ACADEMIC MODELS OF EDUCATION SUPPORTED BY INFORMATION TECHNOLOGY

Aldona Drabik, Lech Banachowski, Agnieszka Chądzyńska-Krasowska, Jerzy Paweł Nowacki

Polish-Japanese Academy of Information Technology (POLAND)

Abstract

Information technology is successfully applied in education. The aim of this paper is to identify the main trends occurring in the academic level education especially concerning lifelong learning and integration of informal learning with formal learning.

Keywords: E-learning, distance learning education, educational technology, lifelong learning, informal learning, e-learning systems in Polish-Japanese Academy of Information Technology.

1 INTRODUCTION

It is crucial to use proper technologies to improve learning in the new contexts. Existing solutions need to be carefully assessed from the point of view of their potential in the academic level education.

The present paper has the following main objectives:

- To attempt to classify academic models of education which use information technology.
- To identify models and techniques which can be used to support lifelong learning and continuous education at the tertiary level.

The applied methodology consists in collecting experiences from different types of online courses conducted at our academy (e.g. [1], [2], [3], [4], [5]) and the analysis of results published by other researchers.

The paper consists of three parts. The first part is the analysis of new education challenges. In the second part five education models which extensively use information technology tools are identified. Their essential properties are described from the point of view of new, non-standard education environments. The third part focuses on the needs of lifelong learning, and on the integration of informal and formal learning.

2 NEW EDUCATIONAL CHALLENGES

Universities accept students with varied levels of competence. That is especially true of second degree (graduate) programs, which attract graduates of different schools and different specializations, as well as those who resume higher education after a long break. There is a need to adjust details of the study programs to meet specific needs of students, so that they can cope better with course material, and reach the desired academic level. In order to facilitate the learning process it is necessary to tailor the material to the needs of students so as to assist them in catching up on the areas on which they need to work more to meet the academic requirements.

Massive open online courses (MOOC) attract thousands of students. Teachers need assistance in performing tasks such as answering students’ questions, organizing repetition and consolidation of knowledge, generating and checking tests, home assignments and examinations.

It is of prime importance for the society that all individuals seeking to further their education, irrespective of age, gender and social situation, find suitable study options. Lifelong learning should be personalized to cater for different situations and needs. Schools are increasingly involved in fulfilling their social mission of providing life-long education. Participants of such courses usually welcome individualization of the study program and online mode of delivery.

Informal learning is gaining importance in the modern knowledge society. This type of learning should be supported by information techniques and integrated with formal education.
In all these situations the basic requirement is to adjust the didactic process to individual needs of students. This requirement can be fully met only if online means are adopted, at least in some parts of the whole didactic process.

3 ACADEMIC MODELS

Information technologies support student learning on the school premises in various ways e.g. rooms with virtual reality equipment, laboratories prepared for teaching information technologies, lecture halls with equipment to conduct remote lectures, seminars and presentations.

The following five models have been identified and their properties investigated in order to determine the extent to which they satisfy the needs of new learning situations:

1. Basic blended model
2. Model applying adaptation and personalization mechanisms
3. Self-study model
4. Social network model
5. Smart learning model

All the above models incorporate modules of gathering and analyzing data related to the learning and teaching processes.

3.1 Basic blended model

Basic blended model resembles traditional correspondence model enhanced with information technology tools.

Student:
- has remote access to the components of the educational environment of the school
- does homeworks and takes quizzes every week
- takes part in discussions on chat and forums
- uses e-mail to contact the teacher
- can visit the teacher during their office hours on the school premises
- takes part in laboratory and examination sessions on the school premises

This model is applied in Polish-Japanese Academy of Information Technologies and some other higher schools in Poland.

The components of the educational environment include:
- Learning management system (LMS)
  - sites for specific courses
  - access to electronic materials, tests, homework folders, forum, chat, logbook – within personal learning environment of each student (PLE)
- Electronic materials
- E-portfolio system
- Repository of didactic materials
- Remote access using remote virtual private network (VPN) to systems and applications installed in the local network of the school

Electronic materials include:
- Electronic textbook (e-textbook) with tendency towards introducing “intelligent” features to it such as intelligent e-textbook [6] or intelligent tutoring system (ITS) [7]
- Recorded lectures
- Simulations of physical, social and economic phenomena
• Computer educational games
• Presentations how to use computer programs and systems

Intelligent e-textbook besides e-textbook itself contains knowledge base and inference system supporting finding answers to student questions. When student studies e-textbook, the system encourages them to active reading presenting them with definitions of key terms, suggesting them with possible questions and problems, helping in doing their homework, answering questions. As an example we can consider the system Inquire based on the textbook Campbell Biology prepared by Artificial Intelligence Center SRI International at Stanford Research Institute [6]. Our academy also has designed and tested a similar system [5].

Student e-portfolio (e.g. [8], [9]) is a collection of electronic artefacts prepared by the student such as text documents, graphical presentations, computer programs and so on. In this way the student combines the knowledge and notions pertaining to different subjects. Program of their studies ceases to be fragmented into different areas. Moreover, the student can integrate the experiences achieved in different contexts and periods of life such as academic studies, professional work, self-studies, watching TV, individual experiences and so on. The student can demonstrate the extent of their knowledge and competencies wherever it is needed e.g. at university, at work.

Student e-portfolio is the main part of the personal learning environment of the student (PLE) (e.g. [11]) which includes also copies or links of important educational materials and links to social network tools such as communicators, blogs and so on. Personal learning environment is a friendly environment supporting life-long learning and integration of informal and formal learning.

The both kinds of the systems: Learning Management Systems and Personal Learning Environments can be combined e.g. Blackboard with Elgg at University of Brighton [12], and OpenLearn (UK Open University) with ROLE (Responsive Open Learning Environments) [13]. Integration of social software into formal learning environments gives adult lifelong learner a sense of ownership and control over their own learning and career planning and aids them to be effectively self-directed and self-regulated.

3.2 Model applying adaptation and personalization

The next model assumes that the overall learning environment consists of the educational environment where computers and humans play significant roles [13, p.112-113], [14]. Computer based learning tools do not try to replace teachers. Teachers still control the overall educational process and they can use these tools for their benefit and for the benefit of students. The tools complement learning process by providing repetitive training opportunities to the students to gain mastery in the concepts taught by the teachers. Each course is conducted by a teacher. E-learning application plays a role of an assistant. It has some degree of intelligence enabling helping students.

Two mechanisms are applied: adaptation and personalization. Adaptation means that the system adjusts itself to the student's behavior e.g. when they cannot cope with the material the system indicates the errors made by the student and suggests corrections needed. Personalization means that the system adjusts itself to the student's profile e.g. what country they are from, where they work, what their learning experiences were before. The system monitors the student's actions and collects the relevant information about the learning process. When the need arises, the system intervenes and proposes the student remedial measures.

3.3 Self-study model

There is a lot of Internet services that can be useful in self-directed studies. The general, best known sources of knowledge are: Wikimedia project including such services as Wikipedia, Wiktionary, Wikibooks, Wikiversity and search engines such as Google. The self-directed learners can also use electronic libraries such as Open Educational Resources Commons https://www.oercommons.org/ and National Science Digital Library https://nsdl.oercommons.org/. Moreover, they have access to real courses over Internet without the need of registering for formal studies. Khan Academy is well known for its courses on high-school level. Some universities offer their courses on an individual basis as massive open online courses (MOOCs).

If the student’s personal learning environment is combined with learning management system of the educational institution, the student’s advisor can have access to activities and results of the student. Another possibility for the advisor is to have access to the student’s e-portfolio.
3.4 Social network model

The next model, we will consider, can be regarded as an expansion of the self-study model with the help obtained from other Internet users – other self-directed learners.

The students search for knowledge in the Internet, share their discoveries, describe, comment and discuss about what they have found. The student's advisor can observe the progress achieved by them.

The following kinds of Internet tools and structures can be used:

- Communicators, blogs, wikis
- Social Bookmarking – assigning key words to the Internet pages being visited, recommending them to other participants
- Folksonomy – structure, classification of keywords which result from using Social Bookmarking
- Tagging, commenting – text and images added to places on Internet documents
- Syndication, aggregation, web feeds – collecting content coming from different sources, using services of notifying the user about changes and new content

3.5 Smart learning model

Smart learning model constitutes a collection of new, innovative technologies being introduced to education characterized in general by their “smart” behavior. This includes:

- Smart devices such as Internet of things and wearable technology in the form of accessories such as glasses, a backpack, clothing
- Smart technologies such as computing clouds, learning analytics, big data, educational data mining, artificial intelligence
- Computer vision
- Speech recognition
- Virtual Reality
- Augmented Reality

It is assumed that the system knows the current location of the student both physical and virtual one and can use them to support the student in their actions. The goal is to provide self-learning, personalized services and motivation for a variety of learners, recognizing learners’ competencies, learning styles and interests.

Below there are several examples of these new educational technologies.

- A group of students observes real processes mapped into Virtual Reality e.g. an earthquake [15]
- Investigations conducted remotely by students concerning natural environment such as coral reef with data acquired through the use of remote sensors including sensors attached to animals' bodies and live contact with a diver in real time [16]
- Remote participation in real time classes and examinations [16]

3.6 Learning Analytics

Learning Analytics [17] is defined as measuring, collecting, analysis and reporting of data concerning progress of students and contexts in which the learning takes place e.g. in Learning Management System or Intelligent Tutoring System. The student gets the knowledge enabling him/her to think over his/her processes of learning and compare themselves against others. The teacher can plan didactic interventions directed to specific persons as well to whole student groups, can improve existing courses, plan and prepare new courses.
4 LIFE-LONG LEARNING AND INTEGRATION OF FORMAL AND INFORMAL LEARNING

The following specific tools have been identified to support life-long learning and integration of formal and informal learning:

1. E-portfolios
2. Personal learning environments combined with learning management systems
3. Adaption and personalization techniques
4. Internet services supporting self-study
5. Social network portals
6. Smart learning services

The knowledge concerning Points 1-6 should be included in the academic curricula so that the graduates after completing their formal studies can use them and continue learning as life-long learners.

In [3] the following solution called continuous studies was proposed. The studies start from ordinary academic studies undergraduate, graduate or postgraduate one. The learner achieves the basic formal education in a specific domain along with the basic knowledge about life-long learning techniques e.g. covering Points 1-6 above in this section. The learners have got profiles in the learning management system and personal learning environment and can use them after completing their formal studies. Specifically, each learner owns his/her e-portfolio in which he/she collects all his/her education achievements. The learner continues using them in the next stage of his/her life-long education. Thanks to the participation in the continuous studies the learner is able to maintain employability on the labor market.

The academic teachers, students and life-long leaners form a community of practice whose joint aim is to continuously update knowledge and competences in the given domain using the academic environment based on the methods covered by Points 1 to 6 above. Moreover, the participants bring and share their unique professional experiences to the community of practice.

The construction of a personal learning environment PLE that can be used as an effective framework for lifelong learners is described in [18].

5 CONCLUSIONS

As a starting point in the process of construction of academic education environment the basic blended model should be taken and then extended by adding relevant components of the other models.

The main requirement for the designed system is the adjustment of the study process to individual needs of the student.

The special challenge for the new systems is inclusion of methods and techniques of Smart Learning in such a way that the system plays a role of a personal teaching assistant of the student.

In order to enable individual learners successful realization of life-long education, they should be taught the methods presented in Section 4. Participation in Community of Practice supported by educational institution is also essential.

ACKNOWLEDGEMENTS

We wish to thank Dr. Małgorzata Rzeźnik-Knotek for her help in preparing this paper.

REFERENCES


