

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Participation</th>
<th>Original solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicist</td>
<td>Theory and physical model which describe a relationship between parameters of 6th order CF counts and objects’ surface parameters</td>
<td>Objects’ position location using 6th order CF counts of scattered radiation field</td>
</tr>
<tr>
<td>Radio engineer</td>
<td>Creation of the physical model. Mathematical model of registering the signal. Technique of registration and processing of counts of registered intensity field</td>
<td>Application of gapless reducer gear with aliquant ratio for physical model</td>
</tr>
<tr>
<td>Radio engineer</td>
<td>Conditions substantiation for application of the method of spatial convolve to obtain counts of 6th order CF of scattered radiation</td>
<td>The method and equipment for registration of slowly changing parameters of a field of the probe laser radiation, which are necessary for measurements of results with high repeatability.</td>
</tr>
<tr>
<td>Physicist</td>
<td>Modification of objects’ physical model using electrically controlled spatial light phase modulator</td>
<td>Spatial light phase modulator with non-equidistant gap and filled with anisotropic liquid for light phase control</td>
</tr>
</tbody>
</table>

The leading role of specialists – radio engineers is based on powerful educational base which has been established at Bauman Moscow State Technical University in 1970 – 1980. Certainly those specialists who have knowledge of physics and mathematics have advantage because they can formalize a difficult task and also have a wide scope in science.

5. CONCLUSION

To conclude we summarize a process of a group forming. The flow-chart of communication and segregation of duties between group members is shown on the figure 8.

Supervisor defines a problem, divides it into global tasks and distributes them among experienced members. Problem in the whole and how group members are to start solving the raised tasks should be discussed at the beginning of project. All members can take a part in this discussion because sometimes in this period an original idea can be appeared. After the distribution of tasks among experienced members they should divide and distribute these tasks among junior members such way that they can solve it. Results obtained during project implementation should be discussed by supervisor with junior members and one of the experienced members.

Laboratory of Laser Information Systems, which was founded in N.E. Bauman Moscow State Technical University, uses these principles of science groups forming for specialists, PhD students and students with different specialization during last 15 years. The results obtained by research group allow talking about complete approval of some principles of science groups forming.
Consolidation of achievements and traditions allow to present original ideas and their successful implementations in practical applications. Junior members wish to increase their experience in science area. Combining these wishes with experience of specialists gives results from different points of view. From the point of view of receiving knowledge it allows to increase experience of junior members and will increase their speed of tasks solving in the future. Also it will allow preparing new staff for science laboratory.

Certainly it is not possible to form a set of successful science results which will predict work efficiency. Experience of our research work allows to suggest principles described above to form a science groups.

ACKNOWLEDGEMENTS:
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DEVELOPMENT OF AN INTERNATIONAL WEB PORTAL EDUCATIONAL, SCIENTIFIC-TECHNICAL RESOURCES AND PROGRAMS

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Abstract

In this article we will describe the development of a Web portal, where will be the project tasks.

The project aim - to pool resources for collaborative problem solving in scientific, technical and educational activities and also organization of joint participation in educational and scientific-technical programs, which funded by the EU. To achieve this we should perform several tasks:

- to analyze this domain;
- to build a functional diagram, which shows the architecture of future systems;
- to develop a module for organization of the system (publication and order processing, portfolio and etc.);
- to develop a database system;
- to develop a Web-based interface.

Key words: education, resources, educational resources, higher education institutions.

Today, there are projects in which the functions are implemented by the announcement of the development of any project, and someone takes on this order, there by fulfilling a remote job. Such people are called "freelancers".

Diagram of a freelancer is fairly simple: to find the customer, to negotiate and than to take orders, order execution, delivery of completed work. However, everything not all as easy as it might seem at first glance. Customer scrupulous in choosing the performer, showing rather strong demands for such an employee. Usually the greatest numbers of orders have the most experienced freelancers, who have a rich portfolio. Others wait for a situation when all experienced competitors will be busy and finally thy will take order. Beginners often take orders for very disadvantageous conditions, while the customer is taking a risk by hiring an inexperienced freelancer too.

The most important thing is planning a working time. All the operating conditions must satisfy the customers and at the same time be comfortable for the performers. Today there are many exchanges and areas, where work freelances.

The difference of this project is that as a freelancer will be not one person, it will be universities, which participating in the project.

Here a staff of stakeholders: universities of Russia, automobile factories and abroad universities. In figure 1 we can find a scheme of stakeholder.
Fig. 1. Project participants

Among the participants are:
- engineering and technical educational institutions of the Volga region of Russia;
- technical universities in Europe;
- Environment:
  - international programs and funds;
- automobile plants of the Volga region of Russia – “KAMAZ”, Sollers, "VAZ" and etc.;
- automobile plants in Europe.

Joint educational programs can also be represented in a diagram:
Fig. 2. Join training programs

Development of Web-Portal will be using by content management system CMS Joomla. It provides a standard set of developer when creating the site. Already included the possibility of user registration, authentication; has its own administration panel for site management, creating materials, articles, news, updates and additions. This engine has a modular structure; all extensions are installed as software on computer. Selecting software for development project is justified based on the following criteria:

The software is free:

- Has a number of tools which protect the site (both: standard and external);
- A very simple structure, which clear for anyone;
- CMS Joomla today is the most popular content management system;
- The engine is completely localized for Russia and has many Russian-speaking groups, which transfer modules, components and other extensions;
- Very strong support for users and a large number of extensions.

System architecture can be represented in a diagram in Figure 3.

![Diagram of system architecture](image)

**Fig.3.** Architecture of the system.
With the red color marked the standard modules and components, with the green - being developed modules and components, and with the blue - design portal.

When you develop a project, it is important to highlight attention to building functional scheme, which shows the main functions performed by the portal as the client-side, and for the part of the site administrator. Block diagram of the functional model shown in Figure 4.

Fig.4. Functional model

Approximate structure of the site design should include three columns (left, center, right), the upper part for the header and menu and the bottom part for the banner ads and counters. The layout of modules on the site can be represented as in Figure 5.
Fig.5. Arrangement of the modules

1 - View the site here and the navigation window;
2 - Crown of the site, there will be the main logo and cap design;
3 - Site search module (general search)
4 - Location counter for website optimization;
5 - Main site location of the material site, located here and the current orders, and projects, and jobs;
6 - Authorization for a user is required to enter his office;
7 - The left column, there can settle any modules or links;
8 - Place the withdrawal of participants among institutions;
9 - Place of output among the participants of plants;
10 - The right column of the site required for the withdrawal of additional extensions, such as voting;
11 - Location for additional menu or banner ads.

In conclusion in this article would like to note that because of so many "respectable" members, this project can further development. The essence of his work to help businesses and factories to solve the kinds of projects, either already proposed to introduce institutions. Another indicator of the project is the exchange of knowledge between foreign universities and Russian universities.
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CHALLENGES FOR INTERACTION IN THE CLASSROOM: THE ROLE OF PERSONAL CHARACTERISTICS OF TEACHER
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Abstract
Nowadays the meaning of school education is increasingly tied to need it to support and stimulate the construction of motivational sphere, promoting free expression, autonomy and self inside person students. The role of educators is linked primarily to the creation of favourable conditions for direct involvement of students in the process of their own development, in maintaining their confidence in their own ability and desire to self-realization. In this sense, need substantial change in the attitudes of teachers, which consequently will reflect on how the performance of their professional role. This change is connected with overcoming the mandatory approaches to verbal moralizing and referral to personal-oriented socializing influences.

Key words: education, educational environment, personality, pedagogical interactions, educational strategies

A trend in contemporary society determines the need to seriously transform our conceptual reflection on the meaning of education, and its specific content and technological dimensions. In the context of the ideas of constructivism, identifies new priority areas and their optimal implementation involves primarily the application of interactive teaching approaches.

Interactivity in teaching and education has proven effective in the world teaching practice. Pedagogy of interaction has a tradition of world educational space, while the Bulgarian pedagogical situation it is new. After decades of authoritarian pedagogy, in recent years of transition in our country are emerging trends to move towards the so called free education or pedagogy of the interaction.

Farewell to the imperative pedagogy as a reality, however, proved quite difficult. On an individual level, perceptions of teachers for training and education of children and adolescents are still largely tied to emotional pressure, coercion and precepts. When we think of education thinking is directed mostly to disciplining children, which is very wrong.

Linking education and training in discipline and obedience to the precepts, commandments and imperatives makes it inefficient and strongly confirms the presence of elements of violence. Even should be clearly identified as such. Today's children need a new type of approach for teachers to them. They yearn for new ways of talking and perception of others. These expectations are still not able to respond adequately and with the necessary professionalism. Because professionalism in the pedagogical activity is closely tied to understanding the true nature of man and liberty of thought from harmful communication clichés ,obtrusiveness, bias, prejudice, etc., which invariably impact on the performance of the professional role of educators.
In educational theory in the last two decades mass influx theoretical, terms and models that are not always sufficiently considered and consistent with our socio-cultural context, even with the common view among traditional concepts, values and practices. If you really want to improve the quality of the educational process in school is necessary to abandon the mechanical transfer of declaration that is too typical of recent educational developments and to focus on the real problems on their clarification and remedy. Adequate vision of education invariably is accompanied by the presence of conceptual clarity in relation to the processes of education and training as major components of the pedagogical process, the dynamic and permanent reflection of changes in real-life reality and updating the theoretical and practical strategies in teaching activities.

This paper will focus attention on some challenges to the use of interactive approaches in the Bulgarian school, which at this stage are actually the most problematic areas. One major problem, determining the adequacy of scientific reasoning is related to theoretical clarification of the term "interactivity." Interaction, i.e. interaction term introduced in science from representatives of interactional approach (J. Meade, D. Rose, R. Hill, D. Hanson, S. Striker) in the analysis of interpersonal communication and personal development. Men of interaction accept that interpersonal interactions are a major factor for the development of social experience and development of self-concept (Popova, 2000:27). Symbolic interactions' emphasizes the role of symbolic communication in which the individual realizes the importance of their own behaviour taking place at the other and thus may provide the result of their gesture for him / Dzhonev, 1996:97. Attention of researchers explored the role of signs and symbols in interpersonal interaction. The meaning of social objects do not exist in themselves, and are generated by social interactions / Encyclopedia of Psychology, 1998:1105. That is why the emphasis is on interaction through which individuals get to know yourself and others.

It is however clear that the interaction is not identical to the relationship. Interpersonal relationships refer to the willingness of subjects to a particular type of interaction. On the one hand, they significantly affect the process of communication, on the other - they are the result of his conduct. Experiences that arise in the process of interaction may stabilize, but to destabilize and destroy interpersonal relationships / Sermyagina, 1991:13-23.

When I reflect on the question of interaction and interactivity in the teaching process is necessary to overcome the presence of a certain ambiguity in the use of these concepts, differentiate between two types of communication - interpersonal communication (face in face) and computer-mediated communication. According to Jennifer Stromer-Galey concept of "interactivity" is not sufficiently clear because it refers to different phenomena. You can identify "interactions" between people, between people via computers or networks, between people and computers, between computers through software, hardware and networks. The author stresses that there is a significant difference between "interactive" face in face and "interactivity" between people, mediated by computers and networks (Stromer-Galey, 2004:391-394). Rafaeli believes that interactivity is intrinsic property communication face to face, but can also apply to mediated interactions between people (Rafaeli, 1988:110).

Indeed, in the scientific literature interactivity is perceived and interpreted differently, but clarification of the conceptual context is essential to achieve the accuracy and clarity of scientific analysis. In the search for effective solutions to optimize the educational process in modern Bulgarian school is necessary to place appropriate emphasis in the creation of adequate environment for the development of various aspects of interactivity.

Here we focus on interpersonal communication face to face, as computer mediated communication is determined by very specific factors in this study is not the subject of my research interest.
This study focuses on human communication in the teaching process, because in fact his role as to encourage and support the personal development of adolescents and for the successful operation of the classroom is a basic, regardless of trends in the increasingly intensive integration of multimedia computer technology in education.

A key factor in interactive pedagogy is the personality of the teacher, however trivial it may sound. As Ron Miller notes exactly, education is meeting human and not exercise control. „The reason for my focus in the study is that ultimately the position of the adolescent young man, his relationship with the teacher is the most important aspects of the educational process. Everything else - curriculum, programs, technology, computers, interactive multimedia, etc. are only intermediaries in this regard. The quality of interactive training is based mostly on the possibility of optimal implementation of bilateralism in communication face to face.

Teaching situation in our country is characterized by the expression of various risks and difficulties to overcome that much of the responsible factors are not relevant mode of coping. Yet the perceptions of educators are largely burdened by old stereotypes and mental schemes defining specificity in the performance of their professional duties. Some of them are oriented to the nostalgic past, the imperative pedagogy. Realities of everyday life, however prominence to problems whose solution can not effectively take place within such thought patterns as a basis for constructing a truly effective pedagogical strategies and approaches.

Nowadays the meaning of school education is increasingly tied to need it to support and stimulate the construction of motivational sphere, promoting free expression, autonomy and self inside person students. The role of educators is linked primarily to the creation of favourable conditions for direct involvement of students in the process of their own development, in maintaining their confidence in their own ability and desire to self-realization. In this sense, need substantial change in the attitudes of teachers, which consequently will reflect on how the performance of their professional role. This change is connected with overcoming the mandatory approaches to verbal moralizing and referral to personal-oriented socializing influences.

Pedagogical interactions include mutual exchange of information, ideas, thoughts, experiences and values that regulate a variety of socio-cultural, ethnic and religious norms and rules, to them there is always some or adapt to the demands and challenges of specific life situation, in which they occur.

Optimal functioning of the educational interaction in the classroom depends largely on the adequacy of social perceptions, social assessments, compliance behaviour of the teacher's expectations of students, adequate interpretation of his behaviours, his skills of communication, its ability for self-presentation. Essential and has a tendency of an individual teacher to develop permanent skills for objective reflection on their personal professional style of communication with students.

In the new realities of life the focus of educational interaction in school is mainly associated with the creation of favourable conditions for the mobilization of resources inside person students for self development and self control.

The change in the interpretation of the functional orientation of education towards promoting and encouraging development of basic personality constructs - identity, self-concept, attitudes, value orientations, etc. behind the school innovative educational strategies and technology. This is because these inside person entities are an essential part of the motivational system regulating the behaviour of the individual.
The new realities of both material and spiritual life of the society, determine the necessity of serious changes in the way educational interactions are carried out. It is no longer enough upbringing and education to prepare our children for the typical, problematic and critical postmodern world life situations. Education cannot be separated from the situations and their specifics which have to do with the challenges of everyday life. On the other hand, education and upbringing strongly influence the formation of the individual’s social competence and the development of his skills to successfully solve problems in everyday life.

Adaptability and mobility of modern society individuals are important factors for the achievement of effective results in the completion of the variety of one’s everyday tasks. A leading feature and tendency in educational interactions today, is the fact that education encourages the individual to actively take part in the process of formation of his own personality. The role of education is therefore mainly connected to the creation of suitable environment where self-development, self-realization and self-regulation can evolve.

In our modern world the organization and contents of educational interactions should be bound to the up-to-date life tasks of the individual, as well as to the stimulation of a profound consideration of his life and emotional experience, and to the idea of helping the individual to painlessly and successfully overcome life crises on his way.

This is how educators could adequately meet the expectations of those being educated and helps them understand better their present state of mind and prepare them to fully live the next stages of their live cycle. The chances to organize a more prosperous way of living, to be more “efficient” in performing different social roles and still preserve one’s personality increase through achieving a higher personal level of self-consciousness, inner potential and strong will for its realization, despite the difficulties and challenges of everyday life situations.

The dynamic development of the globalization process on a world scale transforms in a great way our social reality and brings up the problem of self-discovery of the individual and the formation of his psychological and social identity. Pedagogy of the kind that neglects the individual and his uniqueness cannot cooperate in his personality formation. It damages and interferes with the natural strife for self-determination, self-discovery and personal success. An education that is not individually oriented does not only interfere with the process of self-identification but also suppresses the most intimate sides of a person's inner world and therefore negatively influences the formation of the personality as a whole. The replacement of the usage of imperative approaches and verbal “moralization” with individually oriented social influences can lead to the creation of a favorable environment of optimum influences on general personality formation.

The cooperation and partnership in education-oriented interpersonal interactions are, especially nowadays, an important factor for their effective realization. Their efficiency is not only related to the internalization of the social and cultural norms and patterns of behavior, but also to the mobility and inner personal resources of self-development and control. The change in the interpretation of the functional aims of education towards the stimulation and encouragement of the development of the basic personal constructs (identity, the I-concept, attitudes, value orientation, etc) is the ground for innovation trends in educational strategies and technologies, as these inner personal constructs are considered to be a major part of the motivation system which regulates individual behavior.

Nowadays, the core of education is connected to the necessity for helping and stimulating individual motivation, free will and independence of the control. Optimal communication in its educational sense is related to the creation of opportunities for coordination, partnership, and settlement of interpersonal
relations excluding force and emotional distress. It is essential that education support individual confidence and stimulate one's initiative, determination and independence. Educational interactions should be organized in a way that makes them satisfying and joyful for the people taking part, so that they can become confident and also learn to respect the dignity and self-confidence of others.

In the contemporary postmodern situation in terms of a growing heterogeneity of socio-cultural environment is a vital skill of the teacher to rethink universal and generally accepted rules in the light of the specific teaching situation and the specifics of the life experiences of children and their parents. It is required to show empathic understanding and acceptance of diversity in its various versions of the manifestation.

Full communion in the context of which are realized intentions of the teacher is directly linked to the creation of opportunities for coordination, cooperation and establishing reciprocal relationships present in the classroom when they have no emotional pressure and coercion another. It is by learning to maintain personal self-esteem of each student, to encourage his independence, courage and initiative. Teaching interactions must be organized in a way that interacting individuals may feel a sense of joy and satisfaction of communicating with each other, to be confident in their abilities and to respect the dignity and self-esteem of others.

The major shifts taking place in modern lifestyle suggest reconsideration of the balance between restriction and freedom in educational activities. The rebalancing between extreme restriction and total and unconditional freedom which influences optimally the entire process of personality formation, is bound to the educator's respect for the one's being educated, their dignity, independence and welfare. The rude interference with the latter and the desire of the educator to control every aspect of the lives of those being educated leads to various forms of rejection and protest. Deviation in behavior among young people is a result of the attempt for their life to be controlled in every possible way. Only the individual's strive for freedom can become the ground on which efficient educational interactions creating self-confidence, self-importance and a sense of uniqueness can exist.

The degradation in the social relationships, the saturation with hatred, envy, mistrustfulness, violence etc., exercise a negative influence on the creation of opportunities about the achievement of complete educative interactions. In the conditions of a strong frustration of confidence between the people is very hard to realized effective interactions for help the personal development. Here are the tendencies, which are very destructive and create troubles in the concrete realization of the good intentions, which the particular person sometimes has, in connection with the self-realization and the interaction with the other people.

The intensity and the dynamics in the educative interactions, their complement with negative emotions for the educator and the graduate, determine the probability about their inefficiency. For a great part of people in our society the impossibility for satisfaction of the basic human necessities /physical and social/ - a necessity of security, appurtenance, love, and self-realization, etc., destabilize interpersonal relationships and catalyse the display of deviant and psychopathological conditions. The requirements towards the implementation of the educative role of the parents, relatives, teachers, clerics, etc., sensibly grow up as a consequence of all challenges in our daily round, but our society do not help enough the particular person in his orientation in the conditions for the achievement of complete interpersonal contacts.

The social disorganization and the intensity in the daily round reflect on the functioning of the educative factors: the family, the school, the mass media, the religion, etc. The situation becomes more complicated with the negative effects, which multiply, because of the non-conformity with their
activity in the concrete parameters of the changes and the challenges in the socioeconomic and spiritual life of the contemporaneous Bulgarian society. In this way, the unfavourable factors caused by the transition towards the market economy can go deeper.

In this context stand out the basic requirement for formation of a responsible behaviour – the education must help the erection of a persuasion about the interdependence between the behaviour of the particular person and his consequences. According to the specialities of the age, the role of the experience and his consequences must be activated by the educative interactions.

Having to face new realities in modern society, people of all ages, not only children, seem to no longer tolerate strict regulations and order (which they often demonstrate through their behavior) and tend to look for free expression of their personality. That is why we are faced with the need of education through the stimulation of personal characteristics such as independence, initiative, determination, tolerance, creativity, etc. Educational strategies should allow their subjects educational interactions which activate their self-regulation and self-control.

Emotional atmosphere in the classroom, building on the basis of the specificity of the teacher-student interactions, student-student is too problematic area in Bulgarian schools. This is a topic unduly ignored, but is particularly relevant and current, and future to be more thoroughly analyzed. Classroom should be a place where emotions are not suppressed, but rather - to bet on it because, contrary to traditional pedagogy actual catalyst of love, creativity and cognitive activity is emotion, not reason. The management of the emotional climate in the relationship, however, requires the professional expertise and is associated with changes in basic population characteristics on Bulgarian teacher.

As already highlighted, one of the main responsibilities of the teacher is to facilitate dialogue in the classroom. However, this requires creating an atmosphere of mutual respect, trust and understanding amongst students and teachers and among students themselves. Unfortunately, many teachers are afraid of dialogue, so as not to affect their vulnerabilities and have relevant skills to achieve and maintain.

Problems arise because of the growing responsibilities of teachers and there are serious gaps in supporting interaction with other social factors involved in the education of children and adolescents.

The degree of interactivity in the classroom is determined by building trust and supporting relationships between teacher and students and among students themselves. Master's responsibility is to ensure and promote the full interaction in the classroom. Carelessness, arrogance, neglect, criticism and condemnation of the teacher is a serious challenge to the effectiveness of teaching interactions.

One of the most serious challenges facing the possibility of achieving the interactivity in the Bulgarian school is an eloquent deficit reduction of the confidence of the students to teachers and the school. This reflected in the manner in which shall be carried out communication between people there - it is filled with many destruction, pessimism, aggression and concern.

The analysis of the results of a special study of UNICEF (The votes of the young, 2001:89) shows that 22% of students do not believe their teachers. For 49% of the respondents children and young people the school is the main source of anxiety and concern (The votes of the young, 2001:62). Come data make it possible to specify and review highlights, relating to the efficiency of people interactions "teacher-pupil". The lack of confidence block out the possibility for the establishment of spiritual contact between teacher and students, without which it is not possible establishment of pedagogy interaction.
Effective training never is a matter only on the technique and strategy. It is a matter of human respect, kindness, openness, spontaneity, sympathy and tolerance. There is still things that are becoming too shortage in people relations today. Modern childhood and adolescence expect teachers more understanding and support, and not directions, charges and orders. It is very important the ability of a teacher to take into account educational projects with changed preferences, aspirations, desires, expectations and habits of adolescents, with their specific subculture, with the specifics of the specific life situations /typical, problematic, critical/, in which fall modern children in postmodern era.

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USING THE COMPETENCIES APPROACH TO THE FORMATION OF ELECTRONIC LEARNING RESOURCES IN E-LEARNING SYSTEMS

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Abstract

Reviewing the method of organizing educational resources with the competence-based approach. Making concrete examples of structure forming competencies and the organization of relationships between competencies and training courses, modules of the educational program in e-Learning.

Key words: e-Learning, competencies, assessment of competencies, management of competencies.

1. INTRODUCTION

In Russia, transition to educational standards of the higher education professional training of the third generation, where the concepts and principles of the Bolonsky declaration are considered, demands creation of new approaches in such areas as:

- Development and organization of electronic educational resources, which should be directed to forming and developing common cultural and professional competencies of students;

- Designing and developing of control and measuring means for students’ competences evaluation;

- Development and integration of score-rating system, which represents educational technology of transparent activization of the educational process, based on monitoring of students’ knowledge and competences with focus on intermediate certification of completed studies;

- Development of methods and technologies to evaluate the quality of education, based on the competencies approach, etc.

One of the important factors of the successful resolution of the above listed issues, is use of modern information-communication technologies, control systems of educational process and control systems of electronic training.

2. METHODOLOGICAL ASPECTS OF USING E-LEARNING IN THE CONDITIONS OF REALIZATION OF THE EDUCATIONAL PROGRAMS FOCUSED ON COMPETENCIES

In the conditions of realization of the competencies-focused educational programs, modern systems of e-Learning include functional modules directed on formation and evaluation of the students’ competences, and provide special means for performing the following functions:
- Management of competences (forming the structure of competences, clusters of competences, profiles of competences; definition of evaluation scales of competences; identifying alternative competences);
- Forming of competences (appointment of typical training plans; creating individual training plans; automatic appointment to students of separate actions or training plans depending on change of indicators of students’ completion of training courses; ability to correct individual plans of training during educational process);
- Evaluation of competences (usage of various scales for evaluation of competences; support of multistage evaluation; creating profile student’s competences; support of various ways of assignment of competences: automatically and in a manual mode);
- Analysis of competences (comparison of competences profiles for different students; the analysis of conformity of student’s competences profile to a required profile; the automated comparison of students’ profiles).

In order to use given e-Learning abilities it is necessary to generate the passport (or a general characteristic) for each competence which can include the following sections [3]:
- The content and intrinsic qualities of competence display;
- Place and importance of the given competence in cumulative expected result of the graduate’s education at completion of the educational program;
- Accepted structure of competences;
- Clustered position of the competence and its place in hierarchy of competences;
- Planned levels of competences’ proficiency of graduates (threshold level; advanced level; level of high competence);
- General labour input of forming the competence by "the average" student at "threshold" level;
- Subject matters, modules, experts on which subject matter content the given competence is formed;

Main objectives of carrying out an evaluation of competences:
- Defining the students’ level of competences, both on separate competences, and on clusters of competences;
- Forming of students’ profiles of competences;
- Defining of conformity of a profile of competences of students to profiles of requirements;
- Defining of conditions of the beginning of studying of modules (courses) and transition conditions between curriculum components (transition from one educational module to another);
- Updating of the plan of training of students.

By developing of control and measuring means for evaluation students’ competencies it is necessary to consider specificity of measuring instruments for competencies from traditional evaluating means as follows:
- In the form of tasks (the task for modeling, situational tasks, tasks with freely designed answer, practical tasks);
- In the form of evaluation (self-evaluation, a multidimensional evaluation, an integrated evaluation, multilevel criteria evaluation).

At this point, a certain typology of evaluation means got formed in education, which presented in domestic and foreign works [1, 3, 4]. Let’s consider types of evaluation means, which can be used in competencies approach:

1. Evaluation means for quantitative level of measurements (the tests containing the tasks in the closed form; the standardized questioning).

2. Evaluation means for qualitative level of measurements (traditional means of estimation; tests for estimation of practical abilities; tests with innovative forms of tasks; means of estimation on the basis of the analysis of concrete professional situations - cases-measuring instruments; an educational portfolio).

3. The evaluation means combining quantitative and qualitative levels of measurements (competencies tests).

In order to evaluate the level of comprehension of the competency the following forms are used in the system of e-Learning:

- The analytical form (the competence is evaluated by the teacher according to a competence scale);
- Testing (the evaluation is formed based on the test results);
- Interview (the teacher, who is the subject matter expert, conducts the interview with the student; interview procedure may include: questioning, testing, oral interview, etc.);
- Maintaining an electronic educational portfolio of the student (an individual and group portfolio; a working, legal, process, final portfolio);
- Maintaining score-rating system of educational achievements of the student.

The rating of educational achievements of the student is an indicator of quality of learning of the discipline by the student, practices, educational program components, on which the student has been certified by the time of rating completion, taking into account the expenditures of labour required on their development.

Calculation of a rating of educational achievements of students is carried out with purpose of:

- Maintaining of continuous quality assurance of preparation of students, tracing quality indicators dynamics of student’s mastering of the educational program;
- Achieving transparency of educational process and increase in degree of knowledge of students, teachers and other interested parties about a course and results of mastering of educational program;
- Increasing motivation of students to regular work on mastering of educational program, competition and competitiveness of educational process, forming students’ skills of self-evaluation and planning an individual trajectory of training;
- Creations of favorable conditions for recognition of results of training within the limits of the academic profuseness of students and graduates at employment;
- Decision-making on encouragement of students, appointments of grants, appointments of the academic privileges.
3. TECHNIQUE OF FORMING AN ELECTRONIC EDUCATIONAL CONTENT BASED ON COMPETENCIES APPROACH

In order to form electronic educational content based on competencies approach it is necessary to execute the following stages:

1. Creation of the catalogue of categories (clusters) of competences, which the graduate have to possess on corresponding educational program (for example, common cultural, professional, general scientific, socially-personal, instrumental, etc.).

2. Forming the structure of competences of educational program. The hierarchy of competences in the form of groups created for this purpose, and then each competence in a group (fig. 1) is described. During the description, we set such important parameters as a scale, on which level of possession will be defined by the given competence, and alternative to the competence which can replace the initial competence in certain degree, thus conformity degree is underlined in a percentage parity.

![Fig. 1. Structure of competences on educational program.](image)

3. Forming of a profile of requirements for each group of competences. The profile allows to describe a set of requirements with instructions of importance/weight of each of requirements in this profile (fig. 2).

4. Curriculum formation of educational program. The training plan is represented in the form of the hierarchical structure consisting the modules and training courses, grouped as base and variative (fig. 3).

For each training course the program of actions is identified – kinds and forms of educational activity which will be necessary for executing of successful development of discipline, for example, by means of the electronic multimedia textbook to master a theoretical part, to carry out practical tasks, to pass test, to take part in webinars etc.

During creation of the curriculum there is a possibility to set a rule of passage of actions:

- The beginning of studying of the module or course does not depend on other elements of the curriculum;
5. Definition of interrelations between components of an educational program and competencies.

In order to describe the interrelations of each component of educational program the following parameters are set:

- The beginning of studying of the module or course depends on success of development of one or several elements of the curriculum;
- The module or course can be accessible to studying only in a certain interval of time;
- The module or course study should be finished to certain term.
- Entrance requirements. It is a set of competences (with the set minimum level) which the student should master to start studying the current component. Entrance requirements can be constructed on a basis of auto competencies, received on other actions, i.e. as entrance requirements can be used a level of a success of mastering other actions, courses, modules.

- Assigned competences. It is a set of competences which will be assigned to the student at successful completion of action, a course or the module (fig. 4).

Fig. 4. Assigned competences.

At the description of interrelations between components of educational program and competences it is necessary to consider the rules (fig. 5):

- Modules and training courses are interconnected with groups of competences and with competences;
- Components of training courses (for example, webinar, thematic or tasked test) are directed on forming of some aspect of the competence and interconnected with indicators of competences.

Fig. 5. The scheme of interrelations between competences and elements of the training program.

As a result of the executed actions all components of the curriculum will be interconnected with competences or their indicators that will allow to make a detailed card of the formed competences to define transition rules between educational modules and courses, and also most effectively organize the evaluation process of students’ competences.

E-Learning systems allow the automation of the process of monitoring the success of mastering the educational program by the student, and maintain the results of the beginning and current control of progress (fig. 6).
Fig. 6. The account and monitoring of results of the beginning and current control of progress.

Using systems of e-Learning it is possible to carry out calculation of a rating of educational achievements of students and to maintain an electronic portfolio of students.

![Fig. 6: The account and monitoring of results of the beginning and current control of progress.](image1)

**Fig. 7. A student’s discipline rating.**

4. CONCLUSION

In conclusion, modern systems of e-Learning provide special tools for carrying out the evaluation and certification of students based on competencies approach and change model of the organization of educational content (fig. 8).
Fig. 8. Model of the organization of educational content based on competencies approach

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THE COMPETENCE APPROACH TO THE FORMATION
OF THE ENGINEER`S PERSONAL COMPETITIVE ADVANTAGE
IN SOCIAL INSTABILITY

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Abstract:

This paper reviews new approaches to the training of the engineering personnel, in particular, the competence approach. The authors pay attention to the relationship between two markets – the educational services and the labour, interaction of which allows to form new competencies that enable to strengthen the competitiveness of the future engineers during the economic crisis and social instability. The new notion of the «global competitive advantage of the engineer» is introduced.

Key words: engineering personnel, the competence approach, interaction of markets for educational services and labour, «global competitive advantage of the engineer».

A new type of forming economy has raised requirements not only to professional, but also to social and personal qualities of engineers, which allow fulfilling themselves successfully not only in professional, but also in general-cultural aspects. The competition of the specialized labour markets amplification, deepening into the period of the economic crisis, forces future engineers to obtain additional knowledge since their student’s days that is realized later in the form of the competences required for the specific workplace. Defining the purposes and possible results of the engineering education a number of researchers [1] come to conclusion that in today’s higher technical education there are also the purposes of the adaptation, accommodation, cultivation of an engineer in a techno-economic environment in addition to the professional purely technical purposes. If we try to outline the problem of the modern engineering education in whole, its essence will be in forming of a new type of the competitive person on the basis of the dynamic relationship harmonization between culture, thinking and economically-oriented engineering. The comparison of characteristics [1, 2] of the modern engineer (elite specialist, professional engineer) shows their proximity for the various industrialized countries (France, Britain, Sweden, USA), that indirectly indicates the acceleration of the economic globalization of the engineering education and allows us to introduce the notion of the engineer’s global competitive advantage.

Considering the competitive environment and its impact on the offer of the educational services in the traditional market, it should be noted that the main tendency to the competitive specialist formation shows itself mainly in the concept of the competence-oriented continuing education. The competence approach [11] defines such type of the educational content that is turned not only to the cognitive-oriented component but proposes the holistic experience of life problems solving, the implementation of the key competences and social roles, relating to many social spheres. In this case, the subject meaning does not disappear from the structure of the competence, and most probably performs a «subordinate» role.
The most popular concepts of the competence education include the concept of K. Prahalad and G. Hamel. The authors consider the core competencies as a result of the «collective training of the organization – primarily the coordination of various production skills and integration of multiple technology streams» [10]. Thus, the competencies are the basis of linking the various directions of the professional activity and the driving force for self-development. The graduate’s competitiveness is based on its competitive advantages – the exclusive competencies [4], which are based on his personality values and the learning organization value (an institute of higher education). The exclusive competence raises the market attractiveness of the graduate due to his unique ability to make something that is unbearable or impossible for others. The above may be referred to the competence of the university which graduates the competitive specialist.

For the detection of the graduate’s core competencies it is enough to apply to the professional picture of the engineer’s personality. This approach is well developed in the domestic and foreign didactics of the higher education [1, 6]. The case is somewhat difficult with the identification of the specialist’s exclusive competence.

According to the modern Russian psychological theories there are the personal and social spaces among the basic factors of the personality development [7]. It should be noted that the determinacy of these spaces defines a value-semantic component of the specialist’s competencies [8].

The personal space represents a sphere of the individual values and senses, in which recognizes, integrates, and appropriates the values of the modern education, production and consumption, turning them into the semantic sphere of a professional. The social space is the standards and values recognized by the society, which were being worked out over many centuries within the bounds of the social institutions. The social values may be invariant (ensuring the stability of personality) and situational-changing (acquiring the significant status under the certain conditions). It is the situational-changing values which represent the platform for the innovations formation in designing and choosing of the exclusive competencies. They define the individual trajectory of the development and formation of the professional competitive person.

For the most comprehensive and complete analysis of the engineer’s competitiveness, we have researched two markets – the educational services and labour in Volgograd city and Volzhsky town (Volgograd region). The criteria of assurance of the competitiveness we call as endogenous and exogenous for convenience. The endogenous criteria of assurance we consider in two directions:

1. The «input» specialist’s competitiveness, i.e. what competitive advantages must he have to attract the largest number of the institutes of higher education?
2. The «output» specialist’s competitiveness, i.e. what competitive advantages must the graduate have as a product of the institute of higher education to be the most competitive in the labour market? (The «output» competitiveness can be represented as a preference of this university’s graduates who have the given specialty to the others who have the same specialty).

To be competitive in the labour market, the graduate should possess:

- the improved professional characteristics;
- the unique personal qualities as compared to other competitors;
- the increased «consumer» properties.
It was established that during the period from January, 2004 till January, 2005 in the labour market the increase in supply of the specialists who possess the exclusive competencies for working in the material production field and social sphere was fixed. In particular, there was the reduction in labour supply to work in the trade field because of the increased demand for the professional personnel for the transport enterprises, telecommunication agencies, industrial plants and social organizations – the health service, culture and education. During 2005-2006 such «overflow» of the skilled labour has become the most evident. It should be noted that mentioned years were not crisis for all regions of Russia. These were the years of the steady economic growth. The results of the research are represented in Fig. 1.

![Fig. 1. Redistribution of demand on a labour market](image)

During the deterioration of the global economic situation the pattern of supply and demand is changing in the labour market (Fig. 2). According to the given data of 2008-2010 the employment growth in the social sphere (the health service and the education) continues. The financial sphere employment increases also. The dynamics of the manufacturing industries employment is shown by the single curve because of a slight increase. The analysis shows a slump in employment of these industries during 2008-2009 and some «revival» in 2010. These years are also characterized by a nonessential increase in rendering of the social services, besides the increase in services for a fee accounted for less than 1 %.

Taking into account the current state of the regional labour market and the prospects of its development under conditions of the slight economic growth in the material production sectors, the experts attributed primarily to the unique qualities of the graduate which will be in demand in the labour market [3, 5, 7, 8, 10], as follows: the high level of emotional intelligence development; the
ability to self-development; the creative potential; the skills of conceptual and strategic thinking, planning and management; the competence in the integrated fields; the professional use of information and communication technology and modern hardware; the accumulated communication environment; the ability to search, analyze and revise information for obtaining new knowledge; the ability to make decisions quickly and efficiently; the psychological tolerance.

Fig. 2. The dynamics of employment of the able-bodied population in the sectors of the economic activity in Russia (compiled by the State Statistical Committee http://www.gks.ru)

The «consumer» characteristics of the graduate, first of all, are obtained knowledge, skills, the degree of professionalism, the narrow specialization in the object-oriented area.

For the detection of the endogenous factors we applied to the results of the employers polling to identify the basic criteria for the staff evaluation. The following factors and qualities of the competitive specialist were obtained:

- the image of the institute of higher education: belonging to the university that has the leading position in the market;
- the common intellectual level: knowledge of the general subjects; the ability to use the modern facilities; the social adaptation;
- the common professional qualities – knowledge of the office work; the ethics of communication; the ability to make a decision on the basis of the factors; the ability to study something new;
- the special professional qualities – the foundations of professional knowledge; the practical skills in the professional field; knowledge of the latest technologies relating to the professional sphere;
the healthy life-style: the lack of bad habits; the good health; the presence of needs to go in for sports.

As follows from the above list, the exogenous criteria are more transparent for the student and the employer as for the consumers of the educational service. The case is somewhat difficult with the endogenous factors, because their identification is very complicated by the presence of subjectivism in the expert’s opinion.

The research has shown that starting from the fall of 2008, 2009 and 2010, the requirements for the competence of the specialists continue to grow in the specialized labour markets. There is some growth in demand for the sales managers, but at the same time, the reduced demand for the engineers, as well as for the professionals for the immaterial sphere sectors. At the same time in the market of the educational services the demand for the additional educational services begins to increase, that are related to the professional retraining of the engineers and to the obtaining by them additional knowledge in the field of economics and management, as well as knowledge of foreign languages. It is caused by the fact that during the economic crisis the unemployment increases, leading to the social instability. Some of the specialists released from the real economy sector are moving into small business. The so-called «self-employment population» occurs, the new workplaces are created in the micro-business. Setting up your own business requires the new additional competencies always.

Besides, some engineers of the most popular specialties (programmers, bioengineers) may increase the supply of labour in the international labour market (outsourcing). From here the demand for the additional competencies that are related to knowledge of foreign language.

Existing educational techniques have undergone significant changes, when the competence approach was adopted. Case-studies, simulation business-games, practical training at the real enterprises for a long time already habitual in curricula of management and engineering specialties. However, all these techniques only acquaint students with technologies of administrative and industrial activity, but the precipice between real business and concrete practical skills of graduates remains. At the same time there is an experience of realization of the educational programs showing, that the greatest effect is achieved, when the student starts to work and he {it} has a realized need for the certain knowledge. In this case training is not only means of improvement of professional skills of the expert or the manager, but also means of the decision of problems of the organization, a condition of its survival.

If to create conditions for display of activity of students not in traditional educational process, and in such form of business – formation where they will be shipped in reality its possible to receive double effect: stronger development of professional competence, and also result as the created product or service.

The introduction of the Russian Federation in Bologna the process demanding transition of the higher school on two-level model of education, demands precise understanding what knowledge and skills bachelors and masters and how it is possible to prepare the bachelor focused on real employment should possess, having removed a year from preparation of the expert traditional in Russia, basically and intended for preparation of the degree project. The answer is obvious – it is necessary to use innovative educational techniques allowing to the student already during training to receive a real practical operational experience in business, and motivating him to acquire necessary knowledge and skills with much more efficiency, than the traditional approach.
Experience of development and introductions of an innovative educational technique the “business-incubator” starting level [1], allowing to intensify educational process due to training in real business-environment, speaks about efficiency of the given technique. The basic idea consists that students under the direction of skilled tutors pass all stages of a business-cycle of work above the product: from carrying out of marketing researches, advertising, search of customers and the conclusion of contacts before direct performance of orders, registration and subsequent support. Feature is command work of students above the projects. During command work in practice features of group work are studied, students study to overcome the problems arising in any business team. The technique is introduced into educational process of International Educational Center (IEC) VSTU for specialties “Economic”, “Management”, “Applied computer science (in economy)”, “Advertising and public relations”.

Realization of “business-incubator” demands presence in educational process the heads of real business providing resources of business-environment; tutors (teachers of high school), carrying out the current monitoring of practical activities of students, advisers/consultants (teachers of high school advising students groups on real problems, arising during performance of projects). The task of the tutor – to carry out the current monitoring design activity, to help students group to realize an available business-problem and to generate inquiry about consultation. For formation of business-platforms the conclusion of partner contracts with the enterprises interested in preparation of highly skilled experts, and opening of branches of profile faculties SSTU is optimum. Management of “business-incubator” is carried out by a network principle with the allocated managing influence on behalf of the head of educational process on the chosen direction.

Alongside with the basic educational tasks the innovative technique of “business-incubator” is directed on:

- Training cultural competence.
- Development of leadership abilities.
- Formation of the enterprise approach.
- Training to communicative skills.

Summarizing, it can be stated that the task of the institute of higher education in the context of forming a competitive specialist is in the constant decrease in showing of the strategic non-competitive factors, in the intensification of showing of the exclusive strategic competitive advantages and in the constant tracking of the optimum ratio between a width and a depth of the professional training [7, 9, 10].

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GOOGLE SKETCHUP AS A TOOL OF COMPUTER ASSISTED LEARNING
IN DIFFERENT SUBJECTS
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Abstract
The work presents various options for implementing ICT in teaching different subjects. Some conditions for carrying out such training are clarified. Criteria for selection of software and options for use are offered. Some examples for situations in which computer use in education is appropriate are given.

Some opportunities for using Google SketchUp in various general and profiling trainings are presented. Several particular examples are shown.

In the paper teachers’ attitudes towards the possibility to use Google SketchUp in their teaching work are presented.

Key words: computer assisted learning, Google SketchUp, general subjects, professional oriented subjects

1. INTRODUCTION
Opportunities for computer application and the impact of ICT in education have been among the most debated topics in education for many years. There are many opportunities to use office software suite, educational and specialized software to assist traditional training. A wide variety of learning platforms are ready to arrange fully training or to support traditional education. Various applications of different approaches were developed, depending on the specific needs and interests of students. A lot of teachers work on the construction of methodological approaches, based on the ability to use computers in teaching different subjects as mathematics, physics, chemistry, biology, languages, arts, etc.

The main purpose of this paper is to present the capabilities of Google SketchUp for teaching different subjects. The article presents the classification of different ways of using ICT in education and place of Google SketchUp in such training.

2. BASIC CONCEPTS
Due to the multiplicity of computer applications in training, the variety of terms has increased for the different technological approaches. Here we will look at some definitions that affect the job.

In (Kozma, 1987) cognitive computer tools are defined as software programs that use the control capabilities of computers to amplify, extend, or enhance human cognition.

In (McGraw-Hill Dictionary, 2003) computer-assisted instruction is defined as using of computers to present drills, practice exercises, and tutorial sequences to the student, and sometimes to engage the
student in a dialogue about the substance of the instruction. Abbreviated CAI. Also known as computer-aided instruction; computer-assisted learning (CAL).

In (Elizabeth, 2011) computer assisted learning is defined as educational uses of computers that are considered to be computer-assisted instruction (CAI) or computer-based instruction (CBI) are those cases in which either instruction is presented through a computer program to a passive student, or the computer is the platform for an interactive and personalized learning environment.

The above definitions affect the training, which is largely dependent on the computer and in some cases on the Internet. The work has not affected the organization of the overall rate based on computer assisted learning, but only uses the product as a separate tool, contributing to the quality of such course or as a complementary tool to a traditional classroom-teaching lesson.

3. THE ROLE OF THE COMPUTER IN TEACHING DIFFERENT SUBJECTS

The methodology of teaching various subjects has been developing for a long time and has its traditions, but the appearance of the computer in XX century is about to change the traditional approaches in education fundamentally. Recently observed trends show that the computer is used in education for its own sake and is unjustified in many cases. This approach highlights demonstration of capabilities of the chosen software and diversification of the methods, but it is not helpful enough in developing children's thinking, which is one of the main objectives of training. In this regard, we will put some emphasis on the reasonable use of information and communication technologies in education:

- In cases where are required: explanation and demonstration of tables, drawings and diagrams, statements and their proofs, etc., which children can see later in their textbooks. In this way the teacher can save time and present the curriculum attractively.
- In cases where it is needed to visualize multiple and/or complex examples and counter-examples by which children can gain intuitive understanding of the nature of a concept or are required to formulate a hypothesis.
- In cases where trivial templates (a crossword, a coordinate system, a grid square, etc.) are projected onto a whiteboard, and they are filled in with a whiteboard marker pen by a student or by the teacher.
- In cases where the goal is for children themselves to work with a chosen software and along with achieving the objectives of teaching a particular subject (mathematics, chemistry, biology, etc.) some external relations with the informatics and information technology are carried out as well.
- In cases where the computer is used for self-study of an issue to differentiated training and provocation of heuristic learning.
- In the case of language learning.
- In the case when the teacher works with children with special educational needs.
- In the case of work with children living in remote areas or who are often absent from school.
At this stage, the idea is to complement traditional training with the ability of computer-aided learning, rather than replacing it. If we take a look further, we can see that the goal is for computer assisted learning to take place across the board by using "virtual classrooms" in which students along with the possibility of feedback, opportunity to communicate with teachers and classmates in any time, will have a wide range of resources and tools for improving quality and strengthening their interest in learning.

Depending on the goals to be achieved by using the computer in learning, we can distinguish the following options:

1. Computer and projector with main task to illustrate:
   1.1 A large volume of lesson content (MS PowerPoint, SlideRocket, MS Word, Flash, etc.)
   1.2 Individual examples or a series of examples offered in a form ready for the students or created during the lesson. In this case, the teacher can use ready-made or create his own using the software required (GEONExT, Geometer's Sketchpad, Google SketchUp, ChemWin, etc.)

2. Computer used to study a specialized software supporting the understanding of the theory application and solving certain class of problems (GEONExT, GeoGebra, SPSS, MatLab, Mathematica, etc.)

3. Examination and evaluation of knowledge.

4. Computer used for remote and/or individual training - including opportunities for the use of complete systems for e-learning modules or electronic textbooks (www.cnx.org, www.activemath.org, moodle.com, etc.)

The number of lessons using the equipment must be optimized according to the objectives of the training and the results obtained in each class. The software which is used in teaching must be licensed or free and then it can be used in school seamlessly.

In addition to the choice of methods and approaches the question about required technical resources for training arises. Although in the modern school it is no longer a problem to install the necessary equipment in the classroom, but still if your class is not designed for a continued use of computer-based learning, the teacher could find it difficult to organize classes using a computer. There are different options:

- Computer, controlled by a teacher and a projector. Pupils work with their textbooks and on a computer if they are summoned by a teacher.

- Interactive Board.

- All students have access to a computer and work independently, follow instructions and actions as in both previous options.

- The training is conducted at home on a personal computer, in advance of proposed instructions and assignments. This option can be used as an addition to the above.
  - Independently, if there are problems with the material equipment at the school. In this case, checking and discussion with the class could be made on the Internet, but for this
approach, the teacher must spare their own time and motivate students to participate in this lesson.

- Using the project-based approach. In this case students work individually or perform tasks assigned by the teacher in groups, and then present their results to the class.

It is clear that the choice of option or set of options depends largely on the teachers, but with sufficient motivation students themselves could come to class with their laptops.

4. APPLICATION OF GOOGLE SKETCHUP IN TRAINING

4.1 Why to use Google SketchUp?

This product was created primarily to design objects, interiors and buildings. Exactly these features often arouse a greater interest in students than the purely educational software designed specifically for training. Pupils are highly motivated and can easily handle with the study of the product by themselves. They can use a set of video lessons, designed for customers from very beginners to professionals in the official site http://sketchup.google.com. An additional motivation is the ability to create models of buildings for Google Earth. This task could provoke additional interest in pupils and bring them satisfaction by showing the results of their work in Internet.

Organisation of the product is directed towards simplifying its usage by customers with different needs. It must be emphasized that there are intuitive proposed instruments. Their appearance literally dictates the user what tool to use and how to use it.

The fact that there is a free version available for everyone - Google SketchUp is extremely important. For today Google SketchUp Pro is available at $ 495. In the paid version there are many benefits associated with production of documentation related to three-dimensional models, the possibility of high-quality showing in a two-dimensional form, the possibility of convenient presentation of many established models, etc. This considerably optimizes the work of professional designers, but for training purposes the free version is completely enough. On the other hand the realistic models and the possibility to see them from all sides, to get the feeling that one is inside a certain object, to measure the necessary components, to place the students in a situation that is close to the real one.

Here are a few ready-made models borrowed from:

In Fig. 1 a school project model of hourglass created by 11-grader is shown and in Fig. 2 a student's project of a building.
4.2 The “Order-method” in inter-subject relations

In addition, it is possible to carry out inter-subject relations with ICT, industrial arts, as well as with subjects studied at school and oriented to design, construction and architecture. If at school there is an organized learning of SketchUP as a main purpose in ICT lessons than it would be easier to use it in all other subjects. The ICT-teacher, for their part, can carry a set of learning objectives of its subject. If the organization is impossible, teachers, after brief instructions, may use a project approach to offer to students tasks that require a review of the product. Further, teachers can use mostly finished models in their trainings. Over time, students can quickly and by themselves cope with the creation of their own models, but this is not the decisive moment in this approach!

**Fig. 3** presents an “order-method” scheme. The idea is that the teacher, for example math-teacher, "orders" to the ICT teacher to develop a didactic material. Math-teacher indicates his requirements, provides resources, if necessary, and thus formulates a practical task for the needs of ICT classes. In his turn, ICT teacher deems appropriate which class is ready to cope with the offered task. Then he specifies the requirements and offers the task to his students. He can use different forms as a task in class, homework or project. In this way students will see a direct need and application of their work in ICT classes and math-teacher, will save his time and will have ready for use materials.

Certainly the use of this product is far from the goal to make professional designers from all students, but only gives them the opportunity to work with virtual models. If children have no interest in working with the product, the teacher could easily take over control of models. This does not have a harmful impact on the effect of this approach.

4.3 Examples of applications in mathematics education

In today's education one of the main goals is the need of training, which clearly shows the practical application of theoretical knowledge, algorithmic structures and capacity for logical and spatial thinking. According to (COM, 2006) from the second-level of a eight-level table of the European
Qualifications Framework, it is required to solve practical problems using a set of rules. In teaching, for example in Maths, students learn a set of theorems, properties, formulas and algorithms. In practice, however, children often decide for complex tasks at school, without being able to cope with basic household problems such as calculation of the required number of tiles to cover a roof.

Geometry and especially stereometry gives favorable conditions for demonstrating applicability of school mathematics in everyday life. Some teachers spend time out to show the familiar examples, using measurements of objects held in the classroom. This approach is successful, but requires time and often leads to an excess of emotions for pupils and to the deterioration of discipline.

Using Google SketchUp as a tool of computer-assisted learning or as an addition to the classical form of training, you can easily create or use ready models on the basis of which it is possible to compile and solve problems that are closely associated with human life and conditions of life. This approach can be well used in teaching planimetry, placing students in a familiar situation, finding the necessary plans and solving the problem only in 2-dimensional tasks (example on Fig. 4)

There are many opportunities for CAL in geometry. Each product has its own advantages and disadvantages. A wide variety of educational software is available in the Internet space. There are possibilities for dynamic mathematics, computer graphics, virtual reality, etc. Some have the option to follow step by step building, while in others it is possible to create realistic models, some free of charge, for others a license must paid. Depending on the purpose of teaching, the lesson type, separated by time and equipment, and many other conditions, there may be different approaches. Here are a few of them:

1. The description of the problem, along with the ready file are given to students. In the file or in the text of the problem needed dimensions of an object are shown.
   a. Then is possible a full description of a model, but possibly not to mention facts as the correctness of shapes, the fact that a point is the midpoint of a segment, etc. These facts can be clarified during a conversation with pupils and further agreed that they would not mention them if they are obvious (as a model - standard household items and all are familiar with them)
   b. Subjects are presented realistically, but if necessary, transparency is given so you can see them inside.

2. It is given only a model without dimentions and questions about the problem, but it is required from the student to use the features of SketchUp to measure the specified parameters.

3. Pupils are required to create a model and perform calculations.

In Fig. 4 is given a screenshot of SketchUp 8 with one example - a model of a summer-house whith some measurements. The teacher can ask a variety of tasks, using this model.

With this example, we can solve a problem for the 5th grade (according to the Bulgarian curriculum). For example, how many square feet of lattice planes will be needed to make this arbor or approximately how many tiles of size 20 cm\(\times\)20 cm it will take to the floor covering, etc.

For more senior students, the teacher can create problems for calculating the volume of the summer-house, only the volume of its roof, finding angles, etc.
Fig. 4

Fig. 5 shows the following problem: A magician prepares a trick "cutting" the girl in an opaque box. He should cut the parallelepiped, with one iron flatness through points A, B and C, pointed on the model. Draw this flatness. Is this flatness going to cut the girl? If yes, then draw stocks and handles, in a convenient place for her, for which she could hold during the execution of the trick.

Fig. 5
Fig. 5 shows a picture with the initial file, which is given to the students and the pictures of Fig. 6 show the approximate solution from different angles. This problem can be used in different ways. One of the most successful one is to motivate the need of studying sections. This problem may be one of the first tasks of this type. The teacher can show the idea of a construction by using the model, and then to ask the students to work with a pen in their notebooks and to describe the construction of the section in a written form.

Fig. 6

Fig. 7 shows an exemplary model of the table. This example can be used as shown previously. In Maths lessons in design-oriented schools a similar model of a table or other stuff can be used, which will be manufactured by students later in the industrial art classes.

In these tasks questions to the calculation of percents could also be added, such as: How many cubic meters of wood is needed to manufacture the subject, if you know that the material loss during the construction process will be about 30%?

Fig. 7
4.4 Examples of applications in science education

In science education the most basic principles are in force as in teaching Maths. The teacher can use ready models, which are shared by the authors on the Internet. Another tool is to "order models" to ICT teacher. Upon successful inter-subject relationship with ICT it is possible for the science teacher to give a description of the required model and the students (they may be from other grade) can prepare it during their ICT classes as a task or a project.

Here are some models that have been borrowed from a specially created "Web store" of Google - 3D Warehouse.

**Fig. 8** presents the Bohr’s model of the hydrogen atom, applicable to the Chemistry classes and **Fig. 9** presents the structure of the human ear applicable to the Biology classes.
4.5 Examples of applications in design-oriented schools

Here the possibilities are extremely large because, the product is designed primarily for this purpose - the creation of three-dimensional models. With SketchUp, students can create professional models of everyday objects, industry, and also to design buildings and create a vision for interior and exterior design.

There is a methodology and numerous examples of successful practices in implementing Google SketchUp in vocational training. A lot of materials are available on the official site http://sketchup.google.com/intl/en/industries/education.html.

On Fig. 1, Fig. 10 and Fig. 11 are shown models created by students trained in the above-mentioned system.

![Fig. 10](image1.png)

![Fig. 11](image2.png)
4.6 Project-based learning using Google SketchUp

In (Thomas, 2000) project-based learning (PBL) is described as a model that organizes learning around projects.

According to the definitions found in PBL handbooks for teachers, projects are complex tasks, based on challenging questions or problems, that involve students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations (Jones, Rasmussen, & Moffitt, 1997; Thomas, Mergendoller, & Michaelson, 1999).

In this regard there are different variations of the PBL implementation using Google SketchUp. Here are several examples of topics from different subject areas:

- Create a virtual city (specific vocational training - courses in Architecture)
- Establishment of an existing neighborhood. (specific vocational training - courses in Architecture)
- Create a model of the human body (in ICT classes for the needs of Biology)
- Creation of models of mythological creatures (in ICT classes for the purposes of Literature)
- Create models of a system of tasks in stereometry (project in Mathematics or IT)

4.7 Some disadvantages of the approach

Of course, besides the advantages this approach has its drawbacks. Possible drawbacks may be considered:

- Distraction of attention from the problem to the model.
- For learning Maths - to measure the desired length, or automatically find the desired area. This "deficiency" can easily be turned into an advantage by asking students to check their work themselves. The teacher must demand from students to write the complete solution in their notebooks. If the teacher manages the model, he should just not perform these measurements while the students have not achieved the result themselves.
- The need for additional self study by a teacher who takes his personal time and resources.

5. TEACHERS’ OPINION

In relation to the study of the applications of Google SketchUp in training a number of surveys were carried out among teachers in different subjects. The purpose of the questionnaire was to find out whether teachers are familiar with this product, to investigate their interest in SketchUp, to check whether they are able to use the product in training, to find out which is the most convenient way for teachers to learn SketchUp.

During the survey it became clear that teachers are not familiar with Google SketchUp. Only 2% have heard about the product. For this reason, the survey was held after a short seminar at which teachers were briefly acquainted with SketchUp 8 vision, some methodological features of the application of this software in the teaching of different subjects. Some self-learning opportunities from the official site of SketchUp were shown to the teachers.
As a result, the following results occurred: 80% of the survey indicated their interest in the use of SketchUp in lottery game sessions. In this group were teachers of Mathematics, Computer science, Natural sciences, specialized design subjects and part of the humanities teachers. 70% of them are interested in the possibility of using ready-made models as an illustration for solving problems, or to introduce new concepts. 30% show interest in the possibility of a holistic using product with all its possibilities. In this group were mostly teachers of IT and construction and architecture teachers.

20% were unable to determine how the product can help them in their teaching. In this group were PE teachers and a part of teachers of humanities. Interestingly, even this group is interested in learning opportunities for this product.

To the question "What type of training would you choose to learn SketchUp?" - 69% responded that they would like to learn themselves through the lessons posted on the official website of the program. 31% would like to enroll in the course and none of the respondents said they would not want to get acquainted with the program.

Definitive conclusions from this survey are as follows:

- Teachers are not familiar with this product.
- After a short acquaintance, teachers are very concerned about the use of SketchUp opportunities in education.
- The main interest is the use of the product for illustrative examples.
- ICT teachers are ready to teach this software to their students.
- Teachers feel confident that they can easily cope with self-training using the opportunities which are posted on the Internet.

6. CONCLUSION

In conclusion, it should be noted that the use of virtual and physical models should alternate with classical approaches. Currently, there are great difficulties in learning when they use spatial imagination. This approach in designing and solving some problems can motivate students to work on the ICT lessons and other subjects. However, teachers must not get involved in excessive use of computers in the classroom, as this could lead to a blunting of spatial thinking abilities without external hardware.

The possibilities for publishing their own models quickly and easily on the Internet, makes Google SketchUp a very convenient tool for CAL, as well as an additional tool for the classical approach to learning.

The choice of approaches, accompanying software, teaching manuals, optimization methods and used tools should lead eventually to the development of spatial thinking and motivation to work on various school subjects.

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REFERENCES


ROLE OF RECOGNITION OF SPEECH SOUNDS INTO WORDS FOR THE FORMATION OF PERCEPTUAL, PHONOLOGICAL AND ARTICULATION ABILITIES

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Abstract

The report focuses on the question for the content of phoneme-perceptual and phonological abilities in preschool-age children. Old and new theories in these areas are analyzed. The author presents a research on the ability of recognition of speech sounds into words in 268 preschool-age children with and without specific (functional) articulation disorders. Quantitative but not qualitative differences are found between the two groups - all children use common identification strategy in respect of all sounds. Moreover the research shows the influence of phonetic factors on the process of recognition of speech sounds into words. The main factors are the acoustic features of the speech sound and its position into the word.

Key words: articulation disorders, phonological disorders, recognition of speech sounds into words.

The phonological component of language and the phonological ability of children are among the most frequently discussed issues in the speech-language therapy in recent decades. From the perspective of generative linguistics, this ability is evident on two levels: surface - through adequate skills of phoneme production and arrangement of phonemes into meaningful speech circuits, and deep - through representations of phonemes in the mind, ideas about the phoneme structure of language. According to Locke [6] the first level is working closely with the articulation area, the second with the perceptual area. It is not always easy to distinguish the levels of phonology and to determine which belongs to the physical phenomenons and which to the psychological phenomenons, to the "grammar of sounds".

Phonological ability and phonological disorders are discussed in speech-language therapy since the 70-ies - 80-ies of XX century, after the introduction of behavioral theoretical model and linguistic concepts in the interpretation of communication disorders [9, 11]. In the past and in the present a part, the disorders of the phonological component are wrongly interpreted as perceptual distortions. This is demonstrated clearly in the concept "fonematic hearing", "fonematic perception", enshrined in the Russian and Bulgarian scientific literature. Models of impact on "fonematic hearing", occurring in it, contain both phoneme-perceptual (hearing) and phoneme-analytical (cognitive) procedures, although the latter procedures far exceed the borders of hearing perception.

Also in the past it was thought that the phoneme perception develops in parallel with the development of the articulation (speech) and the articulation ability determines the state of the phoneme and speech perception. This is postulated in the motor theory of speech perception [10]. In this sense, all individuals with impaired articulation should have impaired speech perception. Nowadays it is known that the perception of phonemes and the speech perception mark their beginning in the nursing period of life, before the child has developed speech skills. It is also known that the normal phonological
development might occur in persons with an expressed articulation pathology as dysarthria and speech apraxia [13]. Motor theory provides evidence for a partial but not absolute influence of the articulation on the speech perception and it has been already abandoned.

It is now well known that the phoneme-perceptual and the phonological abilities are interrelated, but different abilities. The first is only an instrument input for the development of the second. Germakovskaya [1] underlines this fact. She argues that the phoneme-perceptual ability ("fonematic hearing"), which is the base of speech perception and written language, matures first in ontogeny. This is a natural and external unregulated process, while the ability to analyze the language’s sound structure is a metacognitive process, learned through teaching. Mastery of written language requires metalinguistic, particularly metafonological skills - assessment and analysis of language as a theoretical construct, in particular its phoneme composition. From the neuropsychological point of view the speech sounds perception represents the first phase of the linguistic processing. It largely determines the formation of linguistic and, subsequently, of metalinguistic function.

Nowadays articulation, speech-perceptual and phonological abilities are considered to be three related but autonomous areas. The first is mainly physiological, the second - psychic, the third – psycholinguistic. The most thoroughly studied is the phonological ability. Its specific characteristic, called phonological knowledge or awareness, is often discussed in contemporary literature. The phonological knowledge is closely connected with the developmental level of the oral speech and determines the developmental level of the written speech. Insufficient development of this knowledge in pre-school age is considered a major predictor for the occurrence of dyslexia [1, 3, 5]. Its structure is an object of special researches [7, 12] - scientists examined the stages through which it passes in its development as a natural ontogenetic process. The aim is to embed this structure in programs for work with impaired children and with normal pre-school children in their preparation for literacy.

Some authors [4] distinguish two types of awareness, phonetic and phonological. The first represents the general perception of speech sounds and the ability to distinguish them from the meaning which they generate. The second involves the understanding that words can be divided into their constituent sounds. However, in most cases a distinction between the two types is not made.

Munson et al. [8] divide four subtypes of phonological knowledge, occurring in the following ontogenetic sequence: knowledge of the perceptual and acoustic characteristics of phonemes (perceptual knowledge); knowledge of their articulation characteristics (articulatory knowledge); higher level of knowledge - how words are divided into sounds and how sounds are combined into larger sequences, such as words (higher-level phonological knowledge); knowledge about the ways in which this diversity can be used in social contexts (social-indexical knowledge). According to Germakovskaya [1], the phonological knowledge passes through several stages in ontogeny: awareness of syllables and rhyme, awareness of extrasyllabic elements (alliteration), awareness of phonemes. Adams [2] identifies the following levels of phonological knowledge: ability to correctly reproduce rhythmic structures; skills for comparison and confrontation of sounds in words; skills to connect the individual sounds in syllables and vice versa; phoneme segmentation ability - a list of phonemes, making up words; ability to perform tasks associated with phoneme restructuring - adding, omitting, replacing the sound and syllables.

Knowledge of the stages of phonological awareness is systematically applied in the speech-language therapy. Especially the ability to segment words of their constituent sounds is one of the highest steps of phonological awareness. Before the child has learned to fully decomposing the word, it often passes through a stage of identification of individual sounds in word’s composition. This is an introductory task prior of the segmentation procedures. In Bulgaria, it is applied very often in practice with speech-
correction purposes. It is also used in preschool and elementary-school education in the period of preparation for literacy. The content of the task is as follows: speech therapist speaks clearly an isolated sound, instructs the child to remember it and explains that he/she will hear words which may or may not have such a sound; the child must respond in a manner agreed in advance, when he/she hears the sound, for example with a crack.

The task of recognizing sounds in words takes an intermediate position between the tasks of phoneme perception and phonological knowledge. It includes both metafonological operations and primary auditory-perceptual processing. When it is applied to children with articulation disorders, this task simultaneously influences three capabilities - articulatory, phoneme-perceptual and phonological. This makes it statistically very significant, but there is the following question: what are the regularities through which the identification process passes and what kind of psycho-phonetic trends make it.

An experimental study of the process of recognizing sounds in words answers the question. It clarifies the details over which the awareness of the language sound structure passes and also reveals the contents of the relationship between articulation, phoneme perception, phonological knowledge.

The purpose of the study is: to explore the ability to identify (to recognize) the sounds in words in pre-school children with and without articulation disorders as an indicator of the relationship between articulation, phoneme perception and phonological knowledge; to reveal the influence of the phonetic characteristics of speech sounds (phonemes) and of sound’s position in words on their identification. The tasks of the study are:

1. Comparing the ability to recognize sounds in words in both categories of children.
2. Comparing the achievements of the studied subjects in identification of different consonants sounds.
3. Determining the easiest and the most difficult recognizable sounds.
4. Establishing the influence of the position of sound in the word on its recognition.

According to the hypotheses of the study it is assumed that:

1. In children with impaired articulation the identification process is more difficult than in those without disorders.
2. All children have common identification strategy, in which the phonetic characteristics of speech sounds and their position in the composition of words play a major oriented role; articulation mechanisms do not have such a role.

It is used only one basic research method: a test „identification of consonants sounds in words”. The test involves series of 132 words representing the stimulus material. Ontogenetic earlier (m, t, g) and ontogenetic later (s, ʒ, l, r) consonants are offered for recognition. A subtest containing different numbers of items (words) is composed with each sound. The sounds, which must be identified are allocated at the beginning, middle and end of the words, in heterogeneous contextual environment. The consonants s, ʒ, l, r as phonemes with more complex biomechanics are violated most often both in children and adults. This fact enables the comparison of their perception with the perception of early and correctly pronounced consonants m, t, g and seeking correlations between production (articulation) and identification (perception) of the phonemes as segments in the speech chains. The selected sounds include the main differential features inherent in Bulgarian consonant system.

The investigator notes what sounds in which words were recognized and lists the correct and incorrect answers. Statistical processing is done by variation (parametric) analysis. Statistical significance of the
results is established by the two main statistical parameters - the average and standard deviation or mean square. It is used the criterion of Student (t-criterion) for comparison of averages of results from comparable samples used criterion of Student (t-criterion). Processing of the results led to values of t-criterion, which gives reason to believe that the method used to study is a qualitative basis for reliable and statistically significant results. Conclusion drawn from them are supported by a guarantee probability P (t) = 0.99.

268 children aged 5 to 7 years were studied, 134 with and 134 without impaired articulation. The first category includes children who make various types of articulation errors (substitutions, omissions, distortion of sounds). The errors include different number of ontogenetic late sounds (s, z, ts, j, z, tf, l, r). These children formed the experimental group (EG). All children from this group have an impaired pronunciation of s, z. They do not have any other abnormalities, somatic or psychic in origin and can be defined as children with specific (primary) articulation disorders. children in the control group (KG) have been selected by mirror principle, with indicators numbers, gender and age. In each group there are 42 girls and 92 boys, 72 children are aged between 5 and 6 years and 62 from 6 to 7 years. The survey is conducted in four stages:

1. Selection of children for the experimental group through a screening test for articulation and view of the peripheral speech apparatus. Their normal psychological status is indicated by information from teachers of children, and through observation.

2. Selection of children for the control group (they undergo the same checks).

3. Training. The investigator explains the procedure and encourages children to make several attempts, using stimulus material, different of the test stimuli.

4. Study of the ability to recognize sounds in words for each child individually.

The results of the research reveal facts in support of the hypotheses.

1. RESULTS OF THE FIRST TASK OF THE RESEARCH

Here we compare the overall performance of children from both groups, taking into account the total number of correct answers. In EG they are 6 140 or 35%, in KG they are 8 939 or 50%. The value of t-criterion is 40.96. It can be assumed that differences between the two samples are statistically very significant. The digits show that the recognition of sounds in words is a difficult task for all SS, but for those in EG it is particularly difficult. Children without disorders have generally higher identific ation ability compared to articulation impaired children. Worse articulaton ability, demonstrated by studied subjects in EG, can be considered a reason of the low achievement of those children. Obviously the defective motor programs, leading to traces in cerebral cortex, disturb the perception of speech sounds in an acoustic way and serve as an obstacle to the understanding of the sounds. This demonstrates the influence of the articulation over the phoneme perception and phonological awareness, but further analysis, presented in the following table, explains this result not so simply and clearly.

Depending on the behavior (response) of children in the course of the study, three subpopulations can be identified among them: unrecognizing - children who provide zero-answers to all subtests and items; recognizing a part - who have both correct and incorrect responses; and recognizing - children with correct answers to all subtests and items.
Table 1  Behavioral types depending on identification capability of the studied subjects

<table>
<thead>
<tr>
<th>Studied subjects</th>
<th>Unrecognizing</th>
<th>Recognizing a part</th>
<th>Recognizing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 years</td>
<td>6 years</td>
<td>Total</td>
</tr>
<tr>
<td>EG</td>
<td>27</td>
<td>14</td>
<td>51</td>
</tr>
<tr>
<td>KG</td>
<td>31</td>
<td>7</td>
<td>38</td>
</tr>
</tbody>
</table>

A variable identification behavior occurs most often in EG and in KG. The recognizing a part is about half of all examined and prevail marginally in EG. Obviously this behavior is not associated only with articulation disordered children, but it is typical for all preschool children. It is important that subjects studied with high identification capability occur not only in KG, but also in EG, although children in this group have impaired articulation. However, in KG there are children with poor identification ability, although their articulation is normal. It clarifies that a direct correlation between articulation and recognition of speech sounds is observed only in some children, but not in all. Therefore, the impact of the articulation on the identification of phonemes in words exists, but it is relative, and not absolute.

2. RESULTS OF THE SECOND AND THIRD TASK OF THE RESEARCH

Here you seek the influence of the phonetic characteristics of phonemes. Results in tabular and graphic form are as follows:

Table 2  Identification of sounds in separate subtests

<table>
<thead>
<tr>
<th>Answers</th>
<th>Sounds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Number of correct answers</td>
<td>1 673</td>
</tr>
<tr>
<td>Percentage of correct answers</td>
<td>52%</td>
</tr>
</tbody>
</table>
If we compare the values of t-criterion between different sounds in the pairs, we note that they vary between 93.47 and 0.64. The comparisons with t-criterion between s-ʒ, s-r, ʒ-r, m-g, t-g show statistically insignificant differences. There are no statistically significant differences between m-t. All other comparisons show statistically significant and very significant differences and the most significant are those between s-l, ʒ-l, r-l. The seven sounds are divided into three categories:

- Easily recognizable sounds – s, ʒ, r.
- Difficult recognizable sounds – m, t, g.
- The most difficult recognizable sound l.

Apparently the children's attention is attracted by certain differential features which have the greatest perceptual effect and the highest acoustic value - s and ʒ are strong hissing sounds, r is a vibrating sound and obviously these are their most important attributes, with a greatest effect on the phoneme identification. It is very difficult to recognize the sound l as a lateral sound and it is due to the effect of this feature on the identification process. Therefore, the physical characteristics of phonemes significantly affected their identification in the words.

The four sounds (s, ʒ, l, r) are ontogenetic late, but they are not equally recognizable. This fact refutes the argument for parallel ontogenetic development of articulation and speech perception, respectively, and phonological knowledge. The strongest evidence in this regard is that the sounds are separated in categories described above in both groups, EG and KG. If articulation have a crucial role in the phoneme-perceptual and metaphonological development, the children in EG should have much better results in identification of the earlier and correct pronunciation sounds m, t, g, rather than later and
distorted sounds s, ʒ, l, r. These results clearly demonstrate the dominant role of phoneme perception over articulation.

3. RESULTS OF THE FOURTH TASK OF THE RESEARCH

Here the responses in the identification of sounds s and t in the beginning, middle and end of words are analyzed. They are only in syllables under stress and in disyllabic words with the same, 5-sound length. The results are presented in the following table.

Table 3 Correct answers depending of the sound position in the word

<table>
<thead>
<tr>
<th>Answers</th>
<th>Beginning</th>
<th>Middle</th>
<th>End</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of correct answers</td>
<td>1 003</td>
<td>500</td>
<td>568</td>
<td>2 071</td>
</tr>
<tr>
<td>Percentage of correct answers</td>
<td>48,5%</td>
<td>24,1%</td>
<td>27,4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The comparison between the beginning and middle shows value of t-criterion 138.38; between the beginning and end - 117.73, between the middle and end - 19.73. Statistical data show that the position of sound in the word, in identification of consonants in isolated words, is crucial, and that the starting position is most favorable for both ontogenetic early and ontogenetic late phonemes. Sounds in the middle and end of words are much more difficult recognizable. They are worst recognizable in the middle. The first sound of the speech chain is more distinct and therefore easier to identify. The result does not surprises - it is a confirmation of all data from studies involving segmentation procedures, and is also strong evidence of the strength of auditory-perceptual processing of verbal material. Here also we observe similarity between the EG and KG - the sound detection in the word directed towards beginning-end-middle is an identification strategy used by all children, with normal and with impaired articulation.

The study leads to the following conclusions:

1. Children with specific articulation disorders in preschool age have an ability to recognize sounds in words more hesitant than their peers without any disorders and it is a consequence of the influence of the defective articulation.
2. Ability to recognize sounds in words is not in direct correlation with the state of articulation - in some children with articulation disorders it is well developed, and in some children without disorders is not well developed.
3. Children with specific articulation disorders use identification strategies, all the same to those which children without disorders use.
4. In the identification of sound in words the phonetic features of the sound and its position in the word are essential. The most easily recognizable sounds have strong acoustic characteristics. The most favorable position of the sound in the process of its identification in isolated words is the beginning of the word, followed by the end of the word. It is most difficult to identify the sound in the middle of the word.

These facts reflect on the practices related to the development of phonological knowledge. They must be conducted first in accordance with the laws, which govern the phonological development. Secondly, the regularities of the phoneme-perceptual development should also be taken into account, which means to consider certain psycho-phonetic, not only phonological trends. The survey asks if it is necessary to develop the phonological knowledge in children with articulation disorders, considering the fact that provided this knowledge does not correlate directly with the cause of articulation disorders - injuries in the motor mechanisms of the speech. The results do not give a direct answer to this question, but having in mind the relationship between articulation and phoneme perception, on one hand, and phoneme perception and phonology, on the other, it must be assumed that in these children the development of phonological knowledge is useful for correct pronunciation as control mechanism.

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THE INFLUENCE OF BOLOGNA PROCESS ON SOCIAL AND REGIONAL INEQUALITY IN EDUCATION

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Abstract

The European Educational Community is experiencing nowadays both unifying and isolating processes. This fact is closely connected with wide distribution of Bologna Process. The desire to save national-cultural identity and at the same time the desire to be an equal member of the European society provokes educational reforms in all the countries, involved in Bologna Convention. The epoch of globalization aggravates the inequality of the countries in the sphere of education. Nowadays, we can observe that the countries that have been successfully integrated into world economy, also, have been given an opportunity to improve their educational aspects. We shouldn’t forget that Russian Education is one of the most competitive resources of our country. New situation creates the necessity to investigate the risks, connected with appearance of new social and regional educational inequalities.

Globalization processes, enveloped almost all the spheres of social relations, intensify the inequality of the countries in the sphere of education. The countries, having been given the benefits with help of integration to the world economy, were given marked improvement in education. The problem of searching of explanatory scheme for the processes of globalization and, as a result, new inequalities is extremely important for the world sociological community.

The most debatable question in professional community nowadays is the question about postmodernist sociology as a new methodology of the 21st century. In Russia, there is a tendency among older generation authoritative sociologists to introduce post-modernist social theory as a complex of original, but fragmentary ideas that are not eager to be the leading theory of a new sociological paradigm. The basic arguments of post-modernist social theory opponents are well known. These are inability to correspond to scientific standards of modernism, inability of ideas’ verification. That’s why the knowledge, being created by postmodernists, should be considered as ideology, but not as scientific knowledge. So, the question about verification shouldn’t be under the view and it should be substituted by the question about faith and confidence. Here we can observe rather wide generalization that is not limited by the scientific norms; abstract connection between post-modernist ideas and social reality. But in spite of denial of “big” social theories, post-modernists, nevertheless, follow such kind of generalization. We should notice that criticism of modern society doesn’t lead post-modernism to the development of the normative social model. Moreover, social post-modernist theory leads to the absolute pessimism; inability to share the main and secondary social problems; extreme interest to the differences; the denial of social and cultural universals; the denial of truth – and as a result, inability to work out the critical political program of actions. (6, p.557-558.). The limits and defects of post-modernist social theory have already studied and well known in scientific community, but prognostic potential of a new theory is being discussed not very active. But at the same time, the necessity in explanation of new social phenomena, impossibility to typify modern social practices with help of
well-known classical theories modern concepts make scientists appeal to new approaches, even if the authors don’t name their concepts by the term “post-modernism”.

Gnosiological basis of public and undercover applying of post-modernism concepts in sociology is a new natural-science methodology of post-non-classical system approach like synergy. The researches, being faced with the necessity of explanation and forecasting of social processes in situations of bifurcation, need to appeal to the new methodology, even if they are the opponents of post-modernism.

The interpretation of the results can be directly connected with the addressing to the post-modernism concepts (e.g. “igraization” concept of S. A. Kravchenko) or can be absolutely isolated from them (e.g. “paradoxical man” concept of Z.T. Toschenko). One of the social foundations of post-modernism concepts usage is objective process of globalization that influences on the social processes in the countries that are involved in it.

The estimation of the direction of this process by the sociologists is rather diverse, although the majority of characteristics is positive. At the same time, the contradictoriness of globalization process acts evidently. Global economy has created the atomism of production process, labour market, political organizations and societies. Globalization has extremely increased the ratio of non-military safety aspects of some countries; created new threatening.

Globalization has caused the rapid growth of inequality of the countries, the participants of global processes, in economy, technologies, informational relations, etc. Informatics advantage of the West can lead to the great gap between developed and developing countries. “In 1998 industrial highly-developed countries with 15% of the Earth population had 88% of the Internet users (the USA and Canada – more than 50%), but South Asia, with 20% of the world population, had less than 1%. On the whole, only 2% of the world population has Internet access.” The first decade of the 21st century provoked informational gap, so the gap between countries is also increasing. Internet access nowadays plays the role of indicator and at the same time barrier between rich and poor, educated and illiterate, young and old people.

Moreover, we can add the fact of inequality of information using (80% of all the sites are in English, but only 10% of the planet population knows English) and this inequality is an insuperable obstacle in the world cyberspace. The increasing social-economical and cultural gap between upper and lower social levels has been becoming more evident if we compare the income of the world richest people and the income of the whole countries. Only 1% of income of 200 world richest families is enough to teach the children all over the world in the primary school. If we look at globalization process in regard to one specific sphere of social relations, like education, we can observe all the disadvantages of classical methodology. The search of new methodology is necessary to explain and forecast the development of educational systems, at the same time it is very difficult to overcome temptation by post-modernist social theory. The process of globalization in the sphere of education is evident on both conceptual and technological levels. The concept of modern education reflects the necessity of new generation training in the informational society; the society, where the environment is the world; the society, where values are universal. Internationalization of education is rather evident in the development of the international projects. These projects are connected with the overcoming of crisis phenomena in education, with the documents, concerning the development of modern education, technologies of distance education, the idea of continuing education. All these fact give us a possibility to speak about so-called “world educational framework”.

The world educational problems would seem to prove the fact of existence “the world educational framework”. The main problem of the world society nowadays is illiteracy. More than 840 mln. of
adult population is illiterate; among them 538 mln. are women, 160 mln. of pupils are underweight in the developing countries. At the same time, since 1960 children’s mortality has decreased more than twice in developing countries. Also the number of children, who don’t attend the primary school, has decreased twice. (3, 4)

Education of the end of the 20th century experienced the contradiction of the 21st century, when the beginning of modern natural science had been appearing. Modern person exists in reality, that is not under the influence of classical determinism laws; reality, where the order, stability and equilibrium do not dominate.

The features of instability in the sphere of fundamental characteristics of the Universe that connect inner and outer worlds are the most important phenomenon of modern civilization. Modern culture is able to overcome extremely different models of reality such as intellectual-religious, where the world is represented as a set of facts and conceptions that are ordered and organized; humanist-aesthetic, where the representation of the world is connected with the human ability to live and to feel.

We can point out two different foundations on the base of two opposite models that can define modern pedagogic paradigms:

1. to transfer as much information as possible to the developing personality
2. to form “the inner world” of the person.

All educational reforms in post-soviet Russia were happening with the idea of joining to “the world educational framework”. This idea has found a lot of supporters among wide sections of the population and till nowadays it is one of the most popular social basis of Russian education modernization.

If we analyze the changes in Russian educational system, we will make a conclusion that the process of its development the last decade of the 20th century and the first of the 21st century is rather contradictory and specific.

The condition of Russian education at the end of 80th, 90th can be defined as institutional crisis and systemic renewal. All the crisis features are connected with the changes of functioning conditions of the social institution or with the changes of its functions. All the renewal features such as transition from chaos to order or seeming destruction of post-soviet education are the features of systemic properties.

Gainings and losses in the development of Russian education are not easy to classify on the base of “plus” and “minus” features, as one and the same changes can have both positive and negative consequences. For example, diversification of economical basis of educational institution has created a lot of controversial features in its development.

System of education has been considered as the element of market economy and as a result we can observe the expansion theoretical approaches to this social phenomenon. We can see that new developments and concepts have appeared in the sphere of educational service and educational methods and methodology (distant education, step-by-step forms of professional education, new types of educational institutions).

Diversification has given the freedom in the choice of strategy of the development of the educational system; has represented the possibility to have flexible policy in the sphere of education that is based on real interrelations between labour market and specialists market. Also it has stimulated the sphere
of professional development and retraining. All these positive facts of economical diversification have already stated as a social practice in post-soviet Russia

The importance of positive changes in the development of educational system under the influence of globalization processes sometimes doesn’t give a possibility to notice and pay necessary attention to some negative consequences that can be as a result of modernization.

The epoch of globalization deepens the inequality of the countries in the sphere of education. The countries that were given the best benefits after integration in the world economy also were given the benefits in education. Russian education is one of the most competitive resources of the country. At the beginning of the 21st century Russia was the 25th concerning the level of population scholarship among the countries of Davos forum, but at the same time was the last 52nd concerning all the rest social-economical parameters.

Traditionally strong sites of Russian education are its fundamentality and good natural-science training, especially in the system of Higher Education. But the last years the accumulated potential of Russian education has been destroying. One of the reasons of this phenomenon is the contradiction between specialist training (education) structure and labour market demands. And one more reason is underestimation of the specialists with Higher Education by Russian economy (inequality of a specialist’s salary and his qualification).

Hereby, globalization has both positive, innovative, dynamic process and negative process, leading to destruction and marginalization.

The world financial crisis has intensified the contradictions in the sphere of education. The typical feature of modern Russian education is the absence of systematic nature, weak coordination with the labour markets, lack of theoretical concepts development that are the basis of integrated educational framework and future professional community. Modern Higher Education is determined by the spreading of Bologna Process through Europe. In June, 1999 a number of European Secretaries of Education signed the joint declaration that was the beginning of Bologna Process. More than 10 years have passed, and as a result 33 of 45 European countries, including Russia joined Bologna Process. In 2011 all Higher Professional Education Institutions have transferred to double-step system of education: Bachelor and Master. Europe should have the integrated system of Higher Professional Education. Advantages and disadvantages of Bologna process is another question and rather considerable for a sociologist.

The reform of Russian Higher Education causes contradictory debates among teaching staff, officials, specialists in the sphere of education sociology. The official position of the Secretary of Education and Science is based on the fact that the majority of graduating students are unclaimed by the modern Russian labour markets. Thus, we can observe that the Secretary of Education in a number of his statements says that the demand of young specialists doesn’t exceed 15-20% form the total number of graduating students.

From the officials’ point of view, the transition to double-step system of education can decide this problem. The teaching staff, especially in Russian provinces, doesn’t share the officials’ optimism. They don’t think that this transition will be able to help in students’ mobility and employment. According to the experts’ estimations, approximately 80% of Russian Universities are against adoption of European system of education. (4, 34)

The employers define the Bachelors as “ half-educated persons”, defective specialists Moreover they can’t understand why the officials are not satisfied by the national system of education. According to
the estimations, done by the teaching staff of Moscow Universities, the graduating students that have
the degree of Bachelors of Sociology are not in demand on the labour market and can’t find the place
of job. N.G. Golovanova, analyzing Bachelor system as a pedagogical problem, points out the fact that
teaching community has not realized yet all social-cultural aspects and psychological-pedagogical
nature of a new “product” of Higher Education.

The term of “Bachelor” was introduced in 13th century at theological department of Paris University.
Even at that time Bachelor degree was not very popular. In 16th century the teaching staff and the
students of Germany organized the movement against Bachelor system of education as they thought
that it didn’t reflect a real level of University education. Bachelor degree causes rather mixed feelings
in modern Western Europe. Thus, the standard period of Bachelor training is 6 terms in the majority of
European countries, but in Holland and Scotland it is 8 terms.

In France and Spain Bachelor degree is given to the graduating students of senior secondary school
and gives an opportunity to enter the university. In Russia, Bachelor degree was used only in
theological academies, but in 19th century was abolished. (1, 37).

The real threat of decreasing of educational level of new Russian generations, connected with the
transition to double-step Higher Education system is evident for any sociologist. Nowadays the level
of basic secondary education is 11 years, but it is not obligatory, universal and accessible. Master
degree is considered to be as a non-obligatory part of Higher Education. Moreover this level of
education will be limited in Russian provinces. Thus, the major part of new young generation will be
able to study not more than 14015 years, but this fact contradicts the world tendency and doesn’t
correspond to the sophisticating professional world.

One of the most important problems of modern Russian education is reorganization of the basic
element of education and reforming of Higher Education. Without doubt, this problem needs the
participation of civil society. Standardization of education content, rehabilitation of educational work
at High and Higher schools, the processes of optimization of High education are not only the problems
of officials. These problems should be under the control of civil society. Otherwise, it can increase
regional inequality.

The typical example of such kind of problem is the problem of university entrants decreasing in
Russian Universities. This problem is connected with demographic drop. Thus, the number of
positions at the state Universities can exceed the number of entrants. It seems to us, that this situation
is critical and needs immediate decisions and reorganizations in the sphere of the state policy. But in
reality, this problem is the problem of existing models of Higher education, their reasonableness and
prognostic functions.

The base of this modeling should be the dynamic estimation of youth demand for the national labour
market, entrants’ number and educational needs. All these characteristics are ambiguous, they are
determined by a lot of objective and subjective factors and can change in a short period of time. It is
known, that the first decade of the 21st century is characterized by the decreasing of the population
that is younger of the working age and by the increasing of the population of the working age. It
means that labour market is oversaturated and can’t accept all the working age youth.

It is very difficult for the youth with low level of qualification and professional education to be
competitive in the labour market. The second decade of the 21st century will be characterized by the
considerable youth necessity. Thus, in 2011 the system of education should attract as many youth to
get Higher professional education as possible. The demands of labour market and challenges of the
21st century make the society modernize and modify education to do it more qualitative and long-term to give the opportunity to the new generation to be competitive.

The society of a new century is determined as the society that is based on knowledge. These facts demand from the educational system the ability to form the necessity, experience and skills of students’ continuing education and self-education. These problems can be decided with help of demographic drop. The quality of education can be improved if the teaching load is reduced, the ratio of teachers and students is changed, and qualification of the teaching staff is enhanced. In this situation all the universities and the number of the students should be kept.

All the reforms, during the crisis period, need special management strategy, where the contradictions between officials and teachers should be decided at the period of pre-projecting. The participation of the professional community is very important in this situation.

The possible way out to integrate the efforts of the university teachers from different regions is the organizing of the experts’ groups to solve the key problems of Russian education modernization within the professional communities with the possibility of public discussion and publication of the results. Social aspects of Russian education modernization, the concrete social mechanisms and programs of Russian education reorganizations should be under the control of the sociologists.

The priority social values are mentioned in the documents about modernization. These are quality, effectiveness and accessibility of education. But do these factors really work? That is the question!

The most important argument in the debates between professional community and officials, from my point of view, is the statement about the cultural basis of educational process. It concerns not only the content of teaching materials, but also traditions of organization and teaching methods. Apprehensions of the university teachers are connected with a real threat for Russian Higher education fundamentality, as it was always the competitive advantage of Russian Higher Education and was the symbol of authority in the world educational framework.

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THE RELATIONSHIP BETWEEN EDUCATION AND QUALITY OF LIFE. IMPLICATIONS OF THE LABOUR MARKET IN ROMANIA
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Abstract
Increasing the level of education is a priority for individuals and society. On the one hand, a high level of education increases the chance of adapting to labour market demands and it contributes to increasing the quality of life. On the other hand, education is dependent on the population's living conditions, which in turn it influences the participation in education. The relationship between education and the socio-economic development level confirms that a country’s development is closely related to the level of education, with consequences on the quality of life. This paper presents the two-way relationship between the investment in education and the quality of life and its effects on the labour market in Romania.

Key words: education, quality of life, labour market, productivity, economic growth

1. INTRODUCTION
This paper is based on a post-doctoral research in the field of employment of labour resources in Romania, in order to improve employment policies and quality of life. In this respect, it is important to know the two-way relationship between the investment in education and the quality of life and its effects on the labour market in Romania.

The analysis of the quality of life has a broad coverage and includes all physical, economic, social, health, educational, cultural and political conditions within which people live, and all the activities they carry out, the characteristics of relationships and processes in which they participate, the consumption models they adopt and their way and style of life. Thus, the field of the quality of life is very extensive targeting the objective welfare of individuals (occupation, income, working conditions), but also their subjective well-being (satisfaction, contentment).

In the specialty literature there are many studies on the quality of life analysis. The recent study prepared by the Franco-German Council of Ministers, (2010) highlights the importance of the analysis on the quality of life and suggests an improvement of its measurement. The authors of the Study (Christian de Boissieu, Jean-Philippe Cotis, Michel Didier, Christian Saint-Etienne, Peter Bofinger, Wolfgang Franz, Christoph M. Schmidt, Beatrice Weder di Mauro, Wolfgang Wiegard) consider that: “life is simply too complex and the demands on the statistical reporting are too diverse to allow a meaningful condensation of the current state of affairs into a single comprehensive indicator”. They propose the analysis of the quality of life along several dimensions, namely: material well being (income, consumption, change in wealth), health (life expectancy, diseases, disabilities, physical and mental illnesses, health distribution), education (pupils and students performance, life-long learning, education distribution), personal activities (work, various kinds of recreational activities, distribution
of personal activities), political voice and governance (legislative guarantees, rule of law, possibility to participate in the political process, voter turnout, non-governmental organisations, participation in protests, degree of democracy, independence of media, corruption, distribution of political voice), social connections and relationships (family relationships, friends, type of friendships, social contacts, distribution of social connections), environmental conditions (availability of clean air, water and soil, accessibility to pleasant environment next to one’s home, climate, distribution of environmental conditions), personal and economic insecurity (risk of illnesses, injuries, damages, theft, robbery, murder, death, unemployment, social exclusion, poverty, distribution of personal and economic insecurity).

The relationship between education, employment and quality of life is complex. On the one hand, the influence of education is visible in all aspects related to the welfare of the individual and his level of satisfaction. On the other hand, employment, income levels and working conditions are influenced by the educational level of the individual. Studies show that a higher level of education enables the individual a better labour market insertion, increases the chance to adapt to the labour market demands and it positively influences the quality of life. Moreover, the high level of education is the gain of a greater stability in the labour market, which reduces the default risk of unemployment. The educated people have a higher participation rate on the labour market and their period of active life is generally greater than those with lower education. Education plays a central role in preparing the individuals to enter the labour market and in equipping them with the skills necessary to engage in lifelong learning experiences. Research literature provides evidence of the value of investing in education to develop the human capital and of its contribution to the economic development and growth (Hanushek and Kimko 2000; Krueger and Lindahl 2000; Hanushek and Woessmann 2007, Giarini and Malita 2005, Spence 2009, Phelps, 1999). The primacy of education stems not only from its fundamental role in increasing the individual earnings, but also from its noneconomic benefits - such as lower infant mortality, better participation in democracy, reduced crime, and even the simple joy of learning - that enhance and enrich the quality of life and sustain development.

On the other hand, education is dependent on the population’s living conditions, which in turn it influences the participation in education. The better economic the individuals have conditions, the more possibilities they have to invest in education. Thus, there is a two-way relationship between education and quality of life: a better educated population contributes to economic growth and development and also increases the quality of life, but on the other hand, the participation in education is influenced by the quality of life and by the economic conditions.

2. EDUCATION - EMPLOYMENT - QUALITY OF LIFE RELATIONSHIP

The relationship between the education and the socio-economic development level confirms that a country’s development is closely related to the education level, with consequences on the quality of life. Nowadays, the economic analysis of education is increasingly highlighting the link between the investments in the educational human capital and in the economic growth. “The human capital is the value of the potential that people hold in order to generate income. It includes native capabilities and talent, as well as education and acquired skills. Education is the slowest, but the strongest growth factor.” (Dornbusch, R; Fischer, S: 1978)

Education is essential for any economy, on the one hand because, through education, they diversify the relations between man and society, the individual having the ability to contribute as a member of the society with something to counterbalance what he receives as a result of the coexistence with the
others. Moreover, the current economy needs well-trained workforce, in terms of globalization and technological revolution, which requires the development of skills, creativity, solid knowledge and a greater sense of responsibility.

A country’s economic performance increasingly dependents on more than the access to new technologies and their adoption of new requirements, that are imposed to the labour market in terms of training. The differences in living standards between countries are assigned according to the International Labour Office specialists especially the disparities between the levels of training and the quality of employment. Thus, the countries with high levels of education are serious competitors for the others, by increasing their ability to adapt better to new technologies, to the challenges generated by globalization.

There may be more general social benefits for a better educated population, because there is a productivity growth, and, the more time is allocated to educate a person, the more adaptable to new challenges that person becomes.

The investment in human capital can bring not only the best technological knowledge to people, but by educating the potential innovators, it leads to advanced knowledge and contributes to the economic growth.

In the modern society, as a result of changes in the labour market, of new requirements of skills and competences of individuals, the role of education is growing.

The higher the education level is, the more chances the individuals have to occupy a better position in the socio-professional hierarchy. Society in general and individuals in particular, according to the human capital theorists (Becker, Schultz), have all interest to invest time and money in education, because the benefits obtained are important on the long run.

On an individual level, a higher level of education is associated not only with job stability and increased income from employment, but also with the improvement of the living conditions, health status and quality of life.

However, education is a necessary but not sufficient condition for an individual to enjoy good labour market outcomes, whether in the formal or informal economic sectors. In addition to education, good labour market opportunities for the skilled persons require an economy as a whole to be operating well, with macroeconomic stability, an attractive investment climate, and efficient labour markets, in addition to other factors.

In all the world states it was found that extending the duration of training for a growing number of individuals and even if it does not always provide a well-paid job and certainly has a high intrinsic value by transmitting knowledge, values, principles and rules which govern society, thereby it contributes to the strengthening of its social cohesion.

Given the major implications of education on the quality of life of individuals and the on the development of economy, concerns in the field have widened in the past years, especially in the developed countries. At EU level, the increase of education level of the population has become one of the priority objectives of the Lisbon Strategy, Europe 2020. By achieving this objective it is aimed the labour productivity growth, the lowering of unemployment, a better labour market insertion of young people, a growth in people’s participation in education and life-long training.
To support a Europe where people can develop the right skill mix to perform in and shape jobs, there should be stronger bridges between work, education and training. So we need an improved capacity to anticipate changes.

Globalization and developing a new economy require a growing number of completely new and evolving professions. This development puts pressure on a new paradigm in the learning systems, focusing on education, on lifelong learning, on forms of non-formal and non-conventional education. Thus, after the Lisbon conference, the educational and training components included in the guidelines were strengthened to emphasize the need for the Member States together with the social partners to develop and implement a coherent and comprehensive lifetime education and training. There are made references regarding the need to "equip young people with basic skills relevant to employment", to "reduce the illiteracy among young people", to "reduce substantially the number of young people who leave school".

Research shows that the family environment, the level of resources and living conditions influence the education and the individual participation in education. The first effect of the poor living conditions is the early dropout from the education system, with serious implications on the future status of the individual in terms of the insertion in the labour market, level of income obtained, risks of unemployment and poverty.

There is evidence that the individuals and families who have financial capital can invest both in education directly by purchasing books, supplies, accommodation, transport and school fees and indirectly through health care, providing optimal study conditions. On the contrary material and financial instability discourages the establishment of educational objectives on the long-run and affects the family environment, the mental and intellectual development of the young people.

Statistics show that usually the individuals who have low incomes also have low education, facing difficulties in finding employment, with social integration problems and the chances to send this situation on to their descendants are high. Research shows that parents demonstrating more interest in their child’s schooling, with higher levels of aspirations for them, had children with higher levels of self-efficacy and academic belief.

Thus, the residence environment and the educational level are important factors that contribute to having unequal opportunities for education access and success of the individuals and consequently, they reduce the chances of having better living conditions in the future.

An important aspect in analyzing the relationship between the quality of life and education is knowing the factors that determine young people to leave school too early. The European Union defines early school leavers as 18 to 24 year olds who have only lower secondary education level and do not attend further education and training. Young people who are not in education, employment or training are disproportionately likely to have experienced poor attainment at school, low motivation, truancy, homelessness, poverty, lack of family support, health problems, special educational needs, disabilities or unemployment in the family. Many have had negative school experiences and faced issues such as bullying, exclusion, behavioural difficulties and stress. Some young people from relatively poor backgrounds find it difficult to progress into further education or training as they struggle to cope financially or they feel pressure to begin contributing to family finances. For some young people, finding an opportunity to earn money, by whatever means, becomes a priority over continuing their education or training. Young school leavers tend to become locked in a cycle of recurrent unemployment and low-skilled, short-term employment more often than young people with higher level of qualifications.
When the Education and training 2010 benchmark was established in 2001 at 10%, almost one in six young people aged 18-24 were early school leavers. Since then, there has been a reduction in the rate of early school leaving of 3%, from 17.6% in 2000 to 14.8% in 2007. The patterns of progress are diverse between EU countries. In 2007 only six Member States reached the benchmark target and five of these were already below the target in 2000. Five of these six countries are the Czech Republic, Lithuania, Poland, Slovakia and Slovenia. Finland is the only longer-standing EU country, where the early school leaving rate was below the Lisbon target throughout the reference period. Early school leaving rates are also below the target in Iceland and Norway. The southern European countries Spain, Italy, Malta, and Portugal, followed by Bulgaria and Romania, remain the furthest from the EU benchmark. Some of the greatest reductions in the proportion of early school leavers have been seen in Bulgaria, Cyprus, Malta, Portugal and Slovenia. A reverse trend has been witnessed in six EU Member States, with the most significant reversal in Sweden. (See figure 1).

Early school leaving has far-reaching individual, social, economic, cultural and political implications. These include short, medium and long-term effects and can be direct or indirect. So, the costs of school failure can be:

- **private costs**, such as:
  - higher unemployment incidence and unemployment duration,
  - higher own discount rate, i.e. valuing less present relative to future income, thus being willing to invest in human or other capital,
  - lower initial and lifetime earnings and own health status,
  - less risk aversion and lifelong learning participation,
  - lower lifetime satisfaction.

- **social costs**: 

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**Figure 1.** Early school leaving in the European Union, 2000-07;

Source: Guiding at-risk youth through learning to work, CEDEFOP, 2010
increased criminality and higher police and criminal justice expenditure,
lower rate of economic growth,
lower intergenerational effects on children and parents,
lower public health status,
lower social cohesion,
higher unemployment,
lower tax revenues.

Children and young people represent the highest leverage point for investments to build the human capital because the benefits of investments have the longest possible period to accrue (World Bank, 2009). This has been confirmed by many national studies. For example, Ecorys in the Netherlands has calculated that the cost of early school leaving for the Dutch society can reach EUR 1.8 million per person over the course of his/her lifetime.

The decisions a young person makes in the first few years after leaving education have a huge impact on their future prospects. Although the initial transition is only the beginning of a working life that normally lasts several decades, many studies have shown that initial job outcomes have a lasting affect on the career development. Transition is a significant step and it is essential that young people to be equipped with the knowledge and support they need.

The factors affecting the transition from education to employment are diverse, such as: labour market conditions, industrial structure and occupational change, population’s skills levels and education system structures, employment protection legislation and youth cohort sizes. Other related issues include the levels of young people leaving school without a basic education qualification, as well as the nature of skills acquired in school and their suitability for the labour market.

The current economic crisis has made the transition from school to work even more difficult for young jobseekers, in particular for the early school leavers (OECD, 2009). Young people with low levels of education are the ones having the toughest time finding a job, as they now have to compete for a smaller number of available jobs against their qualified and skilled peers. It is expected that countries will continue to be affected by the consequences of high and persistent youth unemployment for some time after the recovery is well underway. This is likely to make school-to-work transitions longer, across European countries.

3. THE CHARACTERISTICS OF THE RELATIONSHIP BETWEEN EDUCATION - EMPLOYMENT AND QUALITY OF LIFE IN ROMANIA

The studies made in Romania have revealed that the individuals are aware of the difficulties and labour market changes, so that having a job is associated by about 90% of the population with a quality life (Mărginean, 2005).

According to the recent research in the field, overall, the quality of life in Romania recorded impairment, thus many of the indicators examined in 2010 returned to the values of 1999. (Quality of life in Romania, 2010). The matters analyzed in the specialized research aim the progress of household income, access to education, labour market integration, population health status, working conditions, the quality of the social environment.
Regarding the education and employment situation, with implications on the quality of life in Romania, we can mention the following:

- the access to education in Romania is highly dependent on the social and economic factors as well as on the area of residence. In Romania, in order to ensure a quality education for the individual, a major responsibility is placed on the family level, the social and family circumstances substantially influence a child's educational path. Between them, the economic standard of the family is very important. Young people living in remote rural areas of Romania have lower school completion rates than their peers living in cities. A national study concluded that, at the end of 2006 almost 20% of the pupils in lower secondary schools in rural areas were registered as drop-outs in comparison to only 5.5% in urban areas (Ministry of Education, Research and Youth, 2008).

- the education level of the parents greatly influences the education level of the young people. Thus, from the correlation of parental level of education with the one of the young people it could be seen that:
  - 87.4% of young people coming from families with higher education left school after graduating from an educational institution at the same level;
  - 67.7% of the young people whose parents have an average educational level did not graduate from college and they limited themselves to the same training level;
  - in the case of young people coming from families with low education, 52.5% left education after finishing not more than a secondary school, while, 47.4% exceeded the education level of their parents leaving education after graduating from an average (44.9%) or even higher education (2.5%).

- according to the graduated profile we see that the technical graduates integrate in the labour market more quickly (average time elapsed from graduation to first job was 4 months), on the opposite side we find the legal science graduates who need an average of 6.3 months to find a job.

- an important issue arising from the studies made in Romania, is the one that refers to the low share of the Romanian population that considers that education is a revenue generator factor. The revenue of the rural population is much lower than one of the urban population. A low quality of life, given by the economic and cultural insecurity as well as by a negative perception of the accessibility of education are not in a position to support the young people living in such households and to encourage them to continue their studies.

- regarding the university graduates, there is a relatively better insertion on the labour market in Romania (60.9% one year after graduation). The graduates from technical education integrate the fastest on the labour market and the most difficult is for the ones from law field. The economic education graduates are on average regarding the period of time to find a job.

- one year after graduation, 60.9% of university graduates had a job, and among people with low education level only 14.6%.

- most graduates (44.2%) found a job through friends, relatives or acquaintances, which reveals the difficulty of labour market insertion of young people. This might also suggest the existence of certain labour market functional rigidities in Romania. These rigidities are also outlined by large disparities between residential environments in respect to the origin of higher education graduates, i.e. the location of jobs which signals a potential underdevelopment of the rural environment.
in 2010 the unemployment rate reached a value twice of that in 2008 and the employment rate decreased significantly in the last year. Under these conditions, assessing the chances to obtain a job indicates an increase in pessimism and a situation similar to that of 1999. After a period of economic development, accompanied by an increase in the rate of employment, the economic crisis of the past two years has brought significant changes, both in the state and private sector. The share of employed persons has decreased in Romania over the past year, falling below the European average (58.6% vs. 64.6% EU average). Unemployment in Romania is still below the European average, but it is significantly increasing compared to 2007 and 2008 values. Among women, the employment rate is even lower (52% compared to 58.6% EU 27 average) and among the population in the age group 55-64 the percentage of employed population was 42.6% (EU average is 46%).

from the European Institute for Statistics' data (Eurostat) we see that Romania occupied, in 2008, the last position of the 27 countries in terms of population income. The average disposable income per person per year in Romania is Euro 2323, income expressed in euro as equivalent per person in the household, compared to the maximum value recorded by Luxembourg, EUR 35 448.

one third of the population believes that income does not even cover the basic necessities and another third that it is only enough for the basic necessities. Very few households (14%) manage to save and nearly half of the households (46%) say they can not deal with the monthly expenses.

4. CONCLUSIONS

Experts consider that the young people transition from school to work has become longer and more difficult now than in the past few decades (OECD). Today few of the young people leaving the education system manage to integrate quickly into the labour market and to secure the newly gained position. The high rates of youth unemployment and the significant incidence of underemployment among them indicate important difficulties which young people experience in the transition from school to work. This phenomenon occurs not only in the developing countries but also in the advanced economies where the active measures and support programs are well developed. The prolongation of the transition period from school to work is explained by several factors, most important of which are the restructuring and economic developments, the proliferation of new forms of employment, unemployment among youth, changes in the social protection systems, the extension of the educational period.

The systems of education and training are challenged to generate new skills to meet the demands of new jobs that will be created in the new economy and to improve the labour market insertion of young people and ability to adapt and professionally integrate the adults who are already active.

The labour productivity growth is one of the most important solutions in developing a healthy economy; it depends very much on the quality of labour. Therefore, the employment policies and strategies should follow the increase of investment in human resources, investment in training of young/adult at the company level, providing the access to the relevant information on education and training opportunities.

The national labour market problems in Romania are generally caused by a reciprocal relationship with the economic growth level – the new jobs created are insufficient, the adaptability and mobility of the workforce are maintained at low levels, which require strategic approaches to reduce the discrepancies between supply and demand for the professional qualifications of the labour market.
It is necessary the correlation, through various methods of structures and content of education and labour training, with the current and future economic needs; the increase of the level of education and access to education to gain greater stability in the labour market, which implicitly reduces the risk of unemployment and allows a "soft" insertion on the labour market; the participation in continuing professional training, increased labour mobility, which can improve the economic position of young people; labour market flexibility, which plays an important role in absorbing the newcomers. This shows the market capacity to respond to the changes that occur in the economic and social environment. It should be noted that in the recent years flexibility has been placed in spotlight in terms of specific labour market policies. Thus, through flexibility there is a greater adaptation to new things, to change.

In the current economic crisis, exacerbated by the organizational failure and coordination of macroeconomic policies, Romania must pursue the modernization of labour market infrastructure, adapt the educational system to the market requirements to revive the scientific research and innovation, with emphasis on the relevance of economic practice, to pursue a more flexible labour market and assure the necessary conditions for the development of a competitive environment.

The analysis of the relationship between the quality of life and education shows that in a society there can not be a high level of quality of life with a low education level of the population. Both the quantity and quality of education are key determinants of the socio-economic development of a country. Quality education, a percentage as high as possible of school enrolment, an educated population from an appropriate age not only ensure the recovery of investment in education, but also obtaining benefits at both individual and social level: growing the living standards of the population, improving quality and productivity of labour, health, quality of life.

ACKNOWLEDGEMENTS:

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UNIVERSALITY AND SPECIFICITY OF THE DEVELOPMENT OF PHONOLOGICAL AWARENESS BY BULGARIAN CHILDREN

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Abstract

The phonological awareness is a single, unified ability that is manifested through various skills in the development of man but is influenced by the specific effect of the phonological system of each language. It is related to the structure of words and depends on the cognitive problems included in it.

In the empirical research of 137 Bulgarian children between the age of 4 and 7 the general sequence of the development of phonological awareness is confirmed: 1) with increasing age children become more sensitive to small and increasingly smaller linguistic elements; 2) children can identify similar and different sounds within a word before they can manipulate the phonemes in it; 3) children refine their skills of the acquired task while learning a next, more complex level.

Meanwhile, the research established the following more specific characteristic features of the Bulgarian children: comparatively lower results in the tests of rhyming; almost identical results when testing items for segmentation of sentence and segmentation of words; and finally, high averages in the tasks of manipulation (syllable and phoneme level).

The phonological awareness at preschool age is divided into early implicit sensitivity to sound similarity and later explicit awareness of phonemes.

Key words: phonological awareness; structure of the word; syllable level; onset/rime level; phoneme level;

1. INTRODUCTION

1.1 Universality of the Phonological Knowledge

The concept - "phonological awareness" started appearing in the scientific fiction at the end of 1970 and the beginning of 1980 (Runge, Watkins, 2006). Usually, phonological awareness is a widely accepted term and is used as an „umbrella” term, labelling all levels of aware cognition about the sound elements in speech. Many definitions are introduced about the phonological awareness, each of which is based on a comparatively well developed theoretical basis, or some of them - on empirical support. The alternative definitions differentiate and variegate by the range of the different abilities (levels) of the phonological awareness. The idea that the phonological awareness depends on the performed tasks and the size of the sound units on which the tasks are focused, is developing.

Methodically, by examinations, using a great number of children, quantities and developed statistical methods of processing, a unified construction of the phonological awareness is determined — i.e., the phonological awareness is accepted as a unified cognitive ability, which is manifested by the behaviour through various abilities (Anthony & Lonigan, 2004). On the other hand, we consider, that the phonological awareness includes five levels of linguistic abilities (rhyming, phoneme
identification, blending, segmentation and manipulation), which follow consistent hierarchy of development and get into a continuum of levels of complexity (Chard & Dickson, 1999).

What is specified in terms of the discussed phenomenon is that phonological awareness refers to the structure of the word, and not to its importance. On the other hand, a new idea is being developed that phonological awareness depends on the fulfilled tasks and the size of the focused phonological units. Contemporary phonological theories are focusing on the non-linear and hierarchic nature of the phonological form and are analyzing the connection between the phonological units in words in non-linear structure (Gillon, 2004; Стоянова 2009). The analysis of the phonological structure of words at hierarchic level contributes to the understanding that phonological awareness is represented at different levels. The differences between the skills of phonological awareness, based on the sound structure of words, are determined by the focus of the given tasks and the aimed level – on the syllable, as a whole, and its structural elements such as consonant onset and rime – or on the single phoneme segments.

Anthony (2005) characterizes this sequence with the following regularity: First, with the growth of age children become more sensitive to the smaller parts of the words. Secondly, children can identify similar and different sounds within a word, before they are able to manipulate with sounds. Lastly, children refine their abilities of the already gained task of the phonological awareness simultaneously with the studying of the next more difficult level of phonological awareness, which is contrary to the theory of the stage development (Anthony, 2005). Long before the children are able to understand explicitly the phonological structure of the words, they begin to develop implicit phonological cognition, which enables them to reach a better competence regarding listening and speaking in their maternal language. Implicit phonological awareness helps children to take the right decision when saying which words are in their maternal language. It also gives the opportunity of self-correction of spoken mistakes and develops the child’s ability to discriminate the admissible versions from the inadmissible ones of the spoken words. Daskalova (Даскалова, 1994) notes that exceptionally good sensitivity to language is inbred in children from 2 to 5. A perfect example of this is children’s verbal creations. The author specifies that children between the age of 5 and 6 already are at a certain level of awareness of the basic language elements.

During the last decade of the XX c. there two relatively independent tendencies by the phonological awareness of children are being confirmed. On one hand, Goswami and Bryant (1990) note that during preschool and early school period of development children go through 3 stages of phonological awareness: awareness of syllables, awareness of onset and rime and finally, stage of phoneme awareness. Gombert (1992) presents a different concept of the matter. He suggests that phonological awareness should be divided into 2 basic types: epilinguistic awareness and metalinguistic awareness. The epilinguistic awareness is composed of global sensitivity to the similarity between speech sounds, while the metalinguistic awareness is composed of the realization of phonological segments in words – the phonemes. In maintenance of this opinion there is proof that little children use global strategies to assimilate words when solving given tasks related to phonological awareness (Carroll, Snowling, 2011)

1.2 Specificity of the Phonological Knowledge

Although phonological awareness develops from large units of sound to small units of sound which is universal across languages, the rate that speakers of different languages progress through (the sequence and the proficiency), varies at each level (Anthony, 2005). The differences connected with language are systematic and the fact that phonological awareness is formed earlier at an earlier start of
tuition and introduction to the concepts of literacy, supports the idea that experience in labial language plays an important role on its development.

Scientists have begun to discover the characteristics of oral language that take care of the development of particular phonological awareness skills. Here there are some examples. Vowel and consonant harmony are likely to influence on the development of phoneme awareness (Durgunoglu, Oney, 1999). Saliency and complexity of onsets in spoken language may influence on the development of onset awareness and phoneme awareness. Karpova (1987, by Tsenova /Ценова/, 2008) determines about the Russian phonological system that only 22% from 5-7-year-old children can separate consonants as well as vowels in words. Caravolas and Bruck (1993) found preliterate English-speaking children were better than preliterate Czechspeaking children at isolating single onsets (onsets with one consonant), which is an onset–rime awareness skill. One way to index the saliency of a linguistic unit in a language is by the number of phonological neighbors—words in the language that share a same-sounding unit. (Antony, 2005). Research done again in Poland in 2005 reveals that phonological knowledge goes through own ontogenesis and its development runs successively: from awareness of syllables and rhymes, through awareness of oversyllable units (alliterations), to phonemic knowledge (segmentation and operation).

Another conclusion is that children in linguistic environments where spoken syllables are highly salient, as determined by a number of factors, develop syllable awareness sooner than children in linguistic environments where syllables are less salient. (Cossu, Shankweiler, Liberman, Katz, & Tola, 1988; Demont & Gombert, 1996; Durgunoglu &Oney, 1999). According to the examinations of Lipovska, connected with the Polish phonological system (Germakovskaia /Гермаковская/, 2005), a normally developing child manages to make a syllable analysis and synthesis of words and to differentiate auditorily quasi-homonyms in its mother tongue round the fourth year. Daskalova (Даскалова, 1994, p. 236) notes that ‘Bulgarian children are adjusting quickly to the accent-syllable structure of words’ and that ‘the work on its practical awareness is exceptionally important not only for the successful liquidation of literacy in school but also to the correctness of writing’.

Not a lesser speciality is that determinants of linguistic complexity other than word structure also influence on the phonological awareness. The development of phoneme awareness is also affected by articulatory factors that contribute to the linguistic complexity of words (Treiman, Broderick, Tincoff, & Rodriguez, 1998). Data on the articulatory complexity of the Bulgarian sounds we can get from Tsenova (Ценова, 2008) and Stoyanova (Стойanova, 2009) in connection with the phased assimilation of phonemic diversity of the Bulgarian language.

2.PRESENT RESEARCH

The experimental study, presented in this presentation, is part of a more global survey to 137 Bulgarian children from 4 to 7 years old, which covers the characteristics of phonological knowledge (rhyming, blending, identification, segmentation and manipulation of linguistic units) and their relations with the speed of naming.

2.1The purpose

The purpose of this study is to examine the components that form the phonological knowledge of the Bulgarian children from 4 to 7 years old and their continuum in degrees of complexity.

On the other hand, this research sets its task of checking the two basic theories of child’s development, namely, is it going through 3 stages – awareness of syllable, awareness of beginning and end of rhyme
and stage of phoneme awareness; or is it divided into implicit and explicit.

2.2 The hypothesis

The hypothesis of this study is that phonological awareness in Bulgarian children: 1) follows the common sequence of development, characteristic of different language systems, 2) increases with the growth of chronological age of children, and 3) passes through specific variants of sequence and gaining experience, determined by the characteristics of spoken Bulgarian language.

2.3. Participants

Participants of the study include 137 children aged between 4 and 7 years (72 boys - 53% and 66 girls - 47%). For the study children were selected randomly and represent a variety of academic achievements. Certain restrictions are included - the Bulgarian language is essential for children and they have special educational needs.

Several instruments were taken directly from previous research, others were adapted from measures used in previous research (Shtereva K., 2008), and some were created specifically for the present study. Each test included at least three practice items for which feedback was given to ensure that students understood the task.

2.4. Criteria of selection

Criteria of selection of implements cover: five types of tasks: rhyme, sound categorization, blending, segmenting, and manipulation; two response method - „recognition” and „production”; sound representation – oral representation and picture representation.; linguistic unit - sentence, compound word, multisyllable, single-syllable, onset-rime, phoneme; phoneme position - beginning, middle, end; phonological properties – variety of phoneme, phoneme combination, syllable, lexical and sentence structures.

2.5. Assessment Battery

I. Rhyme - Test 1: Rhyme Recognition - The child was asked to recognize whether two orally presented words rhymed. Test 2: Rhyme Production - It was composed of 10 items that ask the child to produce a rhyme when given a stimulus word.

II. Classification - Test 3, 4, 5: Identification of phoneme (beginning, middle and end position). The child was required to orally produce the sounds (beginning, middle and end position) in the word. Test 6, 7: Categorization of phoneme (beginning and end position) - this 10-item measure asked children to identify one picture out of three that had the same initial/ending phoneme as a target picture.. Test 8, 9: Categorization Production (beginning and end position). The child was asked to produce an oral response to a specific linguistic unit.

III. Manipulation Recognition - Test 10 and 11 (syllable, phoneme): The examiner presented the child with four pictures and identified each of them. The examiner then asked the child to mark the picture that showed the word that would become when a specific linguistic unit was removed (syllable, phoneme).

IV. Blending Recognition - Test 12 and 13 (syllable, phoneme): The examiner identified four pictures for the child. Next, the examiner spoke the stimulus linguistic units (syllable, phoneme) at a rate of one unit per second. The child was required to mark the picture that depicted the stimulus linguistic units when blended together.
V. Segmenting Recognition - Тест 14, 15 и 16 (sentence, syllable, phoneme). The examiner made an utterance, presented by pictures (sentence, syllable, phoneme), and the child recognized the number of words, syllable and phonemes articulated by tapping a pencil on a hard surface. For example, the examiner stated, “Tap this pencil for every …”. Partial point was not given.

When compiling the data, the results are reported on individual test protocols, where correct answers are marked with "1" point and wrong - with "0" points.

Children perform the tasks in two sessions lasting between 20 and 30 minutes. In carrying out statistical process is used the program SPSS.

3. RESULTS AND DISCUSSION

To test the hypothesis, aiming at the analysis of common sequence in the development of phonological awareness in Bulgarian children, data from the descriptive statistics have been used. By Table 1 is presented continuum of degrees of complexity of the 16 subtests of phonological knowledge concerning the Bulgarian children aged 4 to 7 years (from the easiest skill to implement the most complex).

To establish the presence of increasing capacity of phonological knowledge with growth of age, single-fact analysis called ANOVA was made. Table 2 illustrates the between-group difference between the tasks of rhyming (F = 69.63, P = 0.00) and classification (F = 73.60, P = 0.00), manipulation (F = 20.84, P = 0.00), blending (F = 23.25, P = 0.00) and segmentation (F = 72.66, P = 0.00). Results confirmed that the absorption of phonological knowledge increases significantly with the growth of chronological age between 4 and 7 years.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Average means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blending Recognition / syllable /</td>
<td>9.5</td>
</tr>
<tr>
<td>Classification Identification Recognition /beginning phoneme /</td>
<td>8.1</td>
</tr>
<tr>
<td>Classification, Categorization Recognition /beginning phoneme /</td>
<td>7.7</td>
</tr>
<tr>
<td>Rhyme Recognition</td>
<td>7.3</td>
</tr>
<tr>
<td>Blending Recognition / phoneme /</td>
<td>7.0</td>
</tr>
<tr>
<td>Segmenting Recognition /sentence/</td>
<td>6.6</td>
</tr>
<tr>
<td>Segmenting Recognition /syllable/</td>
<td>6.5</td>
</tr>
<tr>
<td>Manipulation Recognition /syllable /</td>
<td>5.9</td>
</tr>
<tr>
<td>Manipulation Recognition /phoneme /</td>
<td>5.9</td>
</tr>
<tr>
<td>Classification Identification Recognition /end phoneme /</td>
<td>5.8</td>
</tr>
<tr>
<td>Classification Categorization Recognition /end phoneme /</td>
<td>5.8</td>
</tr>
<tr>
<td>Classification Production /beginning phoneme /</td>
<td>5.2</td>
</tr>
</tbody>
</table>
In a more detailed overview of the development of phonological knowledge of Bulgarian children, we should note that the task of blending a word by its syllabic structure, while the most difficult task is to reproduce, i.e. refer to any word that rhymes with the model or ends with the same sound as suggested by the examiners. Children cope with the categorization of initial phoneme comparatively well, either by separating it from the word or by locating a picture that begins with the target sound. Interestingly, as noted in most research, Bulgarian children deal better with recognition of words that rhyme, but this is not the easiest operation for them, as it is, for example, by English speaking children (Chard & Dickson, 1999). This is most likely due to the fact that a much greater variety of sound combinations is manifested at the beginning of words in the Bulgarian language than at the end of them (Boyadjiev, Тилков /Бояджиев, Тилков/, 1999; Anthony, 2005). Of course, the reason may be held in the Bulgarian educational system for kindergarten children, in which there is no covered program for working with rhymes and rhyme-forms, unlike English. The present study also shows that by children of Bulgarian origin segmentation of sentence into words and segmentation of words into syllables are the next level components (in difficulty) that are almost at the same level. On the next hierarchical step are the tasks of manipulation with syllable and phoneme. Before the most difficult tasks associated with the reproduction of rhymes and reproduction of words with the same ending phoneme, ranks the ability of children to classify phonemes in the middle of a word.

We can generalize that this study duplicates the results, defining the laws of common sequence of development of phonological awareness, proven through many tests, surveys of people of different ages, with different languages and reading levels (Anthony, 2005), namely: First, children become increasingly sensitive to smaller and smaller parts of words as they grow older. Second, children can detect similar- and dissimilar-sounding words before they can manipulate sounds within words, and children can generally blend phonological information before they can segment phonological information of the same linguistic complexity. Finally, children refine phonological awareness skills they have already acquired while they are learning new phonological awareness skills, contrary to the strict stage theory of development. The presented study determines the following more specific characteristics of the Bulgarian children: lower scores in tests of rhyming, almost identical results

### Table 2- Generalization of group difference (ANOVA)

<table>
<thead>
<tr>
<th>Variable quantity</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhyme</td>
<td>29.63</td>
<td>0.00</td>
</tr>
<tr>
<td>Classification</td>
<td>73.61</td>
<td>0.00</td>
</tr>
<tr>
<td>Manipulation</td>
<td>20.84</td>
<td>0.00</td>
</tr>
<tr>
<td>Blending</td>
<td>23.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Segmenting</td>
<td>72.66</td>
<td>0.00</td>
</tr>
</tbody>
</table>
when testing for item segmentation of words and sentences, and finally, relatively high average results by the items of manipulation (syllable and phoneme level).

In connection with the discussion of the two basic theories for development of phonological awareness the obtained results are debated on the basis of the average arithmetic values of the separate levels of phonological awareness.

Figure 1 shows the average arithmetic values: at syllable level – \( X = 7.3 \); at onset/rime level – \( X = 7.6 \) at phoneme level – \( X = 5.4 \). In the analysis are included the following subtests, reflecting tasks at separate phonological levels (syllable level – segmentation, manipulation, blending). The figure shows that determining the onset for the researched children is the easiest, followed by rhyme and then syllable levels. Awareness, on its part, is significantly easier for Bulgarian children than determining the rhyme component, Cognitive tasks related to phoneme level are the hardest.

Figure 1 – Average arithmetic values of the values of phonological awareness

The data in this research prove the hypothesis of Gombert (1992) that the development of phonological awareness is divided into implicit and explicit realization and they prove the fact that small children use global strategies to assimilate sounds when solving the given tasks. The facts noted here are also supported by other scientific data. Byrne and Fielding-Barnsley (1993) emphasize that the initial implicit phonological awareness during preschool age is a natural result of the construction of the lexicon. Foy and Mann (2001) show evidence that phonological tasks concerning the linguistic units rhyme and phoneme, include fundamentally different processes and that realization of rhymes and realization of phonemes are different abilities.

In conclusion, development of the phonological awareness at preschool age reflects the change from global to segmented phonological representation.
4. DIRECTIONS OF FUTURE RESEARCH

The findings here provide another opportunity for continuing the research in several aspects: firstly, by extending the number of participants and cover a greater range of children from different regions of Bulgaria, the test battery can be standardized and serve as an extremely accurate tool in diagnosis, on the other hand, it is appropriate if this research is conducted among children at the beginning of the first year of primary school, and the results are compared with their level of reading at the end of the school year, to reveal to what extent the level of phonological knowledge determines the process results in reading.

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The article discusses results of research on knowledge workers and their management. Knowledge workers are emerging group of employees. While agricultural and industrial worlds depended on the work of manual workers and the life standard of their inhabitants grew due to the increase of manual worker productivity, existing knowledge economy depends on the work of knowledge workers and the labor productivity they can achieve. It is well known that knowledge workers are those who are responsible for the growth of advanced economies (Mládková, 2009). Knowledge is of intangible character and we cannot follow the way how knowledge workers work. It makes their management difficult. The research started in autumn 2010. It is a quantitative research and it is based on the questionnaire. Up till now we have questionnaires filled by more than 260 respondents. The research provides us with answers to questions concerning knowledge workers and their management. Questions on knowledge workers examine who are knowledge workers, which dimension of knowledge they use when working, how they learn their knowledge, if they share it and how they work. Questions on management of knowledge workers examine how knowledge workers are and should be managed. The research continues but results we collected up till now give interesting view on problematic of knowledge workers and their management.

**Key words:** knowledge, knowledge worker, tacit and explicit knowledge, management of knowledge workers

### 1. INTRODUCTION

Literature specifies that knowledge workers represent more than half of all employees in advanced economies. Peter Drucker is the author of the term knowledge worker. In general knowledge workers are people who, when working, use their brain more than their muscles. Knowledge workers can be identified in any culture and in any phase of humankind development. However, technologic and social changes in the 20th Century caused a remarkable increase in their numbers in organizations in advanced economies. While agricultural and industrial worlds depended on the work of manual workers and the life standard of their inhabitants and the success of agricultural and industrial organizations grew due to the increase of manual worker productivity, existing knowledge economy depends on the work of knowledge workers and the labor productivity they can achieve. Knowledge workers are those who are responsible for the growth of advanced economies. Organizations that employ a high percentage of knowledge workers and are able to use their potential are successful in the long run. Despite this managers often know very little about knowledge workers, the way they work and create values, how to improve and increase their efficiency and labor productivity and about ways to manage them. Managers who try to manage knowledge workers using tools developed for the management of manual workers can still be identified in organizations. This of course is counterproductive (Kelemen et al, 2010).
2. KNOWLEDGE WORKERS

There is no one single definition of knowledge worker in the literature. The first to use the term knowledge worker was Peter Drucker (1954). Knowledge worker, by Drucker is:

- A person who has knowledge important for the organization and often is the only person who has it.
- A person who can use the knowledge in work.
- The knowledge is partly subconscious; the worker may not know about it or may not understand its importance. Other employees of the organization have a limited approach to the knowledge, they cannot learn it (it is demanding on time or finances or is impossible as they do not have the knowledge or skills to develop it) or they cannot or are not allowed to use it (knowledge is linked to some certificate or diploma).
- Knowledge workers often work intellectually, but this is not a rule.

Drucker (1954) predicted that knowledge workers will be creators of values in future. Fifty years after his prediction we must admit that he was right.

Alvin Toffler (1990) understands typical knowledge worker as a scientists, an engineer or a person who operates sophisticated technology. By him, knowledge worker must be able to create and improve his technological knowledge or manage technological knowledge of co-workers.

Jack Vinson from Northwestern University wrote that knowledge worker is every employee who uses his brain more than hands. Knowledge workers depend on their knowledge and ability to learn, even though they work with hands (Vinson, 2009).

Thomas Davenport (2005) sees knowledge workers as people with high degrees of expertise, education, or experience. By Davenport, the primary purpose of knowledge workers’ job involves the creation, distribution, or application of knowledge. Knowledge workers think for a living (Davenport, 2005).

Reboul (2006) summarizes:

- Knowledge worker’s main work tool is his brain. Therefore losing a KW for a company is a loss of its capital, too.
- Knowledge worker uses knowledge at his work – he creates, distributes or applies explicit as well as tacit knowledge.
- Knowledge worker’s position requires continuous learning and improving.
- Processing information and data requires creating a high added value on this information.
- The individuals change the job. He goes his own way. Two knowledge workers would not do the same job.
- Productivity and quality of his work are hard to measure.
- Knowledge worker manage their days. Their positions require creativity, innovation and problem solving skills. That is why knowledge workers don’t like to be told how to do things.

Jonathan B. Spira in internet discussion concludes: “We can, in part, describe knowledge workers in terms of what they are not. They are not factory workers, they are not laborers, they are not farm or
field workers (the term "out in the field" notwithstanding). But that doesn’t tell us very much. Many, but not all, knowledge workers are office workers. Some, but not all, are managers or white-collar workers. Some, but not all, are professionals, such as doctors or lawyers.” (Spira, 2008).

Alle (2002) and Shawn (2007) think that the term 'knowledge worker' is now a meaningless concept in developed countries because the shift Drucker started to notice in the '50s from jobs requiring manual work to jobs requiring knowledge work is now complete (Mládková, 2009).

Knowledge workers and their management rise interests of both theorists and managers. Practical aspect of knowledge workers’ management is very important. Due to intangibility of knowledge, knowledge workers cannot be managed in the traditional way (Mládková, 2011).

3. PREVIOUS RESEARCHES ON MANAGEMENT OF KNOWLEDGE WORKERS

Even though many researches have been done on the topic of motivation, we have found only one research focused on knowledge workers in the literature. It is a research of Gallup Organization on motivation and management of so called talented employees. Over 25 year long research was focused on employees’ performance and loyalty to their organizations. Term “talented people” is close to our term knowledge workers and results of the research are fully applicable to this group of employees (Buckingham, Coffman, 2005).

Analysis of huge amount of data identified twelve key factors that influence behavior of an employee in an organization. These factors are needed to attract, focus and keep knowledge workers in the company. Factors are formed as questions employees ask themselves and are listed from the basic ones to more advanced ones:

1. Do I know what is expected of me at work?
2. Do I have the materials and equipment I need to do my work right?
3. At work, do I have the opportunity to do what I do best every day?
4. In the last seven days, have I received recognition or praise for good work?
5. Does my supervisor, or someone at work, seem to care about me as a person?
6. Is there someone at work who encourages my development?
7. At work, do my opinions seem to count?
8. Does the mission/purpose of my company make me feel like my work is important?
9. Are my co-workers committed to doing quality work?
10. Do I have a best friend at work?
11. In the last six months, have I talked with someone about my progress?
12. At work, have I had opportunities to learn and grow? (Buckingham, Coffman, 2005)

Researchers tested twelve factors in 24 different organizations from 12 industries. Organizations were divided to 2500 “business units” (industry x factory, banking x branch). Interviewed employees evaluated each question on the scale from 1 (strongly disagree) to 5 (strongly agree), 105 thousand employees participated. The analysis of research showed strong link between answers of employees and success of the “business unit.” Units where employees responded more positively were more
successful. Many companies accommodated both successful and non-successful units, e.g. employee performance and loyalty did not depend on corporate HR policy and benefits. Researchers developed the hypothesis, that major factor influencing productivity and loyalty of employees is the employee direct manager. To verify it they did additional research in extremely successful retailer employing about thirty-seven thousand people in three hundred stores, seventy-five percent of employees participated in the research. The differences among stores turned out to be enormous. The research verified the hypothesis. Whatever is the corporate policy and rules, the behavior and performance of knowledge workers influences the one, who is above them, their direct manager (Buckingham, Coffman, 2005) (Kelement at al, 2010).

4. RESEARCH ON MANAGEMENT OF KNOWLEDGE WORKERS

The research on knowledge workers and their management started in autumn 2010. The main hypothesis is that managing knowledge workers in traditional way is contra productive. We think that knowledge workers prefer different style of management. The research is a quantitative research and it is based on the questionnaire. The questionnaire has two main parts and includes 24 questions. The first part of the questionnaire provides answer to important questions concerning knowledge workers. It helps us to separate respondents who are non-knowledge from respondents who are knowledge workers, gives answer on role of tacit knowledge in the knowledge work and helps us to identify important aspects of management of knowledge workers. E.g. the first part of the questionnaire identifies a respondent (question 1-3) and determines if he is the knowledge worker (question 4-9), how he developed knowledge he uses in his work (question 10), how he sees his personality and his viewpoints on styles of management and managerial tools in relation to the productivity of knowledge work (question 12-15).

The second part of the questionnaire is only for respondents who are managers. Its main purpose is to find out which styles of management managers of knowledge workers use and what they think about their knowledge workers. We examine if a manager is an expert in his subordinates’ specialization (question 16), we examine which style of management he prefers (questions 17-21) and what is his opinion on knowledge workers (question 22-24). Questions are constructed as closed questions. Respondents choose from given options or evaluate given options on the Likert scale. Some of closed questions offer option of commentary. Five levels were used for the Likert scale; poor, under average, average, over average and excellent. Poor and under average evaluation indicates that the factor is not important, over average and excellent evaluation indicates that the factor is important.

Respondents fill the questionnaire without supervision of researchers. Questions are constructed so that they did not indicate what may be “correct answer” (Mládková, 2011).

Most of respondents were combine students of the Police University of the Czech Republic. We decided for them because they work in security sector as policemen, firemen, and soldiers or in various positions in the public administration, e.g. their jobs are knowledge intensive jobs. Students of distant program Economy and Management from University of Economics, Prague also answered our questionnaire but this group of respondents was much smaller.

This article covers the most important part of the research, part dedicated to management of knowledge workers.
5. FACTORS THAT POSITIVELY INFLUENCE PRODUCTIVITY OF KNOWLEDGE WORKERS

Important part of the Research on knowledge workers and their management is focused on factors that support and inhibit productivity of knowledge workers. Question on which factors improve performance of knowledge workers examines following factors: colleagues and their performance, salary, professional pride, availability of necessary contacts, availability of necessary knowledge, style of management of direct managers, HR policy and benefits (question on benefits was asked only by 125 respondents).

Table 1. Factors that positively influence performance of knowledge workers

<table>
<thead>
<tr>
<th>Factor</th>
<th>Poor</th>
<th>Under average</th>
<th>Average</th>
<th>Over average</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colleagues and their performance</td>
<td>10</td>
<td>19</td>
<td>63</td>
<td>80</td>
<td>65</td>
</tr>
<tr>
<td>Salary</td>
<td>14</td>
<td>27</td>
<td>57</td>
<td>93</td>
<td>61</td>
</tr>
<tr>
<td>Professional pride</td>
<td>7</td>
<td>27</td>
<td>66</td>
<td>86</td>
<td>48</td>
</tr>
<tr>
<td>Availability of necessary contacts</td>
<td>10</td>
<td>31</td>
<td>93</td>
<td>71</td>
<td>39</td>
</tr>
<tr>
<td>Availability of necessary knowledge</td>
<td>4</td>
<td>13</td>
<td>69</td>
<td>101</td>
<td>52</td>
</tr>
<tr>
<td>Style I am managed</td>
<td>26</td>
<td>36</td>
<td>75</td>
<td>71</td>
<td>33</td>
</tr>
<tr>
<td>HR policy of organization</td>
<td>35</td>
<td>57</td>
<td>68</td>
<td>57</td>
<td>20</td>
</tr>
<tr>
<td>Benefits (only 125 respondents)</td>
<td>17</td>
<td>44</td>
<td>33</td>
<td>23</td>
<td>8</td>
</tr>
</tbody>
</table>

As table 1 shows, respondents gave highest importance to availability of knowledge, 59% respondents gave availability of knowledge over average or excellent evaluation. Second are the colleagues and their performance, 56% of respondents gave that factor over average or excellent evaluation. The third is professional pride, 51% of respondents see it in two highest levels of the scale. Opposite to the Gallup research, salary was given great importance, 45% or respondents evaluated is as important. Availability of necessary contacts was given importance by 42% of respondents (36% understand its importance as average) and to style of management by 40%. HR policy and benefits had the lowest evaluation, HR policy 30% and benefits 24% which corresponds with findings of the Gallup research.

6. FACTORS THAT NEGATIVELY INFLUENCE PRODUCTIVITY OF KNOWLEDGE WORKERS

Question on negative influence of factors provided respondents the similar factors as the question on positive factors; professional pride and benefits were not included as it is supposed that their influence
is not negative; on the other hand we included administration as we know that administrative burden is a factor that tortures knowledge workers in many organizations.

### Table 2. Factors that negatively influence performance of knowledge workers

<table>
<thead>
<tr>
<th>Factor</th>
<th>Poor</th>
<th>%</th>
<th>Under average</th>
<th>%</th>
<th>Average</th>
<th>%</th>
<th>Over average</th>
<th>%</th>
<th>Excellent</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colleagues and their performance</td>
<td>42</td>
<td>16</td>
<td>44</td>
<td>17</td>
<td>77</td>
<td>30</td>
<td>43</td>
<td>17</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td>Salary</td>
<td>20</td>
<td>8</td>
<td>45</td>
<td>17</td>
<td>71</td>
<td>27</td>
<td>58</td>
<td>22</td>
<td>34</td>
<td>13</td>
</tr>
<tr>
<td>Availability of necessary contacts</td>
<td>26</td>
<td>10</td>
<td>32</td>
<td>12</td>
<td>101</td>
<td>39</td>
<td>44</td>
<td>17</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Availability of necessary knowledge</td>
<td>30</td>
<td>12</td>
<td>37</td>
<td>14</td>
<td>97</td>
<td>37</td>
<td>43</td>
<td>17</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Style I am managed</td>
<td>25</td>
<td>10</td>
<td>34</td>
<td>13</td>
<td>77</td>
<td>30</td>
<td>68</td>
<td>26</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>Administration</td>
<td>23</td>
<td>9</td>
<td>32</td>
<td>12</td>
<td>94</td>
<td>36</td>
<td>59</td>
<td>23</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>HR policy of organization</td>
<td>18</td>
<td>7</td>
<td>41</td>
<td>16</td>
<td>74</td>
<td>28</td>
<td>58</td>
<td>22</td>
<td>32</td>
<td>12</td>
</tr>
</tbody>
</table>

Results on factors that negatively influence performance of knowledge workers are not so significant as results on positive influence. Table 2 verifies results of table 1. Factors availability of knowledge and contacts importance is low (23% and 21% of respondents evaluated it as important) which means that this factor influence performance in positive way. Factor colleagues and their importance were found important by 27% of respondents. Factors that achieved highest score were style of management, 35% of respondents finds it important, salary which was important for 35% of respondents, HR policy, important for 34% of respondents and administrative burden important for 33% of respondents. These results indicate possible negative influence of style of management and HR policy which is compatible with for example F. Herzberg’s theory of two factors (Veber, 2000).

### 7. HOW KNOWLEDGE WORKERS WANT TO BE MANAGED

The research also examined what knowledge workers think about the appropriate style of management, e.g. how they would like to be managed.

The highest importance was achieved by the factor manager should create appropriate environment for my work; 68% of respondents finds it important. Second highest score was given the factor manager intensively communicates with me; 57%. 33% of respondents find important that their manager does not intervene to their work, 30% of them would like to be coached. As for control, percentage of respondents who want to be controlled and who do not want to be controlled is the same, 20%. Integration of personal objectives with corporate objectives is understood as important by 23% of respondents.
Table 3. What I would like my manager to do

<table>
<thead>
<tr>
<th>Factor</th>
<th>Poor</th>
<th>Under average</th>
<th>Average</th>
<th>Over average</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>∑</td>
<td>%</td>
<td>∑</td>
<td>%</td>
<td>∑</td>
</tr>
<tr>
<td>Intensively communicates with me</td>
<td>12</td>
<td>5</td>
<td>13</td>
<td>5</td>
<td>59</td>
</tr>
<tr>
<td>Controls me</td>
<td>13</td>
<td>5</td>
<td>39</td>
<td>15</td>
<td>126</td>
</tr>
<tr>
<td>Do not intervene to my work</td>
<td>15</td>
<td>6</td>
<td>34</td>
<td>13</td>
<td>85</td>
</tr>
<tr>
<td>Coaches me</td>
<td>24</td>
<td>9</td>
<td>46</td>
<td>18</td>
<td>64</td>
</tr>
<tr>
<td>Creates appropriate environment for my work</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td>Integrates my objectives with objectives of organization</td>
<td>8</td>
<td>3</td>
<td>15</td>
<td>6</td>
<td>69</td>
</tr>
</tbody>
</table>

8. CONCLUSIONS

The research on knowledge workers and their management started in fall 2010 by the pilot project and continued in spring 2011. Up till now we interviewed 260 respondents. The research examines who are knowledge workers, how they get knowledge important for their work, which type of knowledge they work with. Key part of the research is the part focused on management of knowledge workers. We are interested on what improves and inhibits performance of knowledge workers and how they would like to be managed.

The results of the part of the Research discussed in this article indicate importance of factors availability of knowledge (59%), colleagues and their performance (56%), professional pride (51%) and salary (45%). These factors positively influence performance of knowledge workers.

Results on factors that negatively influence performance of knowledge workers are not so significant as results on positive influence. Factors that achieved highest score were style of management, 36% of respondents finds it important, salary which was important for 35% of respondents, HR policy important for 34% of respondents and administrative burden important for 33% of respondents.

As for the desired style of management the highest importance was achieved by the factor manager should create appropriate environment for my work; 68% of respondents finds it important. Second highest score was given to the factor manager intensively communicates with me; it is 57%. Results for the factor control are surprising; percentage of respondents who want to be controlled and who do not want to be controlled is the same, 20%.

It is generally perceived that knowledge workers like autonomy, independent work and want their managers to support them. Results of the Research on knowledge workers and their management indicate that this is true. The research indentified two specialties; salary is an important factor supportive to the performance and the importance give to control was relatively high. We explain these findings by our cultural specifics. Our culture is traditionally hierarchical and our employees, even though knowledge workers are afraid of responsibility. Under such circumstances, they do not mind to be controlled by their manager.
ACKNOWLEDGEMENTS
The author would like to thank all respondents for their help and patience.

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E-LEARNING IN THE CLOUDS: EXPERIENCE AT THE KAUNAS UNIVERSITY OF TECHNOLOGY

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Abstract

Cloud computing technologies have changed the way how students and lectures participate in learning process. This paper presents an investigation of education institutions usage of the cloud computing in e-learning. Advantages and disadvantages of cloud computing for education are given. Authors of the paper demonstrate a case study of cloud computing solution – MS Live@edu application in information technology courses at Kaunas University of Technology. The practice of e-learning environment MS Live@edu is summarized by explaining advantages it gives both for lecturers and students.

Key words: cloud computing, e-learning, MS Live@edu

1. INTRODUCTION

Educational institutions have become dependent on the information technologies to support skill providing for students. The technologies available today have made knowledge available to students. They offer great possibilities for the access and style of learning. Information is presented in so many ways that any learner can find and use the necessary material. Students are using virtual world technologies in a classroom to communicate, express ideas, and form relationships based on interests. This fact relates not only to the Internet, but also to all the many technological improvements in learning.

The problem is that not all schools often have ability to take full advantage of the newest information technologies: many schools suffer from insufficient information technology infrastructure and do not have sufficient hardware or software to give students a comprehensive learning.

The educational institutions don’t know, that the problem can be solved through the one of the newest technologies—cloud computing. It offers a way to expand the abilities for education. The cloud computing technologies take some advantages:

- ability to collaborate within the virtual world;
- accessible 24/7;
- allow students to apply skills and knowledge to model solutions not available in a regular classroom;
- provide a larger community within which students can learn from others.
Some educational institutions are beginning to take advantage of applications like email, word processing, spreadsheets, presentations, collaboration and much more. Such applications are hosted on dynamic and expanding clouds that enable end users performing tasks, which earlier traditionally required site licensing, installation, and maintenance. These applications are executed using web browser, while the software and files are housed in the clouds.

The aim of this paper is investigation of how cloud computing can be applied for learning (e-learning in this case). Tasks of the research are:

- Exploring cloud computing services for educational organizations;
- Emphasis on advantages and disadvantages of cloud computing for learning;
- Experience analysis of the Kaunas University of Technology in that context.

The next sections of the paper present: investigation of advantages and disadvantages of cloud computing for education and case study of application of cloud computing for e-learning at Kaunas University of Technology.

2. CLOUD COMPUTING IN EDUCATION

Cloud computing is one of the most talked about and an important term in the world of Information Technology. Cloud computing is a term being used a lot, e.g. in (Vaquero et al. (2009) it is stated that more than 22 definitions currently exist in the literature.

The cloud is the term for networked computers that distribute processing power, applications, and large systems among many machines. Cloud-based applications do not run on a single computer; instead, they are spread over a distributed cluster, using storage space and computing resources from many available computers as needed.

The National Institute of Standards and Technology (The National …, 2011) defines cloud computing “as a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with the minimal management effort or service provider interaction.”

The new technology offers many advantages to educational organizations:

- It frees them from on-site server and data management, ensures that users always have the latest documents and software, and reduces the requirements and costs associated with security of data;
- It offers a range of online tools and services that provide secure communication and collaboration capabilities improving students’ technological skills;
- It lets teachers and students create, access, share, and publish writing projects, class schedules, web pages, and much more.

Unfortunately, not all educational institutions often use the new information technology. Figure 1 presents percentages for cloud usage in different industrial sectors. By the survey that has been completed by (Gartner, 2009) one can see that cloud computing is being used widely in the areas of finance and business while compared to other sectors, e.g. schools and education services where “clouds” are comparatively rarely used – only 4 percent.
Cloud computing services are grouped into three types cloud services: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).

![Fig. 1. Percentages for cloud usage in different industrial sectors.](image)

The first type applications takes on-demand computing and storage to host, scale, and manage applications and services. Data centers offer the infrastructure on which such applications are built and run. The second set of cloud services consists of an operating system, a fully relational database, message-based service bus, and a claims-based access controller providing security-enhanced connectivity and federated access for on-premise applications. The services offer sheer computing resources without a development platform layer. The final set of cloud services take a single function (such as email) that are generally accessed through a web browser and that use the cloud for processing power and data storage. This is currently of most interest in e-learning.

Educational institutions are beginning to take advantage of existing applications hosted on a cloud. Today’s cloud platforms such as Microsoft and Google are providing free services to students and staff at educational institutions. These services include mail, messaging and collaboration tools (for instance, email, contact lists, calendars), office applications (document storage, creation and sharing) and platform applications (the ability to create websites or learning management systems) (Sclater, 2010). Cloud computing is a significant alternative today’s educational perspective. Students and
teachers have the opportunity to quickly and economically access various application platforms and resources through the web pages on-demand.

The advantages that come with cloud computing can help resolve some of the common challenges while supporting education institution.

Many papers like (Schools ...; 2010; Tuncay, 2010; Sclater, 2010; etc) mark the benefits and challenges of cloud computing for the educational sector. We have summarized only main benefits (see Table 1) that service providers take for free in Lithuania.

Table 1. Advantages of cloud computing for educational institutions.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Learning platforms: applications as services are running over the Internet on a scalable infrastructure | • Innovative companies supports the latest tools and features for free to the educational sector in many countries;  
• The companies offer email services. They provide alumni long-term, primary e-mail addresses and other applications that they can use to collaborate and communicate online;  
• Educational environments contain other collaboration tools such as instant messaging with calendar and contact management software. Possibilities for communication and collaboration are increasingly enhanced;  
• There are also document creation applications with word processed documents, spreadsheets and presentations. These documents can all be edited collaboratively with other users through internet. Users do not need any background knowledge of the services. |
| Economies of School IT: cloud computing gives better choice and flexibility to IT departments | • Cloud computing allows for cost and energy efficient centralization of school infrastructures and helps reduce IT infrastructure costs, such as maintenance;  
• Online tools help the organization protect itself from spam and malware. It makes sense for institutions who cannot justify the costs of purchasing, maintaining and supporting hardware and software themselves;  
• Servers provide software applications, operating systems through Internet access, rather than having them installed and maintained on each platform separately;  
• Educational institutions are also beginning to use lower level cloud services for purposes such as data storage. This may be attractive where data security is of lower concern such as where video and audio is provided as open educational resources. |
| Enhanced access: provide students and staff anytime, anywhere, any device access to the latest technology tools and services | • Browser-based applications are accessible with a variety of computer and even mobile platforms, making these tools available anywhere the Internet can be accessed;  
• Many applications such as word processing, spreadsheets, presentations, databases and more can all be accessed from a web browser.  
• The students can work on the cloud, cooperate with team members and share knowledge and be sure that they won’t leave behind their homework assignments when they go to school. Since they are on the cloud, they can access them anywhere, be it home or school. |
The new technology cloud computing can enhance traditional methods of learning but cannot replace the human touch. Along with the advantages for using cloud computing services in the education institutions some researchers will bring up some of the disadvantages. We have summarized only main benefits (Table 2). These disadvantages may differ, depending on the provider.

**Table 2.** Disadvantages of cloud computing for educational institutions.

<table>
<thead>
<tr>
<th>Disadvantages</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data security</td>
<td>• Institutions may consider that their data is more secure if it is hosted within the institution; &lt;br&gt;• Transferring data to a third party for hosting in a remote data centre, not under the control of the institution and the location of which may not be known presents a risk; &lt;br&gt;• Institutions are afraid that cloud computing - and remote connections also - might pose security threats to them and to their company; &lt;br&gt;• Organization data is at the mercy of a third-party company.</td>
</tr>
<tr>
<td>Loss of control to another party</td>
<td>• Customers often do not have control over the remote servers, their software, or their security; &lt;br&gt;• Providers will target users with unsolicited email or advertising.</td>
</tr>
<tr>
<td>Lock-in</td>
<td>• Institution will become “locked-in” to the products of a particular provider; &lt;br&gt;• There are significant difficult in migrating from any widely used system. It may be difficult (or even impossible) to migrate massive amounts of data from the provider.</td>
</tr>
</tbody>
</table>

Students and teachers in Lithuania educational institutions often use cloud computing benefits that take Google and Microsoft companies for free.

Google offers web-based applications for email, calendaring, word processing, spreadsheets, drawing, presentations, collaboration, websites, and video. These products are called Google Docs. Microsoft also offers web-based applications for e-mail, calendaring, instant messaging, video chat, and mobile e-mail. Their product is called Microsoft Live@edu. Both these solutions are becoming very popular in universities of Lithuania.

Microsoft and Google are in hot competition. Both companies are happy to give educational institutions free cloud email and collaboration services. Table 3 lists some of the differences between the companies’ collaboration applications, document storing and sharing (based on (Choosing …, 2011; IT …, 2011; Keir, 2011; Prepare …, 2011).

According to Microsoft, Live@edu is now available in more than 10000 schools in over 130 countries and serves 11 million people worldwide. Kaunas University of Technology made a choice based on Microsoft Live@edu for student needs because of the benefits one can see in the table below as well as due to familiarity of majority with MS Office.
Table 3. Google Apps for Education vs. Microsoft Live@edu.

<table>
<thead>
<tr>
<th>Applications</th>
<th>Google Apps for Education</th>
<th>Microsoft Live@edu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email and Calendaring</td>
<td>Gmail&lt;br&gt;Free email with over 7 GB of storage; schedule of meetings and events, calendars and Gmail for mobile</td>
<td>Outlook Live e-mail service built on Exchange 2010;&lt;br&gt;Free 10 GB mailbox for email, calendar, and contacts; email forwarding to Windows Mobile or iPhone</td>
</tr>
<tr>
<td>Communications</td>
<td>Google Talk&lt;br&gt;Chat from desktop; send and receive files; PC only</td>
<td>Messenger&lt;br&gt;Live chat, voice, and video communication on computer and mobile device</td>
</tr>
<tr>
<td>Websites</td>
<td>Google Sites&lt;br&gt;Create Web sites and incorporate photos, videos, calendars, and more</td>
<td>Spaces&lt;br&gt;Online workspace for collaboration</td>
</tr>
<tr>
<td>Office document sharing</td>
<td>Google Docs&lt;br&gt;Create, store and share documents, spreadsheets, presentations, drawing and forms online</td>
<td>Office Live&lt;br&gt;Access, edit, and share documents, spreadsheets, presentations from anywhere.</td>
</tr>
<tr>
<td>Free file storage space on Web</td>
<td>-------------------&lt;br&gt;Not have, but varies only with the type of file.</td>
<td>SkyDrive&lt;br&gt;Store, access, and share files anywhere online with 25 GB of storage</td>
</tr>
<tr>
<td>Groups</td>
<td>Organize with favorites and folders, choose to follow along via email, and quickly find unread posts</td>
<td>Enable users to create their social groups for sharing, discussion and coordination.</td>
</tr>
<tr>
<td>File types supported</td>
<td>Only Google Documents; but many competing product formats can be imported from, and exported to.</td>
<td>All file types in SkyDrive, Ms Office files in Office Live</td>
</tr>
</tbody>
</table>

3. EXPERIENCE AT THE KAUNAS UNIVERSITY OF TECHNOLOGY

The section presents a case study of successful practice of using MS Live@edu as a mean of communication and collaboration between lecturers and students during 3 academic years. The e-learning environment is used for delivering about 10 IT oriented courses for approximately 700 students. The environment with education features attracts with these main facilities: profile customization, discussions and live chats, possibilities to publish and share documents on internet drives, time planning for individuals and groups, integrated internet office. Following we present outline of the main features teachers and students successfully use in the courses of innovative information technologies.
Fig. 2. General structure of course web site under MS Live@edu.

Fig. 3. Personal profile features at MS Live@edu.
Fig. 4. Benefits of MS Live@edu with respect to types of learning.

General structure of course web site under MS Live@edu (see Fig.2) comprises of three basic parts – SkyDrive virtual hard drive, membership administration of the course users and communication facilities. The last one is very important because it ensures online and offline exchange of Q&A’s between students and teachers. Calendar facility assists in time planning and scheduling, while Q&A’s is used for notification and other communication message interchange. User administration facility beside its main feature to process course members enables teacher to track the number of active users participating in the course activity. The virtual hard drive SkyDrive lets to storage all related courseware.

MS Live@edu system allows users customize their working environment (see Fig.3) by publishing personal information, pictures, create and join networks of interests, use personal virtual hard drive as well as to use planning and communication features explained earlier. Additionally, every user can use Web Office Applications to process their documents directly on site.

Cloud computing solution — MS Live@edu is used for two basic models of course delivery:

**Model A**— traditional distance learning

- Teacher uses course virtual drive and integrated Web Office Applications for delivering lectures. All related material is stored in one place;
- Students and teachers accessing their files from personal virtual drives as at labs, as at home or other places. No portable media is needed.

**Model B**— traditional face-to-face learning

- Students enrolled to a course have access to courseware that is stored in course virtual disk;
- Discussions are actively used for communication between students and teachers on course specific themes;
- Real-time chats are used for student-to-student and teacher-to teacher communications;
- Calendar and reminder service as well as Outlook is actively used for time planning and scheduling;
- Profile customization features and social networking make education environment more users friendly that assists in learning.

Extramural course

- Teacher uses course virtual drive and integrated Web Office Applications for delivering lectures. All related material is stored in one place;
- Students and teachers accessing their files from personal virtual drives as at labs, as at home or other places. No portable media is needed.

Full time tuition

- Remote students use course virtual drive for storing their accomplished assignments or web-links;
- Teacher uses membership administration facility to track a number of active students participating in the course;
- Real-time chat is used by teachers for consulting remote students;
- Web Office Applications integrated into MS Live@edu used for extended consultations while both teacher and student edit the same document and the teacher is able to make some tips in real time;
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- Profile customization features and social networking make education environment more users friendly that assists in learning.
A. Traditional distance learning;  
B. Traditional face-to-face learning.

Benefits of MS Live@edu usage for both are outlined in Figure 4.

Cloud computing e-learning environment is engineered with a focus on mutual communication and social networking, so it becomes more enjoyable to use and more useful over time. The environment is user-friendly and we see many advantages to using MS Live@edu services that are summarized in Table 4 with respect to different perspectives.

### Table 4. Benefits of using the MS Live@edu from different perspectives

<table>
<thead>
<tr>
<th>Teacher perspective</th>
<th>Student perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Create, develop and manage study environment;</td>
<td></td>
</tr>
<tr>
<td>2. Manage the number of subscriptions to a course;</td>
<td></td>
</tr>
<tr>
<td>3. Use of virtual drive for personal and course purposes;</td>
<td></td>
</tr>
<tr>
<td>4. Collaboration by discussions, document sharing and groups;</td>
<td></td>
</tr>
<tr>
<td>5. Publish events in a calendar;</td>
<td></td>
</tr>
<tr>
<td>6. Get&amp;Take real-time consultations.</td>
<td></td>
</tr>
<tr>
<td>7. Customize environment;</td>
<td></td>
</tr>
</tbody>
</table>

In order to evaluate usefulness of e-learning environment we have accomplished a review asking both involved teachers (their number is 6) and students (number of replies is approximately 700) about importance of certain feature of MS Live@edu (0 - not used, 5 is very important) during the course and after the course. Following figure 5 depicts evaluation metrics.

MS Live@edu evaluation metric show that cloud computing education environment is actively used as during the course, as after its accomplishment. Research of MS Live@edu environment for educational purposes was summarized by explaining advantages it gives both for lecturers and for students.

### 4. CONCLUSION

This paper presented an investigation of education institutions usage of the cloud computing in e-learning. We can conclude that cloud computing is a significant alternative today’s educational perspective and take abilities to provide smart formal and informal learning. Students and teachers have the opportunity to quickly access various application platforms and resources through the web pages on-demand.

It can be concluded that cloud computing for education purposes is currently at an early stage. “Clouds” are comparatively rarely used – only 4 percent.

Cloud Computing can provide many advantages. But there are pros and cons to this type of web-based computing. Advantages and disadvantages of cloud computing for education are given.
Provided analysis of cloud computing solution – MS Live@edu application in information technology courses at Kaunas University of Technology - summarized the practice of e-learning environment MS Live@edu by explaining advantages it gives both for lecturers and students.

REFERENCES


RESEARCH WORK AS THE CONDITION OF IMPROVING EDUCATIONAL PROCESS

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Abstract

The article describes the main features of scientific research performed by students in higher education institutions of the Russian Federation. As an example, the authors describe in detail how students’ research work is organized in Kursk State University. The obvious advantages of embedding scientific research into the educational process are stated. Research work contributes greatly to the professional and personal development of the specialist, giving way to creative thinking and non-standard problem solving. Research laboratories and scientific societies in the structure of the Natural Geography Department of Kursk State University give a wide range of possibilities for scientific research and education to both students and the faculty.

Key words: research work, educational process, research and education centre

1. INTRODUCTION

The urgency of the problem of improving the educational process at higher educational institutions is caused by the necessity of its development as an open self-optimizing social and pedagogical system under the conditions characterized by a variety of educational needs of the person and requirements of the society and economy, by the development of ICT and the integrated cyberspace and the rising importance of a person’s mental potential (Strihanova 2002). One of the essential goals at the present stage is to increase the professional level of scientific manpower with higher education and to reveal the talented youth for the replenishment of scientific and pedagogical professional community of higher educational institutions.

2. THE RESULTS OF THE WORK

According to the Federal State Educational Standard of higher education in the Russian Federation, an integral part of the training process for a bachelor’s or master’s degree is the combined system of research work. The implementation of the basic educational programs in the sphere of Biology promotes the formation of the following general cultural and professional competences of the students:

- creativity and system thinking abilities;
- ability to carry out innovative activities;
- abilities to adaptation and increasing one’s scientific and cultural level;
- scope for initiative, including risk situations, being capable to take full responsibility and capable to search of decisions in non-standard situations;
• ability to get new knowledge and skills independently by means of information technologies and to use those in practical activities, including the new fields of knowledge which are not directly connected with the sphere of one’s activity;

• capabilities to analyze available information without external assistance, to reveal fundamental problems, to issue the challenge and carry out field and laboratory biological studies at the point of solving specific professional problems and tasks with use of modern equipment and computing facilities, showing responsibility for the quality of works and scientific reliability of results;

• being able to compile, present and report on the results of research and industrial engineering works professionally, due to the prescribed forms;

• skills for applying methodological foundations of planning and performing field and laboratory researches in biology and ecology using modern equipment and computing complexes, to generate new ideas and methodological decisions;

• ability to use different modern computer technologies without external assistance for solving various research, technological and industrial problems of professional activity, for gathering and analyzing biological information;

• skills for using the awareness of the normative documents regulating the organization and techniques of scientific research and industrial engineering works in the sphere of biology, abilities to supervise the working staff and to provide measures of industrial safety.

For the purpose of formation and development of professional competences of the students, active and interactive forms of carrying out the lessons are used in the educational process in the combination with out-of-class work. However one of the basic active methods of acquiring professional competences is research work. It becomes more and more important indicator of development of the higher education system. Therefore the problem of accustoming the students to research activities today is one of priorities for both society development as a whole and for the particular person. The modern student should master not only the necessary scope of fundamental and special knowledge, but also certain skills for the creative solution of practical problems (Litvyk 2006).

The reorganization of the structure and contents of higher education, the development of academic and economic independence of high schools, and also some new requirements to the educational level of specialists and their competitiveness in the matters of open employment, dictated by the conditions of the modern society – all these define the necessity of improving the system of students’ research work as one of the components of the educational process, by means of enriching it with new methodological approaches, organizational forms, the use of new stimuli, as well as the accumulation, analysis and adoption of practical experience (Shudesova G).

One of promising forms of research work organization at a higher education institution which indicates its successfulness is the functioning of research and education centres created on its basis; their primary tasks are:

• involving talented bachelors and undergraduates into work in the subject areas of the centres;

• realization of projects within the limits of federal target programs, grants of domestic and foreign funds;

• negotiating of contracts with the leading domestic and foreign organizations and enterprises;

• replenishment of material resources of the educational institution with modern scientific equipment;
• elaboration of the experimental basis of doctoral theses created by the faculty (scientists, lecturers,
instructors), and the development of theses in subject areas of the centres;

• patenting the objects of intellectual property.

On the basis of research and education centres many possibilities are provided, both for the
organization of joint scientific researches within the most topical trends, and for involving students,
post-graduate students, teachers and employees of various establishments to scientific research, as well
as for the introduction of results into the educational process and into practice. This integration is not
only the essential component of continuing education of the qualified bachelors, masters and post-
graduate students, who are capable to use creative methods individually and collectively for solving
professional scientific and technical problems, to apply the achievements of scientific and technical
progress in practical activities. Moreover, integration is a factor of success for involved
establishments, and it is a means of improving employees’ professional skills.

As for works management in a research and education centre, the supervising function belongs to the
teacher who is the expert in the field of the problem chosen by the student. Research activity provides
carrying out of original researches, comparison of the data, analysis of theories and opinions of
different authors, development of a personal opinion concerning the investigated problem. The
described system of students’ research work helps higher educational institutions to prepare specialists
with creative thinking who are capable to elaborate non-standard innovative ideas, which is really
necessary for successful development of science and the country’s industry.

At the Department of Natural Geography of Kursk State University, research work is the integral
component of training qualified experts, both bachelors and masters. This work is offers a continuation
of preceding educational programs and deepening of knowledge within the limits of the educational
process, it is normally organized directly in the workrooms of related subdepartments: Zoology and
the Theory of Evolution Subdepartment, Botany Subdepartment, General Biology Subdepartment and
Ecology Subdepartment. Also the studies are organized in scientific units of the Parasitology research
laboratory and the laboratory of Monitoring of Environmental Objects. The research work of students
within the educational process includes:

• performance of tasks, elaboration of course papers and final qualification works containing elements
  of scientific research;

• performance of particular non-typical tasks of research character during field practical training;

• studying of the theoretical foundations of scientific research techniques, problem definition, the ways
  of organizing and carrying out scientific research, planning and the organization of research
  experiments, processing and analyzing the scientific data during the course of Research Activity
  Fundamentals.

The elements of research work are embedded into the schedule starting from the first year of studies
through practical and laboratory lessons, gradually expanding all the time. However students are
involved in "serious" scientific work for the first time when they develop course projects on modern
problems of biology. They carry out original researches in specialized laboratories in cooperation with
post-graduate students and under the guidance of research assistants and the faculty of the department
(Romanenko 2006).

Joint research activity contributes to the improvement of theoretical and practical knowledge, formation
of scientific competences of students and post-graduate students, activation of creative scientific
search under the supervision of scientists and experts. Independent research work of students reveals
the research abilities and skills of each student – this includes the performance of research tasks, gathering the material, studying the scientific literature, processing of the obtained data, preparation for various public events, etc. All the above mentioned creates conditions for creativity and individualism in scientific activities.

Various forms of work provide the broadening of the sphere of scientific interest of students. Thus at there is tradition of several years to arrange regular sessions of a biological society "Parasitologist" the members of which are workers of the Parasitology scientific research laboratory, post-graduate students of Zoology and the Evolution Theory Subdepartment, students of the Department of Natural Geography; some pupils of municipal high schools of Kursk and Kursk region also take part. Pressing problems of parasitology are set forth for discussion. The topics of scientific sessions are: “Modern parasitology and its role in the biological safeguarding”, “Parasitic illnesses of human beings and animals in the twenty-first century”, etc.

In 2009 the research and education centre "Parasitology" was created within the structure of the university department. This is an organizational department which purpose is practical organization and coordination of activities of the faculty, post-graduate students and students of Kursk State University in the field of scientific research on parasitology problems, the organization of scientific and methodological maintenance of works on ecological and hygienic education of children and youth.

The research and education centre of Parasitology was developed by means of close cooperation with leading establishments of Russia and some other counties which is aimed at the successful realization of scientific and practical problems in the field of parasitology. The centre has all the necessary modern equipment for the implementation of scientific research. The work of the team is supervised by Doctor of Biology, professor N.S.Malysheva. The staff of the research and education centre includes 3 professors, 14 associate professors having a wide experience in the field of education, 10 research assistants, 11 post-graduate students, 41 students of the Natural Geography Department.

The members of the research and education centre carry out scientific researches in the following areas:

• ecological and parasitologic monitoring of various objects of environment; inversionsations of the host fauna and parasitocenosis in the territory of Kursk region;
• studying the features of circulation of parasitic causative agents under the conditions of high anthropogenic load; forecasting the risks of parasitic infections for humans and animals;
• improving the methods of ecological and parasitologic researches with the testing of modern technical devices and authorised products;
• realization of the comprehensive approach to the prevention of parasitic illnesses;
• formation of ecological and hygienic habits among all classes of society.

Special attention is given to the investigation of ecological and biological features of circulation of parasitic causative agents in specially protected natural territories and territories with high anthropogenic load.

The members of the research and education centre conduct active research work on the popularization of scientific research among the students. It contributes to the involving of students in scientific work (directly from the first year of studies) if they wish to receive deeper knowledge of high quality and some skills in the selected specialty, and to develop the intellectual and creative abilities. Such
students show great erudition, better progress, passion and enthusiasm, firmness of purpose, persistence, creative thinking, fine communicative skills.

Engaging in academic work students who possess different professional competences, who are ready for the challenges in solving difficult tasks and willing to develop new theories and models, work on research methods and new methodological approaches can receive targeted financial subsidies provided by scientists for research. They get the opportunity to be performers of research supported by different foundations (for example: the Russian Foundation for Humanities, the Russian Foundation for Basic Research etc.), as well as work within the framework of grants funded by the Kursk State University.

The results, obtained in the course of research in the research and educational centre are used by the students for course projects and theses. Masters are actively involved in studying the problem of the parasitological status of habitat in urban areas, and this gives a firm background to their choice of the topic of the master's thesis: “Assessing the environmental risk of parasitosis among the population in urban areas in the Kursk region”, “Bioindicational assessment of environmental quality on the stability and development of phenetics of the anurans in the Kursk region” etc.

Along with the students, some elements of the research work of the research and educational centre is also performed by the pupils. On the basis of municipal educational institution “Secondary school with in-depth study of particular subjects № 6 of Kursk” the scientific community named “Biological Security” is organized. This community enables the students to develop their interest in the problems of biology and to identify future career choice through participation in research activities. Using the results of the work, pupils together with students and graduate students work on research projects that are usually presented in the form of presentations, poster sessions, reports for oral presentation, video and audio materials.

The results of the work in the research and educational centre are successfully used in the process of hygienic care and education of the children, as well as for the prevention of parasitic diseases among the population. On the basis of the municipal nursery № 126 in Kursk there works a team of undergraduate and graduate students in the sphere of Health Education and Prevention of Parasitic Diseases. The content and approaches to the process of hygiene education include a series of special classes for children, activities with parents with the purpose to build parasitological concepts in people’s minds. In the classroom children are reported information on the effect of parasites on health, the mode of transmission of parasitic diseases and, certainly, measures to prevent them. For this purpose, some didactic and subject-role-playing games, drama performances are acted out based on literary themes. Classes are strictly graded according to the age of the children. In the process of growth and development of the pupils, their self-sufficiency and activity level increases and, consequently, it must be reflected in the pedagogical methods. For successful implementation of programs, guidelines for educators are developed and tested. Undergraduate and graduate students are actively involved in the development of leaflets and booklets on the prevention of parasitic diseases, posing a threat to humans, which are quite widespread in the Kursk region.

The results of the joint-research activities of the students, researchers and tutors are considered to be an integral part of federal and regional regulatory guidance documents for Parasitology.

The successful functioning of the students’ research work is directly related to improving the system of the incentives for students, who work on their research papers, tutors and staff who ensure the implementation of the scientific work of students. Students and graduate students, who are involved in the functioning of the education and research centre, present the results of the completed research at
the regional, national and international scientific conferences, symposias, as well as publish scientific articles individually and in collaboration with tutors.

During the period of the research and educational centre of Parasitology, the group has published 112 works, undergraduate and graduate students participated in 9 international conferences, 26 national conferences and 14 conferences within the university, as well as in two competitions (Fig. 1.).

Active researchers, included in the research and educational centre of Parasitology are the winners of contests and competition "Young Scientist of the Year". During the period from 2009 to 2011, the increase of publications on joint research can be traced, including journals recommended by the Higher Attestation Commission of the Russian Federation. Participants in the the research and educational centre are closer to submit the results of research not only at university and All-Russian, but also at international conferences. It contributes to the exchange of experiences among the participants of the activities. The effective work of the the research and educational centre is indicated by an increase in the number of post-graduate students who have defended their theses successfully.

![Fig. 1. Work results of the members of the Parasitology research and education centre.](image)

For developed products (theoretical and applied) the members of the research and educational centre of Parasitology have received many thankful letters from the All-Russian Scientific Research Institute of Helminthology named after K.I. Scriabin, interregional public organization “The Nation's Health and Eco-Parasitological Security”. The best students continue their education in graduate and postgraduate studies in four specialties: parasitology, ecology, genetics and botany. For the excellent
training and advances in research two graduate students majoring in Parasitology have been awarded scholarships of the President of the Russian Federation. Upon completion of post-graduate studies, after the successful defense of the thesis, young scientists are fixed in the research departments. They keep the traditions of research schools existing in the university and demonstrate their achievements in competitions at various levels.

Nowadays, a team of scientific and educational center carries out research work under the federal target program “Research and scientific-pedagogical personnel of innovative Russia” for 2009-2013 (state contract № 14. 740. 11. 0412). Members of the research and educational centre are investigating the influence of parasites on the state of biological resources in order to reduce the risk of infection under the conditions of an increasing anthropogenic load. The research and educational centre staff has developed a system, implementing the results of research in the teaching activities of the faculty. The structure of this system consists of motivation, goals and objectives, process documents, forms and content of the implementation of performance criteria. The significant role in the system belongs to structuring the teaching material and designing of the relevant didactic units on this basis.

The introduction of the university's original research results allows to bring the system of university education to scientific problems investigated by its departments and to enhance students’ cognitive and scientific creativity, create the conditions for the empowerment of scientific and educational research, to familiarize them with regional characteristics. The study of scientific publications of the faculty provides education of students by the example of the teaching researcher’s personality. One form of implementing the results of research into the educational process is initiating the students into the basic directions of scientific activity, major advances in science and practice, the main scholarly works of the faculty. The global efficiency factor for the introduction of the research results should also include the implementation of the principle of theoretical and practical unity and provide the scientific innovation of teaching material. The results of these activities of the faculty are documented in the specific regulations on the implementation of research results in the educational process of the university; they are supported by representatives of the Commission including a number of teaching researchers. These documents describe some forms of introduction of the research results into the educational process for one or another discipline, the effect of the introduction and give a conclusion about the possibility of its use in teaching.

Using the research results can reorient the learning process with the transfer of a body of knowledge on the skills of their development, thereby improving the quality of education.

The integration of research with the educational process leads to the implementation of the basic principles of formation of the new curriculum: science, biodiversity, the level differentiation and integrity, which provides quality training to professionals and makes a transition to higher professional level.

Integrative research in the educational process solves the following tasks:

• changes in the content and technologies of professional training, that is, creating brand new education contents;

• increased scientific competence of the teacher as a subject of academic work, through participation in an individualized system of improvement of professional skills;

• Improving the students’ personalities as the subject of training, in the process of developing their research activities in the research and education centre.
The results obtained concerning the research subject matters are included in lectures, seminars, practical and laboratory classes on the following courses:

- “Sanitary and Parasitological Monitoring”,
- “Sustainable Human development” (Specialization - Environmental Assessment),
- “Earth Sciences”,
- “Ecology and Environmental Management” (major – Biology; Specialization - Ecology and Environmental Protection),
- “Biogeography” (major – Geography; specialization - Landscape Study),
- “The organization of hunting and fishing tourism” (major - Socio-Cultural Service and Tourism; specialization - Tourism).

The logical connection between the results of research university of the university faculty with the main content of student learning significantly improves the efficiency of training of future specialists. Also, the results are used in the preparation of curricula and developing new educational programs for the following courses:

- “Eco-Parasitological Monitoring”,
- “Invertebrate Zoology”,
- “Vertebrate Zoology”,
- “Animal Ecology”,
- “Fauna of Kursk region”,
- “Ecological Parasitology”,
- “Ecology and environmental management”,
- “Protistology”,
- “Parasites of veterinary medical importance”,
- “Population Biology”,
- “Phytoparasitology”.

All these course schedules are created in accordance with the standards of the third generation in the training of bachelors and masters of the highest qualification at the Natural Geography Department of Kursk State University. Online publications developed by the members of the research and education Centre (“Biological Resources of Kursk region”, “Parasites of amphibians and reptiles of natural ecosystems in protected and transformed areas”, “Parasites of birds and mammals in natural ecosystems in protected and transformed areas”) are used in the preparation of students from other departments at Kursk State University.
The introduction of scientific achievements into the educational process contributed to the improvement of the educational, research and innovation complex, expanding the methodological basis for the organization of scientific and educational activities. This improves the scientific and methodological support of the educational process, contributes to the fundamentalisation of the higher education, and raises the quality of education. The intensification of training of highly qualified personnel occurs through the more efficient use of professional, scientific and intellectual potential of employees and students.

After three years of the functioning, something can be said about some of the most striking results of the research and education centre work, which make one generally consider the research and education centre as a form of improving the quality of students’ research work. First of all, interest in research of applied nature among young people has increased, which resulted in an increase in the number of students participating in research works within the department (besides those carrying out research work according to the curriculum). It is possible to observe an increased number of post-graduate students who complete training in the submission of the thesis to the department, and an increase in the number of post-graduate students who complete training with the defense of a thesis. An important indicator of the effectiveness of the research and education centre of Parasitology is the qualitative improvement of the scientific research works carried out in accordance with the curriculum. The number of scientific publications of young researchers has increased, which is important. Moreover, thanks to the research and education centre a special group of student activists was formed at the Department. This establishment organizes various forms of students research work in their groups and in the whole university.

Thus, the work of the research and education centre is efficient and effective way to improve the quality of research performed by students. The creation of the research and education centre of Parasitology made a favorable impact on attracting young professionals, who are interested in research work. The inclusion of undergraduate and graduate students in the research and education centre allows them to carry out full-pledged scientific research, participate in the performance of works by Russian federal target programs, grants, participate in the Russian and international conferences, which certainly increases their motivation, outlook and scientific level. And professors, researchers, research workers have the chance to be at the forefront of the development of scientific knowledge and transfer this knowledge to undergraduate and graduate students.

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Abstract

A vital problem of the Russian education system is the creation of a dynamically developing information and educational environment. A solution to this problem may be found in making a major alteration of the knowledge acquisition technology based on such important didactic properties of special intelligent user interfaces (an augmented reality approach in particular) as individualization and differentiation while preserving integrity of education. The proposed in the report solutions and approaches to the development of augmented reality teaching and learning tools, stand out favorably in comparison with information and communication technologies used in Russian educational field nowadays.

Key words: augmented reality, special intelligent user interfaces, information and communication technologies, imitative-simulating courseware, geolocation system, object identification, computer vision, QR-code, marker, interactivity, educational process, parasitology, ecosystem, biological process.

1. INTRODUCTION

The character of modern society development along with today’s global social, economical and scientific processes facilitate the use of innovative approaches in education in their balanced combination with the traditional ways of teaching and learning. Recent years showed the increasing interest in this problem, which has become particularly important due to computerization of education, and, as a consequence, the growing use of new information technologies in teaching and learning. One of the most advanced ways of knowledge acquisition in the information society is seen as the application of special intelligent user interfaces, or more specifically simulation courseware employing the augmented reality technology.

Computer simulation [1] is a common type of analog modeling carried out with a set of mathematical tools, special computer simulators and programming technologies that enable to conduct an object-oriented analysis of the structure and functions of a real complex process in the computer memory in the "imitation" mode, to optimize some of its parameters.

At the same time the imitation model [1] is a special software solution enabling a simulation of complex objects. It launches parallel interacting computational processes which by their temporal characteristics (time-and-space-wise accurate) are the analogs of the processes being studied.

Augmented reality is a number of technologies enabling to supplement the view of real-world objects with computer-generated graphics and to blend together virtual and actual objects received from various sources: video cameras, thermal imagers, spectrometers etc.
Unlike virtual reality which completely replaces the physical world with an artificial virtual rendering, augmented reality superimposes computer-generated imagery upon the real video scenes.

Rob Gonda, the expert in the field of augmented reality, gives a more concise definition. According to him, augmented reality is the ability to combine the aspects of real and digital world for enhancing one’s current perception of reality.

Ronald Azuma, one of the most known researchers in the field of integrating computer-generated interactive graphics with real environment, defined a number of characteristics AR as systems should have:

- combine real and virtual;
- are interactive;
- are registered in 3D.

Linda G. Shapiro and George C. Stockman, experts in computer vision, defined the following components and abilities for developing the augmented reality systems:

- 3D models of objects used to supplement real world scenes;
- the mapping of the real environment surrounding the user with 3D models based on calibration;
- tracking the user position to determine his/her point of observation in real environment;
- incorporation of computer generated graphics into the physical world in real-time.

2. CLASSIFICATION OF AUGMENTED REALITY SYSTEMS

We will try to present a classification framework for describing the existing augmented reality systems. Human beings have a multitude of senses enabling to attain awareness/understanding of the world around them. An augmented reality system is a medium between reality and a human, which means it should be able to provide a signal for one of the sensory organs. This way, according to the kind of information, the following types of systems can be defined.

- Visual systems. These systems are based on human vision. The main aim of such system is to create an image which might be used by a human for his/her purposes. This type of systems is
the most wide-spread which is due to the role vision plays in human perception – a picture is more informative and understandable for humans.

Fig. 2. Visual augmented reality systems

Audio systems. The systems of this type are hearing-oriented. Such systems are described in [5]. They are often used as navigators. When a human reaches a destination point they make a particular sound. A stereoscopic effect, which enables humans to go in the right direction using the source of sound as a guideline, may also be used. Here&There is an example of such system.

Fig. 3. Audio augmented reality systems.
Audiovisual systems. These systems are a combination of the latter two types but audio is supplementary in them.

Fig. 4. Audiovisual augmented reality system.

From the point of view of the employed technology the existing augmented reality systems can be divided into:

- marker systems – an object is identified when some marker which unambiguously identifies an object is placed in the live environment. Markers may be in the form of a special printed set of digits or symbols, a special picture, a bar-code or a QR-code etc.

Fig. 5. A marker used in the augmented reality and an example of a marker system

- analytical systems – in order to identify an object it is not necessary to place special objects in the live environment. Mimics, gesture and object recognition is carried out automatically.
geolocational systems (browser systems) – wearable computers equipped with video surveillance and special software are used for identification. This software delivers real-time positioning of an object which is being recorded with a camera.

There is a number of science and technology fields in which augmented reality systems can be used. In the first place the following ones should be pointed out.

- education;
- medicine;
- engineering and design;
- cartography and geoinformation systems.

In the medical field these technologies are applied to create realistic training simulators. This provides doctors with practice of how to perform different surgeries and only after substantial training to start performing them on patients. At the same time interactivity and realism of these simulators will guarantee the correctness of the doctor’s actions during the real operation. BoneSim, is one of the examples of the solutions simulating surgeries on bone tissue. In engineering augmented reality can be used to combine real objects with the directions of equipment assembly and its operation.
instructions. In cartography and geoinformation systems augmented reality became demanded in connection with a growing number of mobile devices. So such systems may identify objects allowing for humans to easily find their way around. As an example, Layar service allows to get access to information about the surrounding environment in real time through the lens of a mobile phone camera.

3. THE USE OF AUGMENTED REALITY IN TEACHING PARASITOLOGY

In this part of our paper we will touch upon the application of augmented reality simulator courseware in teaching and learning parasitology. This project, called “The study of parasites’ influence on biological resources aimed at reducing contamination risks under increasing anthropogenic load conditions” is supported by the state contract No 14.740.11.0412 from September 20, 2010, carried out as a part of Federal Targeted Programme “Scientific and Scientific-Pedagogical Personnel of the Innovative Russia in 2009-2013”.

Over recent years parasitology as a science very closely connected with human life has become more prominent and has been increasingly developing in medical field, biology, and veterinary medicine. The study of parasitic life cycles is of primary importance both for acquiring a better understanding of a certain parasite group historical development, and for treatment, prevention and control of parasite-related diseases by means of influencing the causative agent at various phases of its development. In this connection the study of parasite life cycles in the course of time and in connection with the life-span of the host, various conditions and changes of the environment where the host lives are particularly important.

However, the study of parasitology meets a number of obstacles. More specifically, experimental studies are limited due to poor lab facilities of many university departments, which sometimes fail to meet safety standards etc. This makes it more difficult to get an insight into the processes taking place in complex ecosystems, and limits the possibilities of visualization of study materials thus leading to the decrease of student knowledge quality.

Taking into account the theoretical studies of V.A. Kudinov [9], G.A. Bordovsy [10], B.S. Gershunsky [11], E.V. Danilchuk [12], V.G. Kinlev [13], C.C. Colin [14] and others, we can say that the application of augmented reality simulator courseware in teaching and learning parasitology is one of the ways to increase the efficiency of the educational process. Moreover, the transfer from traditional teaching methods in the field of parasitology to teaching parasitology with the help of special intellectual user interfaces is inevitable.

As a part of the project called “The study of parasites’ influence on biological resources aimed at reducing contamination risks under increasing anthropogenic load conditions” which is supported by the state contract No 14.740.11.0412 from September 20, 2010, carried out as a part of Federal Targeted Programme “Scientific and Scientific-Pedagogical Personnel of the Innovative Russia in 2009-2013”, we are developing special hardware and software learning tools employing augmented reality technology for use in teaching parasitology basics. The area of application of such simulator courseware is rather wide. It not only helps to increase student activity and provide learning which is meaningful and full of experience, but also to introduce completely new types of problems which are necessary for the exploration of parasite life cycles.

In the course of study some problems and contradictions of creating a dynamically developing informational-educational environment became obvious. At present there are no teaching techniques
and methodology of using the augmented reality educational tools that we are developing in the academic process of teaching the basics of parasitology. This complicates the work of both software developers and teachers who use these tools.

Moreover, today there remains a contradiction between the intensively developing new software and lack of proper theoretical background justifying the transition from traditional methodology of teaching parasitology to the novel way of instruction using special intellectual user interfaces. Among the information and communication technologies developed for teaching and learning parasitology augmented reality simulator courseware is of particular interest. At the same time the potential advantages of augmented reality tools use in parasitology teaching and learning and their efficiency compared with traditional teaching methods and instruction using other types of information and communication technologies (automated e-learning systems, diagnostic and training tools etc.) still need to be researched. All this shows that the study of using augmented reality simulator courseware in parasitology teaching is rather timely.

We should mention some of the undeniable advantages of new information technology use in the educational process. In parasite research there is little interaction with the study material, it is difficult to obtain experimental materials and hard to repeat experiments involving entire biological systems. This shows the necessity of using augmented reality simulator courseware in teaching parasitology.

Special intellectual user interfaces enable students to independently explore the relations between parasites and their hosts, to study their interaction dependable on the environmental factors by choosing parameters and analyzing the data employing simulator courseware.

In the study of parasitology the augmented reality solutions enable:

- to perform biological experiments using the technology of combining real and digital world aspects when the real systems cannot be engaged, because they may not be accessible, or they may be dangerous or unacceptable to engage;
- to operate abstract data, characterizing processes, which take place in large ecosystems and to present this data graphically and visually;
- to model and to demonstrate the dynamics of hard-for-students-to-understand biological processes in a form of a dialogue with the user.

In the course of the study some research prospects were also outlined:

- to analyze and develop a framework for increasing the effectiveness of special user interface use in the educational process;
- to provide a theoretical background for defining a set of criteria used to evaluate the efficiency of parasitology teaching;
- to define the part which special intellectual user interfaces play in the process of parasitology teaching.

The analysis of parasitology research peculiarities draws us to a conclusion that the use of augmented reality simulator courseware enables to demonstrate the specifics of parasitism and, in some cases, aids in finding alternative ways to study complicated issues of zoology. The systems allowing to combine the aspects of real and digital world for enhancing the perception of reality hold great promise for a wide range of applications in the educational field.

It is necessary to point out some research priorities:
to create layers of augmented reality with the information about the objects of parasites ecosystem on the territory of Russia;

to compile a unified database containing 3D models of all objects from the parasite ecosystem to be used in the future in geolocational augmented reality simulators.

REFERENCES

AN APPLICATION EXPERIENCE OF NETELAB LABORATORY EDUCATIONAL EQUIPMENT SET IN PRACTICAL WORKS FOR “ELECTRICAL ENGINEERING” COURSE OF STUDY

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Abstract

In a present the equipment supply problem for school physics cabinets, laboratories in training colleges, high schools, etc. is evident for both teachers of all kind and employers.

Multiple of proposed laboratory educational equipment solutions are based on software products imitating interface and state of different measurement equipment and sets on PC display. The main attractive feature of such solutions is a relatively low cost which explains their large scale popularity.

The main negative effect of such imitational approach is evident – a term “I can do it” is more often replaced by the other one: “I have seen how it was done”. The graduates often have no practical experience of work with real equipment, even with simplest measurement tools. The fundamentals’ understanding is also often far from perfect.

Key words: Laboratory work; Electronics; Educational equipment; Universal measurement tools

INTRODUCTION

The problems are appeared when equipment are selected for laboratory work. From our experience we try to define some hardware requirements (it’s important to note that these principles can be applied for software):

- Reliability;
- Without excess function;
- Low prices;
- All necessary facilities to make measurements;
- Safety for students without experienced.

These are not full list of requirements for create an educational equipment set and can be added some principle which will expand principles are mentioned above.

A producer sometimes creates equipment set with greater functions and this will complicate a student courses. So, it’s necessary to follow some important principles to create educational equipment set. In the article is suggested and described one of the best solution for the educational equipment set.
NETELAB laboratory educational equipment set

The aim of equipment set is help in students’ educational process to give them necessary skill in practical work with modern measurement equipment and to provide fundamentals in electrical circuits’ research process.

Key positions of NETELAB equipment set design were taken during many years of experience in laboratory works organization for hundreds students per year at “Theory of Electrical engineering” department of Bauman Moscow State Technical University (BMSTU). The design of NETELAB is based on the following key features:

- Equipment set should be stand alone and meet all functional requirements for signals' analysis in real circuits in order to provide high quality of educational process;
- All components of equipment set must provide carrying out educational research works. For universality and interoperability purposes of educational institutions the hardware for the following disciplines should be implemented;
- Electrical engineering (electrical circuits, resonance effects, transient processes, frequency response, long lines);
- Electronics’ fundamentals (semiconductor diodes, Zener diodes, bipolar and field effect transistors);
- Circuitry (bipolar and field effect transistor based amplifying circuits, frequency correction and feedback circuits, operational amplifiers, pulse devices);
- Computing devices’ elements (logical elements, triggers, counters, summers, the simplest finite automata);
- Commutation and control elements' high reliability of the equipment set;
- Variable parameters range restriction and functional block locking for non–experienced in electric circuitry students training process.

As a result 2–units laboratory educational equipment set NETELAB which shown on figure 1 was designed.

Main features of equipment set:

- Universality – one hardware platform provides educational research laboratory works on such disciplines as “Electricity and magnetism”, “Electrical engineering fundamentals”, “Electrical machinery”, “Semiconductor devices”, “Electronics fundamentals”, “Logical elements and schematics of computers”;
- Realism – controls and results displaying conform to ergonomics of modern measurement equipment;
- Informativeness – simultaneous displaying of characteristics’ set for different states and conditions allows students to understand essence of observed processes and effects deeply;
- Interactivity – instructor has an opportunity to evaluate each student’s activity and to make adjustments in the process if necessary;
Autonomy and integration – equipment set can operate as stand alone unit or being integrated into local area network including instructor’s PC.
Instrumental unit (fig. 2) contains displays and controls. Measurement unit (fig. 3) contains connectors for commutation of circuit elements being learned, signal generators and measurement tools designed in BMSTU Laser Information Systems Laboratory in accordance with recommendations [1 – 5].

Electrical circuits are assembled from elements, connected to nodes at the assembly plate. Elements, voltage sources and measurement tools are connected by flexible cables with jacks. Assembly plate is replaceable in order to provide necessary universality of the equipment set.

Figure 3. Measurement unit of NETELAB

**DC power supply E1** provides +1,0…+9,0 V. Voltage value is set by control encoder and displayed on LED indicator. Maximum output current is 0,1 A. Short circuit and overload are displayed as blinking «−−−» on the output voltage LED indicator.

**DC power supply E2** provides −5,0…+5,0 V. Voltage value and sign are set by control encoder and displayed on LED indicator. This source may be used for voltage–current characteristics measurements of semiconductor devices.

**Pulse generator G1** provides periodical positive polarity pulses sequence. Pulses' amplitude, duration and period can be adjusted.

**Sine–wave oscillator G2** provides signal with frequency range of 100 Hz – 99,99 kHz and amplitude up to 5 V. Maximum output current is 0,3 A. Short circuit and overload are displayed as blinking «−−−» on the output voltage LED indicator.

**Voltmeters V1 and V2** are identical. They provide alternating voltage effective value measurement for signals on their inputs.

**Phase meter** provides phase difference measurement (in degrees) between two sine signals on its inputs A and B.

**Digital oscilloscope** provides $U_1(t)$ and $U_2(t)$ (signals measured on inputs 1 and 2) waveforms visualization. In curve tracer mode it provides $U_1(U_{E2})$, $U_2(U_{E2})$, $U_1(f_{G2})$ and $U_2(f_{G2})$ relations.
visualization. There are two switchable frequency ranges are for $f_{G2} = 0,1$ to $10,0$ kHz or $0,1$ to $100,0$ kHz.

Principle of $U(f_{G2})$ acquisition is depicted on figure 4

![Figure 4. Registration of $U(f_{G2})$ in oscilloscope – curve-tracer: control unit (1); direct digital synthesizer (2); DAC (3); testing scheme (4); ADC (5); decimator (6)](image)

**Figure 4. Registration of $U(f_{G2})$ in oscilloscope – curve-tracer: control unit (1); direct digital synthesizer (2); DAC (3); testing scheme (4); ADC (5); decimator (6)**

Assembly plate contains necessary elements for electrical circuits assembling. Each element has one or more connection nodes to build necessary schematics with flexible cables.

**An experience of equipment set application in experimental laboratory works on “Electrical engineering” training course.**

Application effectiveness of NETELAB equipment set in educational process was evaluated by experimental researches volume which was carried out and experimental data quality obtained by students on NETELAB in comparison with the same case with standard measurement tools (generators, voltmeters, 2-channel oscilloscope).

Some problems were found out during experimental laboratory works which have been carried out by non–experienced (i.e. first or second-year) students. Standard measurement tools have excessive functionality for such works, but students must be trained to handle it. The perfect learning of such tools may take too much time. The training only on minimal fundamentals can save time, but it does not prevent different random problems. For example, oscilloscope trigger mode, activating options...
“DC input” or “AC input”, incorrect time base settings are often lead to errors in obtained experimental data. Accidental activation of advanced signal processing tools menu of digital oscilloscope also often leads to significant time losses. So it is reasonable to provide full controls without excess functionality in educational equipment. As a result students can obtain necessary skills to handle such tools – to determine required display mode for oscillograms, to set required harmonic or pulse signals’ parameters – and therefore to pay more attention to obtained results analysis. In case of such tools application an estimation of time profit is about 20 – 25 % vice versa standard measurement tools used.

Equipment set’s functional capabilities allow to practically visualizing the following effects:

- Significant variations of Q factor caused by minor variations of resonant frequency in series oscillatory circuit with $L–C$ and $2L–C/2$ elements (fig. 5);
- Decrease of resonant frequency when circuit load impedance is decreased;
- In process of transient analysis pulses’ amplitude on outputs of $R–L$ circuit is decreasing due inductance coil internal impedance existence.

Figure 5. Image on oscilloscope screen in transfer function analysis of series oscillatory circuits $L–C–(R+rL)$ (a), $2L–C/2–(R+2 rL)$ (b), $2L–C/2–(R+2 rL)$ in frequency range of 0,1 … 100,0 kHz

Besides, it allows determining with error less than 5% the following items:
- $R-L$ circuit phase-frequency characteristic difference from theoretical value on low (about 200 Hz) frequencies due to inductance coil internal impedance existence;
- Resonant frequency of oscillatory circuit;
- Critical resistance value in $R-L-C$ circuit transient analysis process and time constant (with error less than 10%) of transient process.

The results of $L-R$ circuit frequency analysis obtained by means of oscilloscope – curve-tracer are shown on the figure 6. It takes about 10 seconds to obtain one frequency characteristic, so during several minutes students may get one or two dozens of such characteristics by interactively adjusting resistor $R$ value.

![Diagram](image)

Figure 6. Image on oscilloscope screen in frequency analysis process of $R-L$ circuit for different $R$ values in frequency range 0,1 … 100,0 kHz

**CONCLUSION**

Practical application experience of educational laboratory equipment set on BMSTU’s “Theory of electrical engineering” department demonstrates measurement tools complexification effectiveness for significant electric circuits studying process enhancement.

Essentially new features – i.e. amplitude-frequency and phase-frequency characteristics' visualization – allow improving practical skill of students significantly due to the training process intensification.
Several parameters of schematic elements (variable resistor, inductive coil and capacitor) allowed improving resulting characteristics illustration possibility. This makes possible to deepen electrical circuits’ resonant effects and frequency responses learning.

Also students’ activity registration mode appears to be perspective for training process effectiveness monitoring.

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MULTIMEDIA SUPPORT OF A TRADITIONAL LECTURE COURSE

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Abstract

Many language teachers prioritize linguistic knowledge over cultural. As a result, the share of cultural background courses in EFT curricula is small in comparison with that of various aspects of English. The analysis of modern literature on the nature of language, culture and language learning shows that language should be taught and learnt on a cultural background. A newer intercultural approach focused on developing the learners’ personal abilities to coordinate their behavior with the standards of a target language culture denies the need of fundamental lecture courses on cultural background. However, it is not suitable for the students of International Relations who are supposed to work not only on personal, but also on country level (in economy, trade, business, culture, mass-media) and need a good deal of cultural background knowledge. To widen the boundaries of a traditional lecture course, to enrich it with extra information (textual and linguistic), as well as illustrative and audio components a multimedia lecture support resource is suggested by the authors. Possible in encyclopedic and lecture modes, the resource can help the teachers to organize students’ independent homework and develop their skills of writing lectures by ear. It can be used to substitute a live lecture, if a teacher is absent on this or that reason.

Key words: cultural background, target language culture, cultural awareness, cultural stereotypes, minority cultures, Amerindians, multimedia lecture support, multimedia resource, visual and audio components, mode of functioning, navigation through a resource.

1. INTRODUCTION

This article describes the author’s experience of delivering the lecture course «Background to the United States of America». The lecture course is a part of the curriculum for Teaching English as a Foreign Language at the Department of International Relations. The course volume is 35 lectures delivered during one academic year (one lecture a week). The share of this background course is relatively small in comparison with the rest of the English as a Foreign Language curriculum that also includes courses dealing with other aspects of the language, such as phonetics, grammar, spoken English, intensive and extensive reading, business English, the theory of translation, etc. In general, students have four classes of various aspects of English every week during four and a half years. Thus, the complete course of studies at the Department of International Relations comprises approximately 1,120 academic hours (each lasting one hour twenty minutes). In comparison with this figure 35 academic hours for a background course look more than modest.

This situation was partially caused by a strong belief spread among language teachers as well as their administration that cultural background education is much less important than linguistic and should be assigned the second priority. That is why the lion’s share of academic time is devoted to teaching
language proper without paying much attention to cultural background. Teachers’ everyday activity as mediators of a foreign language depends on the aims and objectives they pursue. So, in their aspiration to promote the acquisition of a due level of proficiency in a foreign language they deliberately try to concentrate their efforts on developing various language skills (Sercu, Mendez Garcia, Castro Prierto, 2004: 88). It does not mean that the questions of cultural background are ignored but it does mean that they are taught rather superficially, in passing.

A more modern view on language teaching is focused on the need of developing the skills of intercultural communication only. From this viewpoint, encyclopedic knowledge of the target language country, including its culture proper, is considered to be obsolete.

However, both of these approaches are not good for the Department of International Relations graduates who are supposed to deal with the target language country’s economy, trade, business, politics, mass media. In fact, it is hard to realize an agricultural project without a good deal of information concerning the relief, climate, peculiarities of soil and vegetation of a target area. The importance of such knowledge can be illustrated by a real story of some Japanese businessmen who came to our region with the idea of organizing an agricultural enterprise because they knew about the “vast areas of flat land in this part of the country”, as they put it. Their first “field research” was a complete fiasco because it was winter and they were shocked by our winter temperatures, severe winds, and a thick layer of snow in the fields. Similarly, in order to build a steel-making plant one should possess the knowledge of iron ore and coal deposits as well as of transportation routes in the area of interest. In the same way, diplomats, reviewers, counselors, journalists of international mass media should be experts in history, economy, literature, art. Thus, for the International Relations graduates a contact with a foreign culture can arise not only on a personal level but rather on a country level. In other words, in spite of their intercultural awareness that will play a definitely positive role in their communication with foreign partners, they may need substantial knowledge of the target country’s cultural background.

In this context there arises a problem of the course contents choice. Traditionally background courses at this department include several blocks of information dealing with the history, physical geography, economy and culture of the target language country because the courses’ aim is to form in the students’ minds some more or less panoramic view of the country. It is apparent that the course time is not enough to cover all the above mentioned aspects. So, the course developer should carefully think not only of its structure (what blocks to include), but also of the range of topics in every separate block. The situation is especially tough for a cultural block that always comes a poor second. Meanwhile, culture is a highly appealing aspect of any background course increasingly demanded by the students. Moreover, it meets the recent requirements for teaching foreign languages through culture.

2. CULTURAL BACKGROUND IN LANGUAGE LEARNING

2.1. Language and culture as a dialectical integrity

The whole natural environment with its specific climatic peculiarities, distinctive relief, flora and fauna, particular life patterns, types of dwelling, costumes, dances, and music is presented to people in some unique colors, images, sounds, flavors, etc. (Matviyenko, 2010: 123). Language is linked with a person’s consciousness thanks to which it accumulates information about a person’s conscious activity, about artifacts produced during this activity, techniques and technologies of these artifacts production, all living beings or scenery that surround them, in fact, about everything that forms
people’s culture. Language describes the diversity and richness of culture which, in its turn, is connected with the specificity of this or that particular language (Базарова, 2007: 72). Language possesses the vision of the world and this vision is permanently filling its native speakers’ minds, thus forming their personality, their attitude to other people, their mentality, personal and national (Тер-Минасова, 2000: 14).

At the same time, language is constantly developing parallel with the development of the people’s culture, thus being its instrument (Волков, 2001: 1). It is due to its reflective ability why language is so often compared with a mirror. This comparison seems to be justified bearing in mind the fact that behind each word there stands a real object or phenomenon, or event of the outer world (Тер-Минасова, 2000: 38). On the other hand, every product, object or phenomenon of nature can be understood, comprehended, described and expressed by means of words. So, in the basis of every culture there lies a corresponding language, as well as speech-and-thinking activity (Волков, 2001: 1). Culture is a part of our outer and inner world reflected in the language. Language creates artificial, supersensitive dimension, sort of the culture’s “space-time” (Санджяев, 2007: 2). Any culture is, in its own way, pierced by the language that expresses, describes this culture and is associated with it. In other words, the relationship between language and culture is definitely bilateral (Базарова, 2007: 72).

2.2. Teaching language through culture.

As it follows from the previous section, language and culture are phenomena of the same category. Taking into account that language and culture are interlacing, if not interweaving in the process of their interaction (Gene and Bada, 2005: 75), the idea of teaching any language on a corresponding cultural background has become axiomatic (Угренинова, 2007: 1). This is extremely important for those who are involved in the process of language learning and teaching because in our time the range of foreign languages applications has become much wider, especially for the citizens of Europe and the former USSR republics that enjoy the newly-open opportunities of international and intercultural communication.

In this respect it is interesting to remember the old soviet textbooks of the 1960s -70s for learning, for example, English and French. From the viewpoint of methodology they were highly professional and guaranteed excellent results due to some very sophisticated skill of their designers to incorporate lexical and grammatical units under interest into the main and supplementary samples for reading, materials for oral comprehension, dialogues, exercises and every other sort of work, thus providing a substantive drill and practice to achieve firm consolidation and remembrance of what was declared as the aims and objectives of a presented teaching module. The high quality of language teaching in the former USSR was frequently mentioned by native speakers. The point of their genuine surprise was how such perfect results were attained in a closed country with such limited chances of training in a live language environment.

However, in spite of well developed language skills our students had plenty of problems when going abroad or communicating with real native speakers in their home countries. They did know how to construct this or that phrase and how correctly pronounce it, while in most cases the problems were not ‘how to say’, but ‘how not to produce inappropriate utterance’, ‘how to interpret an interlocutor’s response’, sort of ‘how to behave’. Though education in the former USSR was based on the best principles of internationalism and democracy and soviet people were brought up on the ideas of friendship and openness to people of all countries, irrespectively of their race, nationality and religion, they were still not ready for effective intercultural communication. This was caused by the lack of background and, especially, cultural knowledge and intercultural communicative competence. What is more, insufficient cultural knowledge created in the learners’ minds sorts of stereotypical images of
representatives of this or that culture: e.g. all Spanish men are ‘toreadors’ and all Spanish women are ‘Carmens’. In the same way, all Frenchmen are expected to be gallant, whereas all French women are definitely elegant. Plunging into some real cultural-linguistic medium with such habits of measuring people against some stable stereotypes usually causes disillusion, distrust, reticence, shyness, and reserve. All these are, in fact, symptoms of a cultural shock.

To overcome these problems, to shorten the period of adaptation to another culture, to ease the ‘ice breaking’ when coming into contact with people of another culture foreign language teaching should be realized in a new intercultural dimension. Intercultural dimension guarantees that the students acquire the proper linguistic competence as well as intercultural competence, i.e. they are able to express themselves correctly and appropriately in speaking or writing, without violating the norms of etiquette and behavior adopted in the frames of another culture. Intercultural speakers are able to draw parallels between the ideas, events, documents from different cultures, to consider them from both perspectives and resolve or even prevent misunderstanding that may arise (Byram, Gribkova and Starkey, 2002: 9-12).

Everyone knows that communication even between the people of the same nationality means choosing a particular way of entering the world of those you come in contact with and sustaining due relationships with your interlocutors. When people from different countries are talking this is a contact not only between two personalities, but also between two different cultures (Byram, Gribkova and Starkey, 2002:9). This contact can be made more relaxed if its participants could acquire beforehand the knowledge about each others’ countries especially those concerning their systems of values and beliefs, rules of etiquette, appropriate and inappropriate behavior, as well as the way all these manifest themselves in most frequently arising situations (Thanasoulas, 2001: 16). Language teaching should be directed at developing the learners’ abilities to coordinate their behavior with the cultural standards of the target language country. In other words, the learners should be aware of the fact that communicating with people from another country is similar to becoming like a person from that country (Byram, Gribkova and Starkey, 2002: 9).

To sum it up, language teaching must become culture teaching because language does not exist in a vacuum (Thanasoulas, 2001: 6-7), but in some cultural medium. When students study a language without being familiarized with the culture of its native speakers and the country where it is spoken the process seems to be ‘inaccurate’, ‘incomplete’, and even ‘senseless’ (Gene and Bada, 2005: 73). Learning the target language cultural background results in an expansion of the learners’ cultural awareness, and intercultural competence. (Sercu, Mendez Garcia, Castro Prierto, 2004: 86).

2.3. ‘Language through culture’ principle in national and international documents.

The need for simultaneous and parallel language-culture learning has become a core element of documents defining the standards for foreign language teaching. For example, A Platform of Resources and References for Plurilingual and Intercultural Education developed by Language Policy Division of the Council of Europe specifies that learners should be given not only a language, but also intercultural competence in order they could ‘operate effectively as citizens’ and ‘develop open attitudes to otherness’, as ‘the experience of otherness through languages and cultures they carry is the precondition … for intercultural understanding and mutual acceptance’ (Aase, Beacco, Byram et al., 2009). American Standards for Foreign Language Learning state that language and culture are the key components of human experience. The document defines the so-called ‘Five C’s of Foreign Language Education’. In their number there are culture, communication, connection, comparison, and community.
According to these standards, language acquisition proceeds simultaneously with acquisition of culture in one integral process. So, mastering language should be carried out ‘in the cultural context in which this language occurs’. Comparison gives a chance of an ‘insight into the nature of language’ and ‘the concept of culture’ that enables the students to understand ‘the world beyond the American culture’, ‘gain knowledge and awareness of other cultures’ and compare them with their own culture. Students must be able to ‘communicate with other people in other cultures in a variety of settings’ and ‘participate in multilingual communities at home and around the world’. The final aim of observing these standards is ‘to educate students who are linguistically and culturally equipped to communicate successfully in a pluralistic American society and abroad (Standards for Foreign Language Learning, 2006). The same tendency is observed in State Educational Standard for the degree of Master of Philology adopted by the Ministry of Education and Science of the Russian Federation. The document defines the list of Master’s programs some of which deal with learning a wide range of linguistic disciplines in ethno-cultural aspect, investigating multiculturalism and diversity of peoples of the world with special accent on their peculiarities of speech and business etiquette. The Standard states that language should be learnt in the context of ’cultures polylogue’. Learning national-and-cultural differences is recommended in order the graduates were able to develop communicative conflict-free discourse as well as methods and techniques of tolerant communication in multi-ethnic environment (Государственный образовательный стандарт ВО, 2005: 4-6).

3. A MULTIMEDIA SUPPORT FOR LECTURE COURSE «BACKGROUND TO THE UNITED STATES OF AMERICA».

3.1. The choice of a topic for a multimedia resource

In the beginning of the article we have already discussed the shortage of time allotted for teaching cultural background and the problem of the choice of material that should be rich, but compact. In order the students of International Relations could get some integral knowledge of the United States a lecturer has to embrace a wide range of topics beginning with purely physiographic issues (the relief, climate, vegetation, mineral and water resources, etc.) and ending with the survey of the main regions of the country. Each region is presented from the viewpoint of its economy as predefined by its physiographic features, most typical professions and crafts, folk music styles, some region’s specialties, general life patterns and people’s characters. For example, southerners are described as known by their hospitality, unhurried way of life, personal valor and honor, hot temper, etc. To round it off, the students are lectured on the American values and beliefs on the national level: ‘material wealth through hard work’, ‘the spirit of competition’, the importance of being ‘a winner’ and the like. Nevertheless, it is definitely not enough to reveal the sources and roots of American culture, as, in fact, it is not the culture of one nationality that we call ‘American’, but a ‘mosaic’ of many minority cultures or subcultures coexisting with the more powerful dominant culture and constantly balancing their interests with it. The result is a sort of multicultural fusion of European, Asian, African, Latin American and Native American components (Buckland, 1998: 7-8). Thus, similarly to Byram, Gribkova and Starkey (2002:10), we can state that average Americans born in the United States acquire their identity through being brought up surrounded by other Americans, many of them being representatives of minority cultures possessing some distinct cultural attributes contrasted with the larger dominant culture and contributing to the development of American cultural heritage (Buckland, 1998: 7). The Americans acquire these cultural traits unconsciously and independently of their own background, right in the course of their life: indirectly (through the dominant national culture) and directly (through contacts with the representatives of these minority cultures). This is explained by the
fact that culture cannot exist on its own, in isolation from the social structure which it is ‘intrinsically inherent in’ (Abalkin, 2010:8). Of course, in a heterogeneous American society groups can be formed in many ways, but the primary factors are race and ethnicity (Buckland, 1998: 4). Therefore, according to Byram, Gribkova and Starkey (2002:11, 14), we can expect our students to acquire the socio-cultural identity of an American speaker, or at least to imitate it, so that their perceptions of the USA were close to those of its inhabitants.

In order to prepare students to a subtler perception of the American culture the authors took an attempt to widen their outlook by enriching the traditional lecture course on cultural background of the USA with several additional topics dealing with minority cultures. The first of them is «The Native Cultures of North America». The authors decided to begin with Amerindians because they are America’s natives. Some of them are still living as bands, tribes, peoples or nations keeping their unique life patterns of hunter-gather societies since the time immemorial. Many of them live in reservations being attached to their native way of life. Many melted into the multi-cultured American society. Contemporary Amerindians’ relationships with the U.S. government provide for their sovereignty and independence which is an interesting social phenomenon.

The Amerindian culture is popular not only in the U.S., but worldwide. It comes to the world in films, on canvases by G. Catlin, S. Eastman, H. Inmann, etc. Modern designers use typical Indian colors and patterns. Thanks to books by J. F. Cooper, Th. M. Reid and other American writers many Amerindian words were borrowed into modern languages: some are used as terms in sport (toboggan, la-cross, squash), fashion (wrap skirt, moccasins, leggings, the Mohican haircut), some became words of everyday speech (pow-wow, wampum, squaw, tipi, totem, pueblo, wigwam). Many of them are used in sport teams names (Brooklyn Redmen, Chicago Blackhawks, Spokane Chiefs) and automobile brands (Jeep Grand Cherokee, Pontiac). The most valuable contribution into the English language are idioms that cumulate the nation’s past events and cultural semantics (Lebedko, 1997: 1-4), but can’t be translated and understood word-for-word e.g. to smoke a peace-pipe, to bury the hatchet, to take up the hatchet, to put on war painting, the last of the Mohicans, pale-faced brother. The students who use the language learnt without the culture in which it operates may use it within the inappropriate cultural context (Leveridge, 2008). That is why the Native American culture is sine qua non for the students majoring in International Relations or American studies.

3.2. A multimedia resource structure

A multimedia resource suggested in this article consists of three blocks: I. Textbook, II. Reference Book and III. Resource Book.

The first block, Textbook, is the core of the multimedia resource that contains basic information concerning the cultures of aboriginal peoples living on the territory of the modern United States. The material is divided into sections according to physiographic-cultural principle, each section describing a certain area inhabited by a group of native peoples speaking similar languages and sharing more or less common culture. All sections are presented in the same way. The narration is open by some very short description of the area nature: its relief, scenery, peculiarities of climate, typical vegetation and animals. Special accent is made on those features of the region that were most influential in the process of forming peoples’ life-style, created favorable or unfavorable conditions for developing cultural traditions and customs, were reflected in specific arts and crafts. Moreover, natural environment suggested materials, instruments, techniques and technological processes, as well as images and designs for works of art. For example, luxurious woods of the northwest predisposed the native people to making wooden figures, totem poles, masks, whereas the abundance of sea animals in Alaska - to the use of bone, whisker, fur. Then, on this background, the native peoples are introduced
with due characteristics of their dwellings, costumes, life patterns, habits, rituals, traditions. In the last part of each section the learner is familiarized with specimens of native arts typical for the main periods of the area’s cultural development. The Textbook is realized as a sequence of pages containing textual information overlaid onto a subtle background with audio support. Many of the pages contain pictures and photos.

The Reference Book block is presented on the three levels: 1. Dictionary, 2. Museum and 3. Atlas. On the first level the English-Russian Dictionary is placed. The Dictionary contains only neutral everyday lexis a learner can resort to in case of difficulties with understanding the main text. The entry into the Dictionary is possible from the Textbook, at the first mentioning of a new word in the text, or from the main menu. In the first case a particular entry from the English-Russian Dictionary appears right on the screen, and if the entry is asked from the main menu, then the contents page appears on the screen. This page is organized in a traditional for standard dictionaries way, each page being marked by the beginnings of the first and last words, e.g. DES – DYE (deserve….dye). The list of words is presented alphabetically in column and separated by the capital alphabet letters. The quantity of words on each page is different because we consciously placed only such quantity of dictionary entries on each page that could be looked through at a single glance, without scrolling. The same principle was also observed while organizing the pages of the Textbook. It was, certainly, possible to foresee the immediate translation or interpretation of an unknown word or term right in the text, as a floating prompt, but there was a danger of hindering the learner’s perception of the text integrity. What is more, the text is accompanied by sound in order to form in a learner’s mind sort of concordance between the text’s visual and audio components. Thus, any prompt floating onto the screen could result in divergence of text perception as a whole.

Museum and Atlas are the two glossaries of cultural and geographical terms correspondingly. Their contents pages are organized in the same way: these are alphabetic lists of glossary entries, each entry occupying one separate page. In both glossaries each term is assigned its Russian equivalent (if there exist any) and also its interpretation in the Russian and English languages (for advanced students).

A Resource Book contains additional information the use of which is optional. It is a list of all native peoples whose names are mentioned in the main text, each name being accompanied by a short description of a corresponding people. If a student is familiar with these peoples through literature or films, then they will not need the information of this block. It can be used by those who do not have initial knowledge about the aboriginal peoples of North America or if their knowledge is insufficient.

3.3. A multimedia resource realization

The author medium used to realize this multimedia resource was Toolbook Instructor 2004 that makes it possible to combine textual information with any other multimedia and build a ramified structure. Information component of the present resource is realized as textual files in TXT or RTF formats. Illustrative component is presented by graphic files in GIF or JPG formats. Audio component is realized in formats WAV or MID. The program functions in Windows.

The style of the resource is laconic: text, graphics, sound plus wide reference possibilities. Special attention while developing this resource was paid to a graphic component. Bearing in mind that an image of an American Indian has been formed under the influence of stereotypes imposed by the world cinema and, thus, inseparably associated with bison, mustangs, feathers, etc., the title screen was decorated by a typical picture from everyday life of Native American people. As the pivotal element of resource navigation its designers used a picture of a totem pole with the buttons of transfer and reference elements call out placed on it. For the users’ convenience each section of the Textbook
Art devoted to a definite cultural area is preceded by its own title screen with a most typical for this area landscape. This very landscape in a somewhat ‘washed-out’, water-color’ form is used as a background for all the rest pages of this section, so that the learners could easily know what section they are working with. The same principle is applied to the Reference Book: The background for the English-Russian Dictionary is a picture of an open book, for Atlas - a physiographical map of North America, and for Museum – a picture of wicker baskets and utensils. As the image is very light as if just outlined it does not prevent the learner from working with the text.

The text contains a large amount of keywords. In fact, keywords are all new lexical units, such as geographic place-names, cultural terms, or just ordinary everyday words that can be unknown to a student. Keywords are marked in the text by different colors in order the learners could immediately understand where they are, what block of the multimedia resource they are dealing with. Traditional blue color is used for neutral lexis, green – for geographical terms and dark-red for cultural terms. In Atlas each entry is illustrated by a fragment of a physiographical map of the USA with the names of main rivers, mountain ranges and cities. A target area is marked (e.g., encircled or followed) by a red line. As for the Museum, nearly each entry is provided with a picture or photo of some figurine, tool, jewelry, or specimens of native art, such as beadwork, quillwork, embroidery, sand-painting, etc.

Great attention was paid to Museum because material aspects and components of culture are very important as they are physical objects and artifacts that people made. In this sense, they are reflective of their culture. They witness of the people’s everyday practices and give food for analysis of objects, providing insights into the culture that produced them (Buckland, 1998: 5). The audio component (an accompanying narrator’s speech) is foreseen in all main blocks. The narrator’s speech begins automatically when a learner enters a new page. The sound can be switched on or off on the learner’s will. All audio files are put into a separate ‘paste-board’ called Media. Hence, they can be listened to in a standard Windows Media Player, sequentially or at random.

Navigation through the multimedia resource can be carried out from the main menu to all blocks as well as their sections, and vice versa, from each place of the course to the main menu or to any dictionary or glossary. Navigation elements are made intuitively clear to the learners. On all main screens there are buttons Dictionary, Atlas, Museum, Sound. In the dictionaries and glossaries the usual buttons with arrows are foreseen, as well as a special list button for a transfer to the main menu of a corresponding glossary or dictionary. In addition, the resource contains a Help section with due descriptions of the elements of interface, recommendations on the work with the dictionaries, preface to the resource and sources of information used. In general, navigation through the resource is organized in such a way that it did not cause problems for students.

CONCLUSION

The multimedia resource presented in this article was developed with the aim of providing a lecture course support in order to cover some additional topics outside the main curriculum and thus widen the students’ horizons. Moreover, the resource can be used for developing the skill of writing lectures by ear that many students lack. For this purpose the resource can be used in two modes. The first one is a traditional for multimedia textbooks encyclopedic or hypertext mode that allows to the students to work with the material in their own pace, ‘wandering’ from section to section and passing on all sorts of keywords to the levels of Dictionary, Atlas, or Museum. In this mode a student’s contact with the teaching material is practically unlimited. The second mode is lectural when a learner’s route is rigid not allowing to pass on the keywords and refer to the other sections. The only difference from a real lecture is a visual support, because a learner can always see the text. At the last stage only audio
component of the resource can be used: a student can play the audio record of narration in a Windows Media Player. Such lecture can be listened by a group of students because its pace and order of narration is the same for all of them. So the multimedia resource is very convenient for organizing all sorts of independent work and simulating lectures for a purpose of training. It can also be used instead of a real lecture if a lecturer is absent on this or that reason.

The multimedia lecture support resource is based only on authentic sources: books, online and CD-encyclopedias, journals, and Internet resources. The accompanying narration is performed by a native speaker.

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IMPLEMENTING A PROBLEM-SOLVING APPROACH TO ENTREPRENEURSHIP STUDIES IN ESTONIA - CHALLENGES AND OPPORTUNITIES
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Abstract
Entrepreneurship studies within non-economic curricula should develop entrepreneurial skills and attitudes, and the ability to make decisions and exercise critical judgment in daily problem-solving processes. The teaching focuses on learners using a problem-solving approach within simulations of real life. An action research was conducted in a higher education institution providing engineering education in Estonia. Altogether 67 students participated in the research: 44 male and 23 female. The aim of the study was to indicate the managerial and instructional changes needed to implement an entrepreneurship model in the curricula of higher education institutions. The implementation of a new entrepreneurship programme revealed factors that need further improvement: the learning environment, cooperation, teacher competencies and management support – all crucial to the contribution of the quality of the teaching. This demonstrates the importance of cooperation with all stakeholders (employers, students, etc.) to enhance the school’s ability to face the labour market needs.

Key words: entrepreneurship, entrepreneurial skills, entrepreneurial behaviour and attitude, problem-solving approach, problem-based learning.

1. Introduction
Discussions of the importance of developing suitable attitudes and an entrepreneurial manner in students, in addition to skills and knowledge, have become commonplace (Communication…., 2005; Entrepreneurship studies ..., 2009). Therefore, the European Commission’s report “Fostering entrepreneurial mind-sets through education and learning” states that entrepreneurship is a key competence for growth, employment and personal fulfilment (Communication …., 2005). Entrepreneurship studies should be implemented at all educational levels and are one of the priorities of National Education Policy in many countries (e.g. Scotland, Norway, Sweden etc.). The EU Commission’s report defines entrepreneurship as follows:

*Entrepreneurship refers to an individual’s ability to turn ideas into action. It includes creativity, innovation and risk taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports everyone in day-to-day life at home and in society, makes employees more aware of the context of their work and better able to seize opportunities, and provides a foundation for entrepreneurs establishing a social or commercial activity.* (Communication …., 2005, 548)

This report also states that Entrepreneurship is a key competence for all, helping young people to be more creative and self-confident in whatever they undertake and to act in a socially responsible way
Innovation holds the key to the continuity and growth of companies (Hage, 1999), whilst entrepreneurship holds the key to economic growth in the country (Harkema & Schout, 2008).

Entrepreneurial competences are a combination of knowledge, problem-solving skills and individual attributes. Harkema and Schout (2008) complement this statement by saying that attributes and skills refer to the capability to deal with problems and solve them, and in the process find solutions to achieve the defined objectives, so success in this sense is the ability to meet one’s own objectives. That suggests that a wide range of stakeholders are confronted with the need for entrepreneurial behaviour; for example, priests, doctors, teachers, policemen, pensioners, community workers and indeed, potentially everyone in the community (Gibb, 2002). Therefore, national governments pay attention to the stimulation of entrepreneurial and innovative behaviour (Harkema & Schout, 2008). That is why the Estonian Government and local authorities have started up this initiative of entrepreneurial schooling.

Such a range of knowledge and skills can be taught by problem-based learning (PBL), where the focus is on what students are learning rather than what the teacher is teaching (Barr & Tagg, 1995). This is learning where students take the initiative by studying the learning issues identified in the first tutorial, and using their knowledge to further their understanding of the trigger situation, particularly in the final tutorial (Lloyd-Jones, Margeston, & Bligh, 1998).

This study was designed to evaluate the new entrepreneurship programme, and was conducted in an Estonian higher education facility that provides engineering education. The goal of the new model was to stimulate entrepreneurial behaviour, attitudes and knowledge. The programme, designed for engineering students acquiring a technical non-economic higher education, took into account learning outcomes developed by the expert group (expert group was initiated by Estonian Ministry of Education and Research and a study by the Ministry of Economics and Communication), and based on the current curriculum.

The results of the development of a new entrepreneurship programme demonstrated that this implementation:

- improved the quality of teaching and learning,
- helped meet learning outcomes,
- enhanced cooperation within the school, and
- enhanced the school’s ability to face the complex demands of today’s labour market.

The following will give an overview of the historical unfolding of the planned activities and results of the action research carried out. Engeström’s “model of expansive learning” (Engeström, 2001; Postholm, 2009) was used as the basis of the new instructional system.

2. Historical background of the entrepreneurial programme

The EU Commission report dealing with non-economic higher education states that universities and technical institutes should integrate entrepreneurship as an important part of the curriculum across different subjects, and require or encourage students to take entrepreneurship courses. Even more, it says that combining entrepreneurial mind-sets and competence with excellence in scientific and technical studies should enable students and researchers to better commercialize their ideas and the
new technologies developed (Communication …, 2005). In light of these initiatives, the development of entrepreneurial studies has become one of the most spoken about topics in higher education today.

Entrepreneurship teaching concentrates mostly on students following economics and business courses across Europe. The teaching available to those studying other subjects is limited (Communication …, 2005). Estonia is not an exception. In non-economic studies, entrepreneurship remains primarily elective, or is offered as a stand-alone subject. The report suggests that universities should integrate entrepreneurship within different subjects of their study programmes, as this may add value to all degree courses, and that special attention should be paid to the systematic integration of entrepreneurship training into scientific and technical studies in higher education institutions (HEI). Problem-based learning is an instructional (and curricular) learner-centred approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem (Savery, 2006). Even more, PBL is not a mere teaching and learning technique, but an educational strategy (Barrett, Labhrainn & Fallon, 2005).

The Estonian Government has initiated extensive measures to develop entrepreneurial studies since 2008. An expert group was formed to establish common ground for entrepreneurship teaching in Estonian higher education. A report (Entrepreneurship studies …, 2009), issued by the expert group, mapped the state of entrepreneurship studies in Estonian non-economic higher education. This report (Entrepreneurship studies …, 2009) highlights the lack of a systematic framework and the fluctuating/volatile nature of the entrepreneurial education offered by HEIs. For example, there are HEIs that have economic and entrepreneurship courses in all curricula and there are HEIs that do not have any – either among compulsory or optional courses. At the same time, to create structural changes in the economy, Estonia more than ever needs people with entrepreneurial attitudes and a coherent framework for entrepreneurial studies (Entrepreneurship studies …., 2009). The study among alumni students indicated that only 5% of HEI graduates have established their own company or are self-employed or freelancers (Vaade & Tamm, 2007).

A curriculum analysis indicated that 45% of Estonian undergraduate curricula and 44% of graduate curricula did not have any economic and entrepreneurship courses (EEC). An analysis of Estonian applied higher education curricula demonstrated that 2% did not have any EECs, and 36% had EEC combined on a compulsory and optional basis. Compulsory EEC courses were included in 58% of curricula and 5% had optional courses. The assumption that the existence of EECs in curricula is directly connected to the profile of the HEI (e.g. share of technology based courses) was not confirmed (Entrepreneurship studies …, 2009). The report pointed out that it is extremely important to have a systematic and complete approach to EEC studies. Furthermore, the content of entrepreneurship studies should support reaching these goals. Based on observations of common practices it can be stated that the usage of innovative teaching methods is still modest in Estonian HEIs. Instructional cooperation between colleagues and with entrepreneurs is underused.

The authors suggest that the key factors in the successful implementation of an entrepreneurship programme are the teaching methods used. Gibb (2002) and Sogurno (2004) confirm that widely used traditional teaching methods, like lectures and exams do not activate students enough. It also prevents students from participating actively in the learning process (Gorman, et al., 1997). To pursue education that is effective and supplies students with adequate knowledge and skills for their future career, the teaching should be looked at from a broader perspective and innovative teaching methods should be implemented (Heinonen, 2006). Moreover, higher education courses should help students obtain theoretical concepts and the practical implementation of these concepts, raise entrepreneurial attitudes and encourage self-reflection that enhances individual performance (Edwards & Muir, 2005),
and this should be part of the daily learning process, not only the essence of the content. Therefore, entrepreneurship can certainly be taught, but it depends largely on the pedagogical approach and the context in which teaching and learning takes place. It is a competence that can be acquired. Competences in this context refer to a combination of skills, knowledge and attitude (Harkema & Schout 2008).

3. Theoretical basis of the entrepreneurship programme

Different theories present entrepreneurial education as teaching the skills to start up and develop a small business enterprise (Kourilsky, 1995; Bechard & Toulouse, 1998). The recommendations by Noll and Roach focus more on the characteristics needed to be a successful entrepreneur and not as much on starting up the business. They stress the skills that can be applied to entrepreneurial enterprises whether in the business, government or the social arena (Brown, 2000). Therefore, it is more important to concentrate on people skills and developing an entrepreneurial attitude than on the managerial issues of starting up a new business. Hattie’s (2009) synthesis of over 800 studies identifies some teaching and learning strategies as key factors: students’ self-reported grades, formative evaluation, cooperative learning, feedback provision, self-questioning, teaching problem-solving, providing direct learning instructions, worked examples (example of what success looks like and a problem statement + appropriate steps to the solution) and so on.

In recent years, variations on approaches to problem-based instruction have emerged including guided discovery learning, model-centred instruction, problem-based learning, situated learning, case-based learning, discovery learning and so on (Merrill, 2007). PBL approaches commonly involve learners (Merrill, 2007). One problem-solving approach presented in the new entrepreneurship programme is a structured learner-centred approach with direct instructions in the context of real world problems. This approach concentrates to the student’s personal discovery and teaches the ability to deal with daily problems. The teacher’s role is to be a facilitator of the learning process, not someone who transfers knowledge. Consequently, learning refers to a change in the learner’s behaviour as a result of a personal discovery (Harkema & Scout, 2008).

4. The research project

The developed entrepreneurship programme took into account all three important factors: skills, knowledge and the characteristics needed to be a successful entrepreneur. Therefore, the emphasis of the teaching is developing the students’ problem-solving skills and attitudes, their ability to cope with group processes and/or middle management tasks in larger organisations, to control external/internal resources and to integrate them and implement them with consistent monitoring.

Different stakeholders inside and outside the HEI were involved in developing and carrying out the project. The process started with presenting the expert group report and formulating the learning outcomes. The second step of the project was designing the action plan to develop an entrepreneurship programme. Outside the HEI, entrepreneurs monitored and complemented the inputs for the programme and its links with labour market demands. The whole programme was strongly supported and received contributions from academic colleagues and the HEI management team.

Engeström states that a crucial triggering action in the expansive learning process is the confrontational questioning of the existing standard practice (2001). Standard practice here means the changes that have occurred over the years (based on what has happened) examined in the local context.
Engeström (2001) sees the idea of evolutionary change as a collective and long-term process that develops in cycles, as explained in Figure 1.

![Figure 1: Strategic learning actions and corresponding contradictions in the cycle of expansive learning. Source: Y. Engeström, 2001, Journal of Education and Work, Vol.14, no. 1: 133–56.](image)

4.1. Questioning (Primary contradiction)

Engeström (2001) stated that contradiction is crucial for the development of activity systems on the one hand and current arrangements on the other. After mapping the situation, questions connected to the projects needed to be answered: What kinds of teaching methods should be used? What should the content and credit point value of the entrepreneurship programme be? What are the limiting factors when implementing the entrepreneurship programme in the curriculum? Under what conditions (formal or informal) can this curriculum change be most effective?

4.2. The historical and empirical state

The historical and empirical state of economics and entrepreneurship studies within the HEI’s different curricula, based on 2010 data – entrepreneurship is considered a single subject and is taught in a limited number of curricula.

In addition to the data in Table 1 (page 6), the analysis did not indicate what kinds of teaching methods were used during the teaching process, and whether they supported the development of entrepreneurial skills and attitudes. The observations often confirmed the use of traditional teaching methods. The new entrepreneurship programme base model was developed after detailed curriculum analysis (in cooperation with colleagues and managerial team). The base model considered different curricula, prerequisite subjects and was designed to be implemented within all curricula at the HEI. During the development work the team faced another obstacle from academic Chairs: How to increase the amount of ECTS’s for entrepreneurship studies within the curriculum? Why should they overcome
this change at all? Fortunately, most of the stakeholders saw this as an opportunity for a positive change.

Table 1. Share of economic and entrepreneurship studies in vocational curricula at the HEI (2010)

<table>
<thead>
<tr>
<th>CURRICULUM</th>
<th>Curriculum capacity in (ECTS)</th>
<th>Management &amp; economics module (ECTS)</th>
<th>Share of economic and entrepreneurship studies in curriculum</th>
<th>Share of entrepreneurship studies in curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied architecture</td>
<td>240</td>
<td>7</td>
<td>2.9%</td>
<td>-</td>
</tr>
<tr>
<td>Technoeology</td>
<td>240</td>
<td>23</td>
<td>9.6%</td>
<td>-</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>240</td>
<td>24</td>
<td>10%</td>
<td>-</td>
</tr>
<tr>
<td>Construction Geodesy</td>
<td>240</td>
<td>25</td>
<td>10.4%</td>
<td>-</td>
</tr>
<tr>
<td>Road Construction</td>
<td>240</td>
<td>26</td>
<td>10.8%</td>
<td>-</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>240</td>
<td>19</td>
<td>7.9%</td>
<td>0.8% (2 ECTS)</td>
</tr>
<tr>
<td>Engineering Materials and Marketing</td>
<td>240</td>
<td>61</td>
<td>25.4%</td>
<td>1.3% (3 ECTS)</td>
</tr>
<tr>
<td>Resource Management in the Field of Clothing and Textiles</td>
<td>240</td>
<td>53</td>
<td>22.1%</td>
<td>0.8% (2 ECTS)</td>
</tr>
<tr>
<td>Technical Design and Technology of Apparel</td>
<td>240</td>
<td>23</td>
<td>9.6%</td>
<td>0.8% (2 ECTS)</td>
</tr>
<tr>
<td>Automotive Engineering</td>
<td>240</td>
<td>12</td>
<td>5%</td>
<td>0.8% (2 ECTS)</td>
</tr>
<tr>
<td>Transport and Logistics</td>
<td>240</td>
<td>56</td>
<td>23.3%</td>
<td>1.3% (3 ECTS)</td>
</tr>
<tr>
<td>Railway Engineering</td>
<td>240</td>
<td>26</td>
<td>10.8%</td>
<td>0.8% (2 ECTS)</td>
</tr>
</tbody>
</table>

Source: HEI’s curricula documentation, compiled by Marge Täks

4.3. Modelling and examining the new solution

After an examination and analysis of the theoretical background, the new entrepreneurship programme was developed (6 ECTS, and prerequisite subjects). Figure 2 illustrates different factors that were taken into account while developing the new model.

Teaching methods took into consideration learning outcomes, previous research in this area and best practices. The suitability of the teaching methods was evaluated by experts and professionals (academics and practitioners). After expert evaluations, additional improvements were made and the instructions developed further. The content of the new entrepreneurship model proceeds from the theoretical and practical knowledge and skills that need to be acquired during the programme.

One of the main criteria for using practitioners as experts was their substantial practical experience in business and some experience in teaching. Academic experts were chosen on the basis of recommendations, experience in curriculum development and on the basis of expertise in the field.

Based on the data gathered and the expert evaluations, instructions for teachers and students, and e-learning support for the course were developed. The aim of the e-course was to support individual student achievements, and provide an opportunity for online discussions and feedback from lecturers.
The new entrepreneurship programme was also introduced and approved by the HEI’s managerial team.

![Diagram: New Entrepreneurship models](image)

**Figure 2**: Emerging factors of Entrepreneurship Study Program

Source: Compiled by Marge Täks

### Table 2. Practical participants

* groups 1 & 2 are considered male groups  
** groups 3 & 4 are considered female groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>Female/male</th>
<th>Total Number of group members</th>
<th>Average age of the participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1* (Automotive Engineering)</td>
<td>31 male students, 2 female students</td>
<td>38 (5 of them in academic leave, 6 did not apply). Participants on total 27, one of them female.</td>
<td>24 years</td>
</tr>
<tr>
<td>Group 2* (Automotive Engineering)</td>
<td>25 male students, 1 female student</td>
<td>36 (10 of them in academic leave, 6 did not apply). Participants in total 20, one of them female.</td>
<td>24.5 years</td>
</tr>
<tr>
<td>Group 3** (Resource Management in the Field of Clothing &amp; Textiles)</td>
<td>0 male students, 12 female students</td>
<td>15 (3 in academic leave). Participants in total 12.</td>
<td>24.4 years</td>
</tr>
<tr>
<td>Group 4** (Technical Design and Technology of Apparel)</td>
<td>0 male students, 12 female students</td>
<td>12 (3 in academic leave, 4 did not apply). Participants in total 8.</td>
<td>23.9 years</td>
</tr>
<tr>
<td>Total Number of participants</td>
<td>56 male students, 24 female students</td>
<td>67 students</td>
<td>24.2 years</td>
</tr>
</tbody>
</table>

Source: Compiled by Marge Täks
4.4. Implementation of the new entrepreneurship programme.

After studying the timetables and having discussions with the Chairs, four groups (2 male and 2 female dominated groups) from two different faculties were included in the pilot project. The pilot project provided an opportunity to study whether the methodologies would work similarly in all groups when carrying out the same activities.

All four groups were directed and assessed in the same way. To make sure that procedures were conducted similarly, two different groups were taught by two facilitators. That helped to double-check the teaching methods, and provided more time for observations. The data and notes gathered during the project were harmonised and prepared beforehand. The procedures for the research were also introduced within the faculties and to the managerial team of the HEI.

In addition to the implementation of the new entrepreneurship programme, a new entrepreneurship project was also introduced. The first phase of the implementation started in September 2010 and lasted until January 2011.

5. Data collection

The most important baseline for data collection was the expert group report that was the foundation for the curricula analysis. The documentation related to the curricula and historical background was taken into account in addition, as well as the analysis of the economic and entrepreneurship module (see Table 1). Some formal materials – official learning outcomes, higher-education policy priorities and so on – were also analysed.

Shortly before and during the implementation phase of the pilot, the introduction of the new entrepreneurship programme was organised in all Faculties and Academic Chairs of the HEI. The goal of these meetings was informative, but among other things the aim was to find out how the teaching was organised. These meetings helped to map economic and entrepreneurship studies throughout the HEI, and provided final refinement of the programme before implementing the necessary executive decisions.

Information gathered during the pilot study mainly consisted of observational field notes and study journal statistics. Observational data was used to make changes to the programme and procedures as necessary. Another objective was to test the suitability of the teaching methods. Reactions, emotions and attitudes were observed during different tasks and activities. All remarks and comments were documented in the study journal. All study weeks concluded with a meeting, where the researchers discussed and analysed the information, and made changes as necessary – student instructions were improved.

Student self-evaluation and group evaluation were gathered on a weekly basis in memo format. These memos described task division within the group, group work/cooperation, problems and accomplishments. During one lecture, videos of group presentations were recorded and students had to analyse these later within their group. The recordings primarily had a learning purpose, but the feedback and self-evaluation received became surprisingly informative and important for the conclusions of the pilot project. During the whole pilot project all groups gave feedback 7 times – 6 times in written format, once in interviews. Two groups were interviewed right before the defence of the course project and the other two groups shortly after. The results did not differ much despite the assumption that the students might have been more cautious with their pronouncements before grading. Presumably, the trust between the students and researchers played a role in this. The
interview questions dealt with the knowledge acquired, emotions, experiences during the programme and suggestions for the future.

The last stage of the pilot project took place after the project presentations, and involved the grading of the project content and the portfolios. The portfolios were compared with the best portfolios from last year. The aim of the comparison was to identify whether the quality of the homework had improved compared to last year’s student assignments.

6. Findings and discussion

Attitudinal change is a lengthy process, so the learning outcomes did not reflect much shaping of attitudes and skills, only knowledge and assessment criteria. It was obvious that primarily traditional teaching methods based on knowledge transfer were used. Only a few teachers used case studies in their teaching and did some group work. So the support in the learning environment remained modest, as did student motivation. Moreover, as Edwards and Muir (2005) have stated, higher education courses should support students in acquiring theoretical concepts and teach them to implement these concepts in practice, to develop entrepreneurship and encourage reflection that enhances individual performance. Heinonen (2006) adds that learning has to be considered as being broader than just knowledge transferral, and should be assisted via appropriate teaching methods. In addition, it is important that academic leaders recognise the need to adjust university structures and processes at the outset in order to support and foster such new teaching strategies (Curri, 2008). Therefore, the gap between actual practice and the new goals was mainly due to the teaching methods and teaching materials in use. Based on the study journal, observational notes and student feedback (self-evaluation, interviews), all groups made similar comments about the teaching methods and group work. Students liked the innovative teaching methods and that the course was completed with a group project. Here are some citations to illustrate these comments (comments translated into English by the author):

“...we liked the fact that our course project duplicated real life”, “...we liked that we could try starting up a company, without any obligation starting it in reality”, “…this kind of learning provided us with new perspectives and activated our imagination. I don’t think this would have happened if we just did theoretical assignments.”

The comments on the teaching methods were as follows: “...we liked the fact that the learning happened in an active form and we always had some practical tasks to perform”, or “…it was interesting and constantly varied”, “…it was difficult at times, but interesting, so this compensated for the difficulties.”

Other positive comments were highlighted regarding role-playing games, especially in the male groups: “...we really liked this board meeting, where all the board members were extremely difficult personalities. It was instructive.” The female groups were more cautious and this held them back during the role-playing games. Even though they performed modestly in the role-plays, they mentioned the experience as a positive one. However, the females preferred the debates and both groups pointed out some issues raised during the debates: “I never thought about trademark registration issues before”, or “…some things did not seem so important before.” Creative tasks were welcomed very positively by all the groups, and commented upon quite frequently: “…we liked the playfulness and the fun and in the process we learned a lot.”
All groups, male and female preferred “...active learning instead of monotonous theoretical lectures, because it made the learning process more fun”. Preparations for the lectures and the paperwork presented were more in depth in the female groups.

Both male groups had difficulties organising the group work and planning the work at the beginning of the course, even though the group work was considered a positive experience. For example:

“At the beginning it was hard to arrange the meetings, but eventually we overcame this obstacle”, “...the most difficult part was reaching consensus within the group”, “...our general manager missed the first meeting, so we had to appoint a new manager, and board members”.

In addition, different working styles prevented group work in progress (mentioned by all groups). For example: “…one likes to socialize and the other prefers to lay on their own.” At the same time, it was noted that even though idea generation, as well as choosing from among all the different ideas was a complicated process, it was instructive and a great learning experience. The feedback from one male group said: “…sometimes it is good to have different perspectives because it gives more starting points even though it is difficult to reach a compromise afterwards.” This statement is confirmed by an extract from the study journal, where entries reflected some confusion and problems with time planning during the first meetings, especially in the male groups. Tasks and coordinating the group work as well as group performance improved every week. The male groups had noticeable difficulties with time management and correct drafting of the given tasks, but they enjoyed a lot of the active and manual activities as well as the role-plays. The female groups were more conscientious throughout the whole process and in drafting their tasks, and the content of their paperwork was better thought through and argued than in the male groups.

The share of independent work was considered vast, and created some difficulties mainly due to the fact that groups had difficulties with their time management, especially at the beginning of the course.

One student group wrote: “the amount of independent work seemed large, since we could not estimate what it meant. After we started the work, we realized that it was not as bad as we had thought”; another group said “it was good that we shared the workload and knowledge because when doing such a large work, no one can achieve good results alone.”

This kind group project creates a better understanding and knowledge of teamwork for the student, and together many can reach higher goals than when working alone. Students who were not used to the new forms (of the task-centred learning strategy) were confused about their actions at the beginning of the course; and therefore, detailed instructions were developed for the students. Students could ask questions as well to get feedback and reflect on their achievements during the course. Some comments about the instructions were as follows: “It was really good to have clear instructions, since the project was difficult and it helped to manage the information”, or “I really liked the structured way we had to solve the problems. At some points the instructions could have been even more detailed”.

Hanke, Kisenwether and Warren (2005) concluded during their pilot project that students who are accustomed to highly structured textbook teaching often feel lost or unguided within a PBL environment. Therefore, it is important that instructions are clear because instructions in the context of complex, authentic, real world tasks play a critical role in an engaging instructional strategy (Merrill, 2007).

Additional tools like e-support were considered positively, but the technical problems that appeared while uploading materials and other e-course related problems were mentioned as obstacles. When
comparing the final student projects to last year’s entrepreneurship course work, it was clear that the quality of the projects had improved. In addition, many bottlenecks in the curricula were established during the pilot project regarding the sequence of economics and management subjects, as well as in the content that contributes to curricular development. Overall, the feedback about the new entrepreneurship programme from students was positive and they also expressed an interest in such learning experiences in other subjects in the future. Cooperation and mutual trust helped to implement the new entrepreneurship programme successfully.

During the study, while taking field notes and asking for feedback, many aspects for Consolidating the New Practice were identified.

Learning environment. The physical environment means classrooms that should be furnished in order to enhance the use of active and innovative teaching methods. For example, tables should be movable and rooms must be equipped with the technical equipment needed. Most of the participants’ comments concerned the physical environment rather than the new approach to learning. To ensure a profound approach to learning, the appropriate teaching-learning environment must be available (physically and socially) (Parpala, 2010).

Lecturers workload. The problem-solving approach requires a different approach to planning the workload than teachers are used to, especially regarding e-support, which requires extra time for preparation, administration and for student feedback. Time is also needed for developing high quality problems. Hanke, Kisenwether and Warren (2005) confirm that more preparation time is needed with PBL, especially with problem formulation and the initial development and use of online course management technology.

Competencies of teaching personnel. Teachers who are practicing traditional teaching methods need to acquire new competences and experience to be able to use PBL, or other closely related (inquiry-based, case-based, project-based learning) teaching methods. PBL is a learner-centred approach – students engage with the problem with whatever their current knowledge/experience affords (Savery & Duffy, 1995). The challenge for many instructors adopting a PBL approach is to make the transition from teacher as knowledge provider to tutor as manager and facilitator of learning (Ertmer & Simons, 2006). Faculties using predictable outcomes in a textbook based on a linear pedagogy find the uncertainty inherent in PBL somewhat daunting initially. Therefore, it is important that faculty is trained in the skills necessary for effective PBL. (Hanke, Kisenwether, & Warren 2005). Teaching institutions that have adopted a PBL approach to curriculum and instruction have developed extensive tutor-training programmes in recognition of the critical importance of this role in facilitating the PBL learning experience (Savery, 2006).

Cooperation and team learning. Most learners will find themselves in jobs where they need to share information and work productively with others after graduating (Savery, 2006), so it is essential that all parties participate and evaluate each other in the teaching/learning process. PBL provides a format for the development of these essential skills (Savery, 2006). It is also important that cooperation between lecturers from different academic units ensures the quality of problems and the learning process. Much learning is informal in adulthood, and takes place in social groups engaged in a common practice (Merriam et al. 2003). Decuyper et al. add that team learning appears to be a key driver for individual learning, team effectiveness as well as organisational learning and innovation (Decuyper et al. 2010). There are indications that the performance of students in scenario-based courses is much better than in the previous courses taught (Merrill, 2007), and this was confirmed by the current study.
Cooperation with entrepreneurs. Cooperation with companies and HEI’s is creating value that is essential for establishing such study programmes. Especially, because the activities carried out in PBL must be valued in the real world (Savery, 2006); for example, many problems for learning purposes are based on feedback from entrepreneurs. Entrepreneurial teaching requires working with practitioners and businesses, since decisions need to be made in a timely manner (Curri, 2008).

Management support. Curriculum development projects affect school planning, financial resources and even influence the culture of the school. It is essential to have management support to implement the new approaches such as in the current project. Management commitment is necessary to keep the entrepreneurship programme working (Harkia & Schout, 2008).

New teacher education. To guarantee the sustainability of the new entrepreneurship programme, it is essential to have manuals for instructors and students. In addition, an induction programme for new teachers should be implemented, using different kinds of resources, such as mentoring, training, observing and coaching.

As a result it can be said that during this action research, many unanticipated factors became important and crucial for the successful implementation of the module. Based on Engeström’s model of expansive learning, the next logical step would be New Questions to start the same 7-step process from that point forward.

7. Conclusion

The problem-solving approach has become increasingly recommended in higher educational practice, as well as in general, and this means change in every day planning and teaching practices for many professionals, such as teachers, administrators and others involved. Changing mind-sets towards a more flexible approach and triggering sustainable management techniques is a long-term process that has to be carried out by the schools. This means changing the teaching culture and requires academic and administrative cultures that are based on a shared vision, institutional structures and processes that are aligned (Curri, 2008).

The results of the current study help managerial teams in HEIs make conclusions about the potential for developing new instructional processes. The same results can be used not only for instructional purposes, but also for the development of a personnel strategy and changes to the school culture in general.

Problem-solving and student-centred learning means that students should be stimulated to set their own goals, collect their own experience and choose how they will proceed with their ideas. Interactive teaching methods support those goals. The implementation of the new entrepreneurship programme helps reach established learning outcomes and has positively influenced the quality of the subject content as well as the teaching practices. The new entrepreneurship programme supports the attainment of learning outcomes, as stated by the expert group. This research also highlights the obstacles and opportunities that can be considered in further developments, and promotes acquiring new teaching competencies, and cooperation between colleagues and different stakeholders and students.

Acknowledgements

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