Issues of Contemporary Education:
Paradigms, Technologies, Teacher Training

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Abstract

In the present paper, the following items are discussed: evolutionary synergetic and ecological paradigms of education; nonlinear thinking and nonlinear educational technologies; E-teaching and e-learning; on-line courses and open source software; m-learning as a new trend in e-learning; teacher training. Modern information and communication technologies, new pedagogical approaches are considered as pedagogical tools for self-education.

Keywords: Educational paradigms, Nonlinear thinking, Nonlinear educational technologies

1. Introduction

Nowadays educational specialists observe a gap between increasing amount of scientific and pedagogic information, its dissemination speed, and personal opportunity to perceive and processing the information. At the same time we feel a need for more and more information. The current situation is forcing young generation to fast adaptation to the processes, continuous enrichment in knowledge, and acquisition of new skills. Thus, self-education becomes one of the main prerequisites for survival and can be considered as a level of personal professionalism.

A few years ago my son graduated from the university where he studied the French language and literature, history, general linguistics. . . But now he is working successfully as a business analyst in one big computer company. How did it come?... I think that using intuitively contemporary methods and means for information search he acquired a new speciality, he was able to become

proficient in modern information technologies, data bases, automatic control system, etc.

Nowadays many young people are capable for self-education, first of all because of their natural ability to communicate with computer and computer nets. Specialists in education should learn from the young generation. We should become aware of those new contemporary pedagogical methods and means which computer suggests us and try to introduce them into the study process. While classroom teaching and management strategies are well documented, the online learning environment presents different challenges and benefits [6]. The present situation in education can be characterized as rapid expansion of e-teaching and e-learning. It is necessary to realize that teaching in an online environment calls for different pedagogical approaches and a special set of teaching skills [7]. A special attention should be paid to future teacher training.

2. Synergetics and ecological paradigms of education

The main feature of the modern world is its diversity and its changeability, which becomes apparent not only in scientific and technological progress, but also in the way of life of the masses. A generation is required who is capable of managing new information technologies, and a new open relationship in the whole world. The possibility of a nation developing as a stable society and preventing global crises and other conflicts is directly connected with the educational level of that society. For adequate perception of a contemporary scientific picture of the world and stable development, a society needs the innovations in education, one of the main directions of human activities. Systems existing in nature essentially differ from those created by human being. Nature is capable to be resistant to exposure to outer influences, to adapt to changeable conditions, to improve [1], [2]. It is obvious that we need to adopt experience accumulated by nature and use it in human activity.

Here Synergetics oriented to search for some universal laws of evolution and self-organization of complex systems relieves. Namely, this theory can serve as a source for new world-outlook and philosophy. In the modern situation of society, there is the formation of a new view of the natural environment. Self-organization processes of a new informational society are developing. *'Synergetics is a new scientific paradigm generating a revolution that is more subtle and larger than the scientific revolution that took place at the turn of the 20th century and started with the theory of relativity and quantum mechanics'* [4]. Nowadays in Belarus and other former Soviet republics we observe a transition to a new evolutionary-synergetic educational paradigm and this is entirely adequate to the changes in science, culture, interrelations between man and nature, and in a modern world as a whole.

'Ecological knowledge plays a special part in forming scientific systems of notions, which combines knowledge about the biosphere on the one hand, and

knowledge about social processes on the other hand. It is not surprising that ecological knowledge is getting special importance in solving problems that concern the interactions of man and nature, the overcoming of the ecological crisis, and hence it is becoming an important factor in forming new worldview foundations of science. The new vision is based on the idea of an interconnection and harmonious relationships between people, man and nature, which constitute a single whole. Within such an approach we can trace the establishment of a new vision of man as an organic part of nature, not as its lord; science develops the ideas of the priority of cooperation over competition' [5].

The principles of openness and self-regulation of complicated systems, developed in Synergetics and introduced as an important principle into the modern scientific picture of the world, have lead to the same philosophical ideas and worldviews.

3. Nonlinearity. Nonlinear thinking. Nonlinear educational technologies

We live in an age of global problems which are problems concerning the survival of humanity. *'Producing and implementing strategies for dealing with the* **global problematique** *is a collective endeavor that requires new ways of thinking and new worldviews'* [4]. Computer, informational and telecommunication technologies all influence the formation of a new style of thinking. They form a new system of culture and a new system of moral and ethical values. Synergetics can serve as source for a new world-outlook and philosophy; it is based on the idea of the non-linearity of development and on a deep interaction of chaos and order. One of the main world outlooks of Synergetics is nonlinearity of thinking. *Nonlinearity of thinking* is a readiness to emergence of a new, to a choice among alternatives; it is also the task of making decisions/choices under conditions of uncertainty. Nonlinearity should become a main conceptual core of a new educational paradigm.

The main task of a new education system is to form a nonlinear thinking, first of all that implies a change of educational paradigm.

Because of their specificity, new information technologies are not able, in full measure, to open their training potential in the traditional education system in which the didactic linear technology of ready linear knowledge transfer still dominates. The gigantic growth of information flows does not automatically give the ability to realize completely the principle of transfer of all stored knowledge in the training process. Rather, the traditional system of education aims the educational medium (the teacher and his means and technology of training) at the linear model of knowledge, according to the following scheme [3]:

Knowledge → decomposition → training synthesis → knowledge → control

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However, in accordance with the argument above, a non-linear model of training is needed in modern education [3]

$$\text{Aim} \rightarrow \text{problem} \rightarrow \text{investigation}\big/\underset{\text{cognition}}{\longrightarrow} \text{knowledge} \rightarrow \text{control.}$$

By all appearances, the combination of linear and non-linear training technology may essentially facilitate the achievement of the study process aims. In the first case, the teacher acts as a knowledge conductor. But under the use of a non-linear model the teacher's role changes. The teacher acts as an organizer of student activities, as a problem producer, and as a system integrator.

Modern trends in education such as e-teaching and e-learning adequately correspond to new educational paradigm. They realize the tasks of the study process under gigantic flows of information and the world changeability. To embody the nonlinear model of training is possible by using such nonlinear technologies as Internet and World Wide Web. In this case, the tools of cognition are computer, nets, different software, computer models etc. Computer, information and telecommunication technologies influence/stimulate the formation of a new style of thinking, nonlinear thinking. Web-based instruction requires a different approach to the educational process and can deliver a different level of educational results.

The use of Web-based teaching technology is not merely a technological extension of using computers in the classroom. Use of the Web should have certain pedagogical implications for the nature of the material. This is an entirely new type of pedagogy. *'A look into the e-learning use in the educational institutions reveals three typical manners: as integrated in the classroom teaching that works as a supplement to the face-to-face-teaching; as a "mixed mode" approach to complement face-to-face teaching (blended e-learning); as an independent mode for teaching and learning as a replacement for face-to-face-teaching'* [6]. These different ways of using the Web are an expression of new models of learning and teaching, indicating the emergence of a paradigm shift from teacher-centered to student-centered learning, transmission of old knowledge to the construction of new knowledge, in fact emergence of new ecological educational paradigm (Synergetic evolutionary educational paradigm) we were talking above.

4. New trends in e-learning

The term "e-learning" implies a new educational technology based on well-designed computer-based courseware that allows students to teach themselves, in some sense e-learning means self-teaching. E-teaching should not refer to the automation of live teaching, as it does. Instead, it should mean the creation and deployment of computer-based educational tools that deliver all the elements of effective teaching: customized information, assessment, guidance, and examples, independent of their creator.

One of the main components of e-teaching and e-learning are online courses. It is obvious now that online courses involve many components:

- technical architecture, - instructional design, - graphic design, - intellectual property and copyright clearance, and - subject-matter expertise.

In the early days of online courses just some of the faculties developed online courses and they believed that information technology could transform learning, such faculties were able to master the required skills (e.g., HTML, Java, graphics packages etc.) and used whatever available resources. Now we can state that the legacy of these early courses is a quantity of different applications, approaches, and instructional designs scattered across the university. In many sources in e-teaching and e-learning it is pointed out that developing and delivering effective online courses requires pedagogy and technology expertise. Online instruction is more than a series of readings posted to a Web site; it requires deliberate instructional design that hinges on linking learning objectives to specific learning activities and measurable outcomes [7], [11]. It is unrealistic to expect that faculties will be able to master the instructional design needed to put a course online. I think it is wrong to make them responsible for activities for which they are not trained and in which they may not be interested. Technology is another significant responsibility when developing and delivering an online course. Here it is worth to add that *'while the development of online education has been progressing rapidly, further research is needed on the experiences of students in online courses'* [8].

There are many other problems, which should be solved by universities, e.g., as it is pointed out in many resources, how to correct curriculum, what brings more value from online courses: having random courses available or having an entire program available online. And many others. Open source software is a recent phenomenon that will revolutionize the software industry. Interest in it is growing globally, particularly in former Soviet countries. One of the main reasons why some institutions are turning to open source learning environments is flexibility because institutions can choose to develop the open source environment to meet their particular needs. The impact of open source software will be felt in many areas. Recently open source learning environments are becoming widely adopted by educational institutions [12], [13]. In pedagogic literature, they argue that it is common for a university or college to either run many different products to suit the needs of all departments or to force departments to adopt teaching methods that suit a single product. According to many pedagogical sources, a consideration of open source options should be written into an institution's IT (Information Technology) strategy. Adopting open source software and virtual learning environment can offer real benefits, but there are of course many issues to consider. Starting small pilot projects and engaging with the open source community will be essential first steps.

Nowadays mobile information and communication technologies are important enablers of the new social structure. We are experiencing the first generation of truly portable information and communications technologies with the relatively recent advent of small, portable mobile devices that provide telephone, Internet, and data storage and management in products such as: *i-Mate, O2,*

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Palm, HP, and *Bluetooth* that combine mobile telephony, removable memory chips, diaries, email, Web, basic word processing and spreadsheets, and data input, storage, and transfer [14]. The communication and data transfer possibilities created by mobile technologies can significantly reduce dependence on fixed locations for work and study, and thus have the potential to revolutionize the way we work and learn [10], [16]. A mobile connected society creates new training delivery challenges. This type of delivery is called m-learning. *While m-learning can be thought as a sub-set of e-learning (which is web-based delivery of content and learning management), the emerging potential of mobile technologies tends to indicate that m-learning, while mostly situated within the e-learning framework, also has links directly to the* **just enough, just in time, just for me** *model of flexible learning, and therefore just one of a suite of options that can be adapted to suit individual learning needs'* [9].

5. Teacher training

Traditional teaching centered on teachers and total control over students does not adequately correspond to contemporary reality anymore. Modern society needs a new student-centered type of pedagogy. Whatever new pedagogical appeared the leading role in educational process belongs to teacher [17]. Introduction of new information and telecommunication technologies demands adequate psychological and pedagogical future teacher education. It is needed to establish the orientations for contemporary teacher training, the core competencies student teacher are expected to have acquired. The setting of these guidelines is only a first step. There is also a need to create modern technically equipped information space allowing future teachers to develop such skills as media competence, critical thinking, ability for accepting newest educational innovations, readiness for living and working in the mobile world, and finally for teaching web-based courses. The use of modern information and communication technologies can also improve the quality and variety of the resources and support available to teachers, opening up new avenues to professional development [15]. Under permanent development of information technologies teacher training should be outstripping. This will help future teacher for easier adaptation to change of educational paradigms, modernization of information and telecommunication technologies, mastering new electronic educational tools.

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