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Developing a modern model of higher education

Izgradnja suvremenog modela visokog obrazovanja

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Abstract

This paper elaborates the development of a new higher educational model. In that model, the focus shifts from knowledge, skills and abilities to the way of acquiring knowledge, skills and abilities.

There are three key differences between the existing system and the proposed new model: the new model has a built-in mechanism for unnecessary knowledge removal; unlike the present system, which is focused on the transfer of teachers' knowledge, the new model is aimed at students gaining their own knowledge; the present system is aimed at the learning content, while the new model is focused on the learning method.

Key words: evaluation methodologies; interactive learning environments; teaching/learning strategies; cooperative/collaborative learning; higher education

Sažetak

Tema rada je razvoj novog edukacijskog modela visokog obrazovanja. Predlaže se novi model visokog obrazovanja u kojem se težište pomiče sa znanja, vještina i sposobnosti na način stjecanja znanja, vještina i sposobnosti. Tri su ključne razlike između postojećeg sustava i novog modela koji se predlaže: novi model ima ugrađen mehanizam odstranjivanja nepotrebnog znanja; za razliku od postojećeg sustava koji je usmjeren prema prijenosu znanja nastavnika, novi model je usmjeren prema stjecanju studentova vlastita znanja; sadašnji sustav je usmjeren prema sadržaju koji se uči, dok je novi model usmjeren prema načinu kako se nešto uči.

Ključne riječi: evaluacijske metodologije; interaktivni sustavi učenja; strategije podučavanja/ učenja; kooperativno/kolaborativno učenje; visoko školstvo

1. Introduction

By analyzing and changing curricula, creating new ones, leading discussions and interviews, conducting surveys with many graduates as well as their teachers in different time periods, a general conclusion can be made: science, society and technology are changing too rapidly to be adequately followed by the curricula the way it has been done so far.

Basically, we have categorised the problems related to the introduction of changes in the educational systems into three groups.

The first group of problems is related to the exponential increase of the overall world knowledge, which introduces an ever-increasing and more frequent number of changes to human life. The modality and readiness of acceptance, adaptation and management of changes becomes one of the most important factors of success, but of survival in various segments of human life and activity as well (Potts and Lamarsh, 2005). Modern society is founded on knowledge-based companies, which are structured much differently than ones in the industrial model. The knowledge economy is based

on "the production and distribution of knowledge and information, rather than the production and distribution of things" (Sawyer, 2006).

Despite these dramatic changes, teaching in most educational institutions still relies on an outdated model of information transfer (Birenbaum et al., 2006). It is hard to find higher education institutions organised according to a sustainable post-industrial model. Although there are such institutions that implement some elements of post-industrial organization in their programs (such as on-line programs), very few educational institutions teach students how to create knowledge. Instead, they teach students as if knowledge is static and complete, and thus they become experts in the consumption of knowledge instead of experts in the creation of knowledge (Sawyer, 2006).

The second group of problems is related to the evaluation of knowledge and competencies of the consumer of individual curricula. In today's higher education, high quality evaluation of acquired knowledge plays an important role. Yet, little is known about the degree to which the evaluation is properly aimed at students' competency in relation to the defined objectives.

Modern knowledge-evaluation methods fail to meet the needs of today's students as well as modern, complex and globalised societies which they are part of. Therefore, the evaluation method of acquired competencies is one of the key issues of the educational system (Birenbaum et al., 2006). Most educational institutions are still predominantly oriented towards a summative evaluation of knowledge (evaluation at the end of an educational cycle), which aims to verify the results of education (Taras, 2005).

The third group of problems is related to an increasing discrepancy between knowledge acquired through formal education and knowledge required in the professional life of an individual.

Despite the fact that the educational results are improving over the years, the discrepancy is increasing. The problem is that most jobs in modern society are becoming more complex and demanding, both in terms of technology development and tasks requiring communication and social skills.

In the employment field, the institution of permanent employment has disappeared. There is a growing share of fixed-term employment. Job field changes are ever more often. Permanent employment is achievable only through continuous learning and training. Consequently, modern societies have a growing need for faster reforms of educational systems. However, no reform can be effective and carried out quickly enough using the traditional approach.

It is often the case that students with excellent grades in traditional educational models are not so successful after college, while some students with barely satisfactory grades achieve amazing professional results. Finally, it happens that individuals without formal education achieve extraordinary results and success (e.g. Bill Gates - founder of Microsoft, Steve Jobs - founder of Apple).

In that effect, it is clear that life also demands some other competencies, to the maximum extent related to real life situations. These are well-developed communication skills, ability of independent learning, ethics and positive attitudes, responsibility, decision-making ability, team work, competency evaluation of individual associates regardless of their status, self-evaluation of own competencies and positioning in a certain environment, etc. It is exactly these competencies, which are generally not part of the curriculum or at least not to the necessary extent and are often acquired through informal education, that are becoming increasingly important in modern society and for preparing students well for their future role in society in terms of employability and citizenship (Villa et al., 2000-2006).

Although the way that people acquire knowledge and develop abilities and skills is better known today, in effect it is very difficult to form a curriculum that would result in desired competencies of individual students. The amount of ultimately acquired competencies depends on a number of variables. According to our experiences as well as assumptions of others (Lalley and Miller, 2007), it may be claimed that the amount of knowledge increases if students discuss the curriculum content with other students and teachers, and if they link specific curriculum content to personal experience. As a matter of fact, if students teach each other, their overall knowledge in a particular area is maximally expanding.

We witness every day that certain plans and programs take account of the creation of precon-

ditions which allow students to master a certain program by discussing and linking the curriculum content to their personal experience. However, such models that would adequately prepare students for real life situations, which require a range of competencies that are now commonly acquired through informal education, are very rare. This paper proposes such a model.

In order to develop such a model, we believe the mentioned groups of problems need to be recognised and the approach should be changed. A series of new elements related to previously mentioned problems should accordingly be integrated into the model and thus enable faster and more efficient solution of such problems. Ideas, solutions and conclusions in this paper were developed in the last four years within the Evalus 360 project.

We present a new model and the necessary preconditions for its development in the second chapter, solutions and advantages of the new model in the third, while in the fourth chapter we offer a conclusion citing key differences between the existing system and the proposed new model.

2. New model development

Several requirements must be met in order to create a unique system, which would, within its boundaries, provide much-needed dynamics of modern curricula. We specify these requirements later in this chapter.

2.1. Course organisation

Each course can be divided into several units. Thereafter, a scoring system needs to be developed for each course, which will follow the types of teaching processes and the verifications of competencies a student should adopt. It can be a unique system at a certain university, which is then modified in accordance with the specifics of individual courses.

During the development of the scoring system, it is essential to establish a sufficiently broad framework that will not inhibit the development of creativity. The scoring system needs to ensure that students continuously develop their skills by

achieving results they truly want to achieve. Within the Evalus 360 project, we propose the creation of preconditions for the development of a system that will foster new ways of thinking, a system that will enable the development of learning skills, and a system that will continuously be possible to improve in accordance with the abilities and creativity of all participants in the educational process.

In developing such a system, it is necessary to determine the bottom margin for a particular course (grade: sufficient), while is better to leave the top margin undefined.

2.2. Earning points

According to the developed system, students need to collect points during the semester pursuant to their commitment, creativity and acquired competencies. Criteria for awarding points are part of the debate between students and teachers and are defined at the beginning of the semester according to the specifics of each course.

Since each curriculum's content which needs to be mastered might basically be divided in several parts, students have at their disposal more ways to obtain the required number of points. It is necessary to emphasize that students have the opportunity to choose the way of collecting points most acceptable to them.

The amount of collected points for individual students increases during the semester depending on their engagement. The present state can be made available to all course attendants.

For students to be maximally motivated to collect even more points than needed for an excellent grade, a general decision for courses within the Evalus 360 project has been made that if some of them decide to do their final project or thesis within a certain course, those students who have collected more points will have precedence.

2.3. Colleagues' evaluation

Fellow students should also give an assessment of each others' engagement, discussions, presentations, seminar papers and the like. In other words, during the teaching process, every student should

assess other colleagues, as well as be assessed by others. The final grade in each course would be based on a significantly higher number of parameters than is the case in most current systems.

That way students would not be solely focused on the exam (as they usually are in traditional educational systems), but they would significantly expand their focus to include a series of other variables (as in real life). Apart from the fact that students would gain necessary life experiences from such situations, they would also master the curriculum content much faster, gain permanent knowledge and acquire necessary competencies. According to our findings, the curriculum content is mastered significantly faster if a student discusses it with other students and teachers, links it to real-life experiences and at the same time educates other participants of the teaching process (Lalley and Miller, 2007).

2.4. Use of communication tools

Apart from direct communication (with each other and teachers), long-distance communication via the Internet should be provided to students. Online learning provides easier communication between students, better acces to information and learning material (Rohleder et al., 2008.). Web 2.0 Learning Management System (LMS) applications help them with that (for example, Claroline).

It has been proven that participation and learning are inseparable, that they work together: if we want to improve online learning, we have to encourage students' online participation (Hrastinski, 2009). Likewise, all types of online interactions stimulate students' creativity (Jang, 2009).

An upgrade of the scoring system has been conceived so that everything previously mentioned could actually be implemented. It is envisioned that students themselves award points for participation in lectures and exercises as well as for seminar papers and presentations, while exam points are awarded by the subject teacher. Points are awarded according to rules defined in line with the specifics of each course.

For certain courses included in the Evalus 360 project the rules are the following:

– Every student who wants his participation in lectures to be evaluated, i.e. to gain points for his participation (short presentations on a given subject, discussions…), is also obliged to evaluate his colleagues' participation.
– The evaluation is anonymous and the results are available only to subject teachers. Results may be used exclusively for a qualitative assessment of each candidate, i.e. the final grade of each candidate has to correspond to their actual competencies.
– Accordingly, each student fills out a table for a certain number of candidates, depending on the part of the curriculum content in question. The criteria are set for each situation separately, depending on the specifics of each course (for lectures, exercises, seminar paper, etc.).

The final grade for each student is based on the sum of all points. Points earned in individual course segments are corrected with regard to students' commitment and seriousness in the evaluation of other colleagues using corrective factors. Basically, students who correctly complete this task should be rewarded and those who attempt to award points outside the agreed evaluation criteria should be prevented from doing so. Positive points are awarded for grades in compliance, and negative for grades not in compliance with the pre-agreed rules.

Since team work is desirable in every teaching segment, rules which regulate and stimulate team work are defined. Accordingly, students do not evaluate colleagues working in their team for a particular course segment.

After creating preconditions necessary for specific activities and model development, the advantages of the new model are discussed in the following chapter.

3. New model advantages and solutions

Although continuous reforms are underway in different countries, a unique platform, which would allow that much needed dynamics of modern curricula, has not yet been presented. Some of them allow the resolutions of a subset of the previ-

ously mentioned problems to a certain extend, but neither solves the complete set of issues. There are many reasons for such a situation and we shall try to single out key reasons as well as offer solutions.

3.1. Knowledge increment

We propose a solution to the problems related to the exponential increase of the overall world knowledge with the new model by:

- integrating a system-changing mechanism into the educational system itself
- redefining the relationship between teachers and students
- involving students into the teaching process and the creation of a common vision.

There are several reasons why these problems cannot be solved through traditional approaches. One of the key reasons is that the system-changing mechanism is usually placed outside the educational system, too far from students and teachers. In most segments where fast change is needed, curricula are changing too slowly. The reasons for that are numerous: in most cases the inert mechanisms for approving individual plans and programs (reviews, etc.), inadequate positioning and defining of the relationship between students and teachers in the educational system, lack of transparency in educational systems and their mutual incompatibility, slow introduction of new contents into programs, inadequate program-individualisation potential, etc.

The new model integrates the changing mechanism into the system itself. All participants of the teaching process are involved in the changes. Therefore, the conditions for a "learning organisations" concept are created. "Learning organisations are those where people constantly develop their abilities to achieve results they really want, where new and expansive ways of thinking are nurtured, where individual and collective aspirations are freely expressed, where people constantly learn how to learn together, and those organisations which constantly improve their ability to build their future." (Senge, 2001). With such an approach, we are moving away from the traditional learning concept (in terms of memorising information).

The exponential development of science and technology requires a different definition of the relation between students and teachers. Although certain reforms place students and teachers in a partnership, in most cases their relationship, due to its inadequate definition, does not offer a complete solution (Bologna process, 2007). In most cases, a teacher is defined as someone whose basic mission is to educate other participants (students) of the educational process, while a student is someone who primarily masters the curriculum content and acquires knowledge imparted by the teacher. The teacher is on one side of the teacher's desk while the students are on the other. That's why these approaches are being increasingly criticised. The present society requires a radical new approach to educational pedagogy where theory and practice are effectively linked (Korthagen et al., 2006). With the help of computer technology, students now have a higher possibility to be proactive in the learning process, i.e. to achieve better learning results. Learning with the support of online applications puts the student in first place, while his progress in the learning process depends on his effort and dedication (Keles et al., 2009).

Modern society and the new approach to the development of educational models require a redefinition of that relationship. The teacher in that sense becomes the first among equals, only someone who is most often at the teacher's desk. His place is with students, on the same side of the desk. He imparts his knowledge, experiences and attitudes to students and teaches them at the same time. Learning methods and ways of acquiring certain competencies are in the focus of the new approach. Online support allows teachers to implement adaptive learning programs as well, i.e. to adjust to each individual student (Gaudioso et al., 2009). Moreover, the teacher is the one who learns significantly more from students than it was the case before.

The teacher is the one that mostly provides materials for lectures, exercises, seminars, etc. He helps students and sets out ways to actively involve them into the teaching process. He helps them to prepare presentations, discussions, etc. The entire work is increasingly shifting towards a mentoring relationship. Methods where students transcribe and take notes during lectures are disappearing and becoming history.

Bloom's taxonomy (table 1) and Bloom's taxonomy pyramid (figure 1), through graphics and tables, show students' desired skills and competencies, from lower-order skills (remember, explain) to higher-order skills (evaluate, create) (Bloom, 1956).
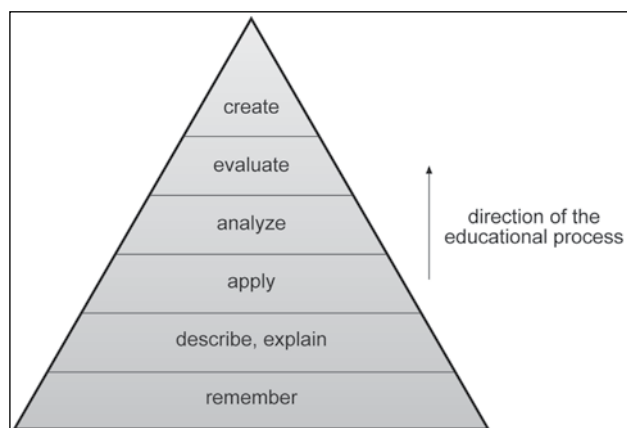

Figure 1. Bloom's taxonomy pyramid

Internet and LMS development provides significantly more information sources and information-gathering methods, especially if the use of individual LMS is properly standardised (Munoz-Merino et al., 2009). Students require an interactive relationship with the world. At the same time, they try to find a way to express their own personality and the need to co-operate and communicate with other people around them.

The student in such a relationship becomes significantly more active in a series of segments. He is the one who improves the teaching process with his creativity. He teaches others through his activities (discussions, presentations, seminar papers, etc.). Besides, he also becomes someone who evaluates the activities of others in the teaching process. Students are capable of taking over some of the teacher's roles (Laat et al., 2006). Certain generations or certain groups of students can be identified as a "learning organisation" (Larsen, 2006). The work and role of students need to be observed in the context of the whole, a larger system that consists of interdependent relations and processes. By involving students into the teaching process they are also being involved in the creation of a common vision, where they arbitrarily decide about their contribution in the process. Once the common vision has been established, due to a "creative tension" it generates, it becomes the driving force for changes (Senge, 2001). If during the teaching process an atmosphere of genuine participation is created, then the control is not needed any more. Students know themselves what they have to do. Likewise, the more people voluntarily participate, the less control mechanisms are needed (Kelleher, 2006).

The new model stimulates students' creativity. Existing systems do not allow that because the teaching contents are too strictly defined. In tra-

Table 1. Bloom's taxonomy

Remembering important information	Clarifying important information	Solving closed problems	Solving open problems	Creating unique answers to problems	Critical judgement
					Evaluation
				Synthesis	judge
			Analysis	compose	estimate
		Application	distinguish	plan	assess
	Understanding	interpret	analyze	build	recommend
Knowledge	recognise	apply	calculate	suggest	evaluate
define	discuss	use	verify	formulate	standardise
recognise	describe	demonstrate	compare	organise	review
repeat	group	illustrate	draw	prepare	valorise
mark	explain	allocate	isolate	construct	compare
name	express	sketch	link	conceive	conclude
isolate	identify	implement	solve	allocate	choose
print	notify	pick	categorise	manage	
remember	summarise	handle	inquire	lead	

ditional systems, students' creativity is "allowed" instead of being developed (Claxton et al., 2006).

3.2. Knowledge and competencies evaluation

During the implementation of the educational process, students are exceedingly focused on exams. Their final objective is to obtain a diploma, regardless of actually acquired competencies.

We propose a solution to this group of problems with the new model by shifting focus away from exams. The evaluation of knowledge is much more objective throughout the entire teaching process (figure 2). Every student is evaluated not only by the teacher but by his colleagues as well. He himself participates in the evaluation of other students' activities.
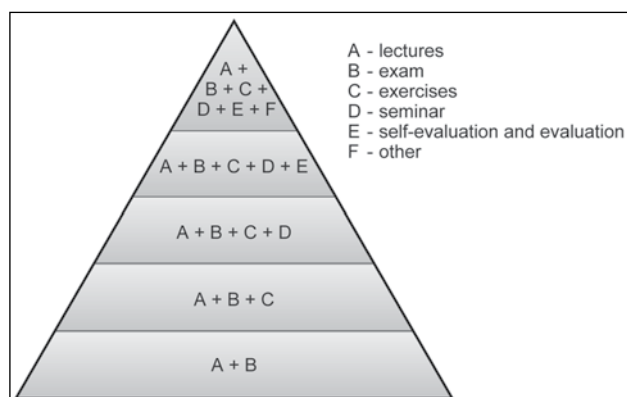

Figure 2. Development of the competencies evaluation process

The emphasis is on the teaching process and actually acquired competencies. The exam becomes less stressful, more objective and a formality if there has not been any attempt to cheat the system. Unlike the previously mentioned and currently dominant summative knowledge evaluation, the formative evaluation of knowledge is integrated in every course program. Its main purpose is to provide feedback regarding progress of the learning process.

In light of the new model, we present the learning results and the evaluation of students' competencies on the example of the Printing and design course. Learning results related to specific common knowledge and relevant to the content of the Printing and design course are:

(a) knowledge

Students will be able to define basic concepts related to the relationships between the format of the finished graphic product, printing technology, printing machinery formats, design solutions and cost of the final product.

(b) understanding

Students will be able to recognise different possibilities of graphic product creation in respect to different design solutions and to identify the optimal way of producing graphic products.

(c) application

Students will be able to apply the knowledge related to raster reproduction, use various graphic tools, choose optimal design solutions for graphic products, draft them and create a production schedule (plan) for a specific graphic product.

(d) analysis

Students will be able to calculate the required amount of individual materials for the production of a particular graphic product, analyze and compare different design solutions, distinguish acceptable from unacceptable versions and solve other problems that may occur during the production of the graphic product.

(e) synthesis

Students will be able to create the design of a graphic product as well as prepare and organise everything needed to enable the printing of such product.

(f) evaluation

Students will be able to evaluate the suitability of particular design solutions for a specific graphic product, standardise tasks related to the design and print of a certain graphic product as well as evaluate, revise and draw a conclusion about the optimal way of producing a certain graphic product.

In this course students' activities and the way of monitoring them are divided into several phases:
1. Browsing information related to course content (professional literature, university libraries, encyclopedias, web...) and writing reports about mentioned activities. Delivering (uploading) reports to the course website in

given time frames. Analysis and evaluation of reports according to defined criteria.

2. Writing a seminar paper. Uploading the seminar paper to the course website. Analysis and evaluation of a certain number of peer's seminar papers, according to defined criteria.

3. Writing a presentation on a given subject. Uploading the presentation to the course website. Preparing for the presentation. Presenting (5-10 min) during lecture time. Discussing the subject of the presentation. Analysis and evaluation of a certain number of peer's presentations, according to defined criteria.

4. Executing exercises. Resolving tasks. Putting forward design proposals and preparing for printing of a particular graphic product under defined conditions.

5. Final discussion. Joint analysis and verification of everything accomplished so far.

The success assessment is conceived as a comparison between students' evaluation results for every course segment and grades given by the teacher.

Points are awarded for each course segment. The total amount of points consists of grades given by the teacher and by the students. A ranking is made based on points, while the final grade is based on the ranking. With the development of the system it is envisioned that the share of students' grades in the final grade increases.

In most cases, the workload of regular students is 100 to 120 work hours per course. In line with the above mentioned, for successfully mastering the Printing and design course students are awarded with 4 ECTS points (European Credit Transfer and accumulation System).

3.3. Discrepancy between the educational system and the professional life of an individual

The third and least solved problem in traditional systems is that the traditional educational systems are not sufficiently linked to real life situations and competencies which facilitate success.

The new model offers utmost improvements in this group of problems as well. Students have an interactive relationship with all other participants of the teaching process. By defining the system in which the student is evaluated not only by teachers but by his colleagues, and in which he must himself evaluate other participants of the teaching process, he is placed in real life situations. In that way, a series of other competencies which are not included in traditional educational systems are being developed.

Unlike most previous problem-solving approaches that were supposed to increase students' competencies by introducing new courses and contents, which would "cover" those specific competencies, the approach has been changed by the proposed model in the way that basic competencies are built into each course, regardless of the content.

Bloom's taxonomy is turned upside down by the new approach in building a modern model of higher education (figure 3). Through creation and evaluation, knowledge is a consequence. With the creation of various elements of each course, analysis, self-evaluation and inter-evaluation of students and engagement during the semester, each student gains his own knowledge, unlike the old system where students consume knowledge of others through lectures and literature.
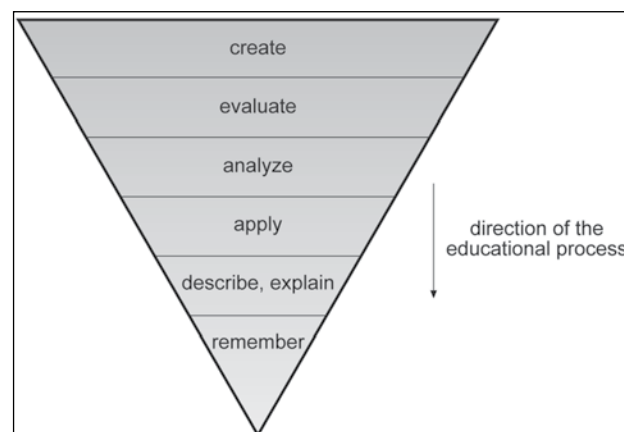

Figure 3. Reversed Bloom's taxonomy pyramid

3.4. The new model in application

The designed model attracted great interest among students and significantly contributed to their greater involvement. Teaching quality and the level of communication between students and teachers has increased, which resulted in better knowledge and higher exam pass rate.

With such approach and development of the scoring model, students have the opportunity to learn in far more efficient ways during the teaching process, through discussions and debates with other colleagues, students and teachers, linking theoretical knowledge to personal experiences, and finally by teaching other colleagues.

In interviews with former students, now professionals, after asking about the necessary competencies required after graduation and when they start working, a few clear answers came to light. Graduated students, who are just starting their working life, usually lack in competencies which are related to real life situations: decision-making ability, evaluation of own competencies and the positioning in a certain environment, evaluation of associates' competency, tendency towards teamwork, etc. (Villa et al., 2000-2006).

Grades earned in college often are not in line with the acquired competencies. According to our experiences, in certain cases a lot of time is needed for an individual to adapt to certain jobs for which he is formally qualified. At the same time, despite their low grades, some students adapt very quickly to individual work environment systems after college and they advance very rapidly in those systems as well.

In line with what has been said before, it is clear that if elements of real-life simulation were embedded in educational systems, especially in the highest level, students' competencies would significantly increase. That would much better prepare them for coping with real life situations. In life, individuals have to make decisions all the time, evaluate personal knowledge, skills and abilities as well as competencies of others in the working environment and other life situations. Success in the professional field and life in general is closely related to the decisions and finally acquired competencies which we develop during the educational process.

4. Conclusion

Every day in different segments of human life the intensity of changes is increasing. The way we do business and learn as well as our way of life in general is changing. Changes are happening whether we want it or not.

Our new model proposes effective and sustainable solutions to all three groups of problems mentioned in the introduction.

The integration of the changing mechanism in the educational system is made possible. That allows easier change management and system control without the suppression of creativity. The system is built based on the creativity of all participants in the teaching process. All of the most effective ways of learning, such as discussions between students and teachers, linking to personal experience and teaching others, can be easily integrated in the system. According to interests and special talents of individual participants in the teaching process, a complete individualisation of the educational system is allowed. The focus shifts from knowledge, skills and abilities to the way of acquiring knowledge, skills and abilities.

Unlike previous systems, which would solve the need for greater knowledge and competencies by introducing new courses and contents which "cover" those competencies, the new model solves this problem by integrating the development of basic competencies into each course, i.e. into each course segment.

The acquired competencies verification method is much more objective (depending on the specific case, the final grade is influenced by several hundred times more parameters than it is in traditional higher education models). The new model simulates real life situations. The rapprochement of the educational system and real life situations results in a shorter adaptation time after graduation. The new model links formal and informal education in the context of targeted competency development.

Developing a modern higher education model becomes a necessity. There are three key differences between the existing system and the proposed new model: the new model has a built-in mechanism for unnecessary knowledge removal; unlike the present system, which is aimed at the transfer of teachers' knowledge, the new model is aimed at students gaining their own knowledge; the present system is aimed at the learning content, while the new model is aimed at the learning method.

We believe the development and implementation of such model would allow a stronger development of the higher education system, i.e. we believe the implementation of such model would allow a sig-

nificantly faster and better development of students' competencies, such as: interactive use of knowledge and skills, interaction in heterogeneous groups and autonomous action of each individual (Definition and Selection of Competencies, 1999-2005). It would also allow a series of other benefits that would ultimately result in a faster and better development of educational systems and the faster development of society in general (Villa et al., 2000-2006).

Views and ideas presented in this paper represent the basis for the development of a series of expert systems in different areas, especially if we want to develop sustainable systems which allow the satisfaction of the needs of present generations without jeopardizing the needs of future generations. This paper also defines the framework of software application development for the new generation of educational systems. The next important step in the development and implementation of the proposed model is the development of tools (Web 2.0 applications) which support ideas this paper is based on.

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