

DEVELOPMENT OF NEW KNOWLEDGE: CHALLENGES AND SOLUTIONS OF 21-ST CENTURY

Vladimir Romanenko¹, Galina Nikitina²

¹St-Petersburg State University of Technology and Design;

²North-Western Branch of the Academy of Information Technologies in Education, Russia
head@akadionw.spb.ru, ladogalake@gmail.com

Abstract. Active transformations in modern society create new education challenges. These challenges affect the education strategies on all possible levels of educational hierarchy. The main sources of educational challenges are connected with globalisation, informational revolution and social dynamics. The responses on educational challenges produce new educational ideas and practices. The high horizontal mobility both of students and educated individuals creates vertical diversification of curriculum for its compensation. The high speed of technological changes forces new demands to education process flexibility. As a result the new curriculum core is necessary for supporting of student mobility and curriculum changes. At the same time computer assisted education changes all traditional educational tools: text-books, recommendations for recitation classes and other. It is necessary to find new methods for motivation of student education activity. Special problems connected with education of students with high IQ are discussed.

Keywords: technological changes; globalization; student mobility; curriculum core; computer-assisted learning; motivation to learning; diversity of curriculum.

XXI century and its educational challenges

Educational system is built to perform demands of social environment. Changing environment creates new educational demands. That is why all educational institutions have to constantly upgrade their curriculum. The sensitivity of curriculum to surrounding environment is described with the so called elasticity index E_j [1].

$$E_j = \frac{(\Delta P_i)}{(\Delta q_j)} = \frac{(P_i^2 - P_i^1)}{(q_j^2 - q_j^1)}$$

If any parameter of environment q_j changes it changes in any value of curriculum denoted as P_i . The changed values are measured at different moments of time: t_1 and t_2 . The integral changes of all possible q_j for many centuries were not high. In former time it was permitted to introduce educational changes with low speed. The new curriculum generated under these processes was stable for a long time. The history of science and technique says the changes in environment have serious acceleration at several last decades. This period is the time of intensive creating of new knowledge. Such intensity transforms the evolution character of education upgrading to revolution one. It is not enough to restrict investigations of curriculum changes with traditional study of elasticity indexes. The new challenges create new responses. The main goal of this presentation is observation of some new challenges and primary outline several ideas permit to find effective solutions of educational practices at the tertiary level.

Changes in the period of active education

The full lists of knowledge which are necessary for normal life are changed in accordance with the changes in the social environment. Some old skills and laws are eliminated and some new ones became useful. It means there are informational flows in the education area. Their directions are opposite. More than over: these two information flows of the opposite direction are not equal. That is why the time of active learning constantly growth. As the result the period of education has grown at each decade. For example, at the end of the XIX century in many countries the secondary educational level took the period of eight or nine years. The university period took frequently four years only. At modern times the education at the secondary level (high school period) finishes after the 12-th form. The university cycle: (BC, M.Sc. enrolment) in many countries takes 6–8 years some time. This means the well educated expert begins his or her practical work not far from its 30. This long term of education is compensated with growing of the human biological life. We can say the fraction of the education period in percent approximately is stable. It is right if we speak in terms of the calendar life duration (life span). Yet, the biological human ages of young experts at starting carrier point have

noticeably grown. Many students which turned 25 have families and kids. They need money for support of his or her relatives. The motivation to education of students at 18 and at 25 years is very different. Many students are forced to have a one-two year brake in his or her studies. This is serious challenge for the university staff, indeed.

There is the third time involved in the standard education cycle. This time can be denoted as the life time of generation of technical and technological products. Evolution of knowledge, ideas and technologies is described with standard laws connected with their development. These main laws could be represented with the help of the S-form curve referred as the logistical curve. This curve started as exponent. It detects any horizontal saturation part after some years. This saturation part transforms into a new logistic curve after the so called period of the technological gap – Fig.1. At former times the technological gaps were long. Let us remember: the needle was invented at the stone age. The sewing machine was invented in the XIX century only. In the XX

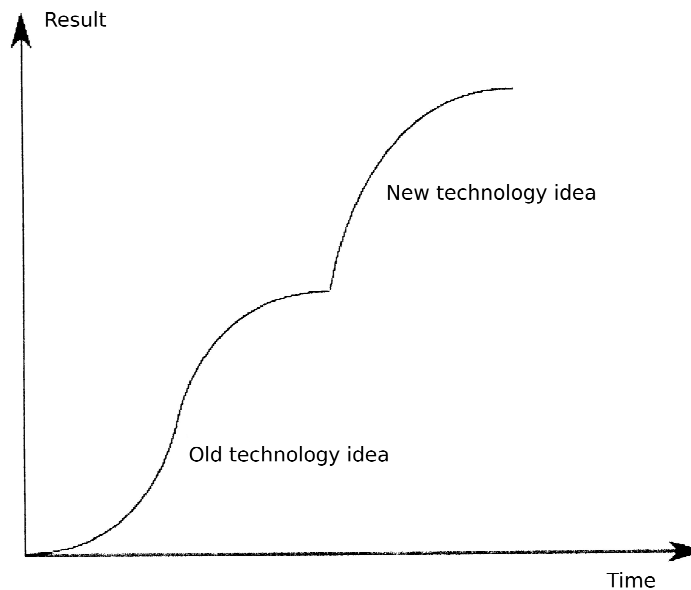


Fig. 1. **Logistic curves for two serial ideas:** the technological gap is absent

century the cell phone was invented in the last decades of the century. It is superseded by smart phones now. So, the life time of technique is sharply decreased – Fig.2. It is necessary to use average human age as a scale in studies of such type processes certainly. Not far ago several generations worked with the unchanged technique. The technical environment was also stable. As a result the education process was stable, too. Nowadays the life time of ideas and technique is shorter than the active period of human life. The expert in any area has to update his or her skills and knowledge several times at the period of his or her real activity. That is why the renovation of curriculum is the actual requirement nowadays. It is the second challenge to education in the XXI century. Our point is that this challenge is the most important challenge of the XXI century to the education system.

Globalization and personal mobility

The term globalization is widely spread. It is connected to the theory and to the sets of facts and observations of the modern human life. The well known term globalization does not have exact determination. At first this term was introduced by R. Robertson who wrote that globalization "... is the compression of the world and the intensification of consciousness of the world as a whole" [2]. Historically the phenomenon of globalization was described many times even in the ancient period. There are known a lot of examples of this process. The experts in economics say this process became very active since 1650 – when the slave trade officially started. All the main confessions are spread in the world in the process of their idea of globalization expansion. The second half of the XX century transformed the ways of globalization. The classical globalization was realised in two ways. The first one was the slow sprawling of technologies. The second one was the territorial extension of states and building of empires. In opposite, the modern process is the association of the independent well-

developed states. This process demands some unification acts in particular new standards like the standards ISO, unification of the traffic laws, the library descriptions and catalogues.

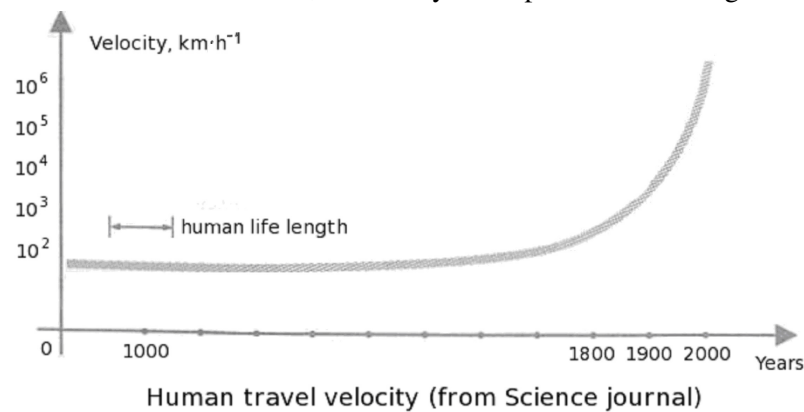


Fig. 2. **Human traffic speed development over time:**
sharp growth during the last centuries is evident

In the field of education there are two areas connected with the globalization [3]. The first among them is the study of new standards, laws and so on. The second area is more interesting. Its idea is to give a set of universal knowledge, skills and abilities, the so called KSA. This universal set of KSA formats the so called base curriculum core. The well educated specialist who possesses all KSA of this curriculum core can find a good position in many countries. He or she can get additional classes in many universities or special schools. That is why the development of the modern educational process creates high mobility of individuals with different education levels. There are some special requirements to ensure programs of students and faculties education exchange and professional mobility. First of all they are new requirements in the conversation field. The European qualified individual must have excellent command in English. His professional knowledge has to be estimated by the help of a universal standard procedure. These facts significantly increase the homogeneity of the whole world educational space. The homogeneity of knowledge includes some standard programs and standard testing procedures, marks and other practices. All documents – certificates, diplomas and degrees have to be standardised, too. Certainly this homogeneity is not painless. The most part of professional competencies are adapted to narrow application area. So the price for universality is the loss of specialisation. The standardisation of educational technologies and the student mobility affect the quality of education. The ideas of Bologna declaration silently permit some deterioration of the quality of education instead of its universality. Yet, the compensation of its improvement is based on creating additional diversity in educational strategies. This diversity is founded on the vertical diversity which is taking into account the personal behaviours of every student and better student-instructor interaction. So the desirable skeleton of the modern educational strategy on the tertiary level is the combination of the horizontal homogeneity and the vertical diversity. To find the necessary balance between these two vectors is a serious problem. Its solution depends on national traditions, previous experience and competition between the different education institutions. To encourage this competition is the best response to this challenge. There is known one more model of creating educational diversity. This way it is connected with implementing in educational process some local aspects and ideas. In the area of sociology it is denoted as glocalisation [4].

Education of gifted individuals

The quality education has to include some special different programs for gifted individuals. The today's optimal education strategy includes the special policy for development of all possible kinds of talent. No losses of individuals with non standard behaviours is the main thesis of the XXI century education system. Many of gifted students can get some additional consultations and study along their intensive personal educational path. Some individuals with high special properties must develop their behaviours in the schools and colleges of professional orientation – sportive, math-oriented, artistic et cetera. In many cases individual orientation in the professional oriented institutions is successful for some deterioration of any subjects of the basic curriculum core. Nobody would say anything bad if an excellent violinist would not possess modest skills in history or statistics. In similar words it is

possible to say about football or chess players or opera singers. The mentioned talent individuals became stable after many years training. It is known that one great talent can be raised from no less than hundred gifted candidates. Big fractions of these candidates usually are forced to find a new profession. Their weak mastering in several basic KSA is a widely spread situation. This loss is a serious obstacle in their integration into the surrounding community. Protection of these individuals is treated as a very important problem. It is evident that this problem must be under active everyday discussion.

The challenge of computerised environment

Implementing of personal computers in education technologies has a long history. The first transistors and analogous schemas were implemented in reciting classes and laboratories simultaneously with the first computing tools. Many achievements in computer assisted learning are described after this time. The Internet learning, new training methods and some other technical novelties changed the principal educational concepts [5]. Both faculties and students love PC in classrooms for many reasons. There is no doubt PC-assistance is the cardinal way of progress in learning. Yet, computer training has some negative effect on the learning results. These negative moments do not have the decisive role in the teaching practice. Nevertheless, these problems are necessary to be taken into account before their effect would not hardly increase. In most European states the toddlers of the modern generation are acquainted with PC. Computer games create some unwanted psychological behaviours of young individuals. The worst of them is the loss of responsibility feeling. The second bad affectation is creating of the custom to continuous waiting of different tips from the computer. As a result the long work in computer-assisted classes produces partial loss of pupils' and students' independence. The skills of active work with different information sources create very slowly under constant computer control of the educational process. That is why it is necessary to use special training programs to avoid these negative behaviours.

Conclusions

We have specified four main challenges to the educational process in modern time only. All of them are serious, yet they are not critical. There are some different ways to compensate the negative effect of the described factors. The ways of compensation still are not studied and compared between each other. Our point is that the study of the content of the curriculum core is the most important subject which has to be studied in the first order. In opposite to this, the computer assistance in classrooms is discussed carefully. The most interesting concept of the farther development of these studies is creating of several standard education strategies which can be fit everywhere. The broad discussion to find the demands for universal text-books, training-programs and other technological tools is also useful. The special programs of life-long education and additional training methods for improvement of high quality specialists may be recommended, too. It must be specially discussed. An especially perspective way for improvement education on the tertiary level is gathering of different statistical data. These data include typical students' mistakes, frequently asked questions, faculties opinion and reviews of widely spread text-books. Some standard recommendations about the periodical upgrade of all teaching tools are also necessary.

References

1. Романенко В.Н., Никитина Г.В. Эластичность педагогического процесса и информатика (The elasticity of the pedagogical process and its Connection with Informatics) (In Russian) - Педагогическая информатика (2010) № 2, 57-65.
2. Robertson R. Globalization: Social Theory and Global Culture – L.:Sage, 1992. 211 p.
3. Derrick C.I. 3. Globalization, Education and Training in the Information Age. Access at: http://www.unesco.org/webworld/infoethics_2/eng/paper_23.html .
4. Khondker H.H. Glocalisation: Evolution of a Sociology Concept – Bangladesh e-journal of Sociology v. 1, # 2 (2001).
5. Abramovich S.(Editor) Computers in Education - NY.: Nova Sci. Publishers, 2012. (In two volumes).