Creating Intelligent Electronic Textbooks based on Knowledge Management

Sharipbaev Altynbek, Omarbekova Assel, Seifullina Assel and Zakirova Alma

***Abstract* – The paper intends to construct an ontological model and create a program generator enabling to automate the process of creating intelligent electronic textbooks by non-professional users.**

***Keywords:* E-learning, generator, intelligent electronic textbook, knowledge base.**

I. INTRODUCTION

Creations and adaptation of the artificial intelligence system is one of the main problems of society information at the moment. It enables the users to discern, design and synthesize characters of objects and processes in real world encouraging the learners to self-learning, to set up regularities out of incomplete and vague data, to make decisions and accomplish other rational actions. As a result, one of the primary spheres which require new technologies for training is education.

Information technologies in the sphere of e-learning are being actively and dynamically developed all over the world and in Kazakhstan as well. E-learning provides flexible timetable, helps save on transport expenses, provides education programme to many users. It also creates corporate environment of knowledge concentration and perfection, ensures comfortable and personalized training style. Application of electronic means of education also gives a lot of opportunities in traditional academic educational environment.

Even though having its own advantages and disadvantages e-learning is a major breakthrough in academic education and professional training. Various universities worldwide have incorporated e-learning software in their curriculum and commercial companies from different fields of business have also integrated this method in their staff training programs to further enhance and develop the skills and knowledge of their workforce which can significantly contribute in the company growth in terms of production and profit.

E-learning refers to the use of electronic media and information and communication technologies in education.

E-learning includes multimedia learning, technology-enhanced learning, computer-based instruction, computer-based training, computer-assisted instruction or computer-aided instruction, internet-based training, web-based training, online education, and virtual education. It can be defined as virtual learning environment (which is also called learning platform), and digital educational collaboration [1].

These alternative names emphasize a particular aspect, component or a delivery method.

Thus the following problems were to be studied: how to improve e-learning systems and how to improve the quality of education. On the one hand universities have enough electronic materials, but on other hand they don't have knowledge base where an electronic text book could be stored in unified format. Moreover the best solution was creating on-line systems with knowledge base.

The main aim of our research project is to make an analysis, which includes the following tasks:

-- Construct an ontological model.
-- Create a program generator;
-- Automate the process;
-- Use non-professional programmers.

II. RELATED WORK

With the development of changes in technology we can see its great impact on different aspects of our life including education sphere. As a result of government policy in Kazakhstan higher education institutions have optimized their structure, in particular by tightening the requirements for licensing educational activities in recent years. Since 2001 this number has decreased from 182 to 149 [1].

A significant growth both in the number of universities and students has led not only to positive changes but also caused adverse effects in the quality of education.

A group of scientists from L.N. Gumilyov Eurasian National University is attempting to improve education system in Kazakhstan at universities through new technologies in the education area.

It is also necessary to develop distance learning, e-learning and collaborative programs together with foreign universities. Distance learning should be used as a global opportunity for worldwide communication and telecommunication. This technology in the field of knowledge is one of the most important factors which increase the possibility of getting access to many people and enables the population to get involved in the reform of education as a major institutional element of society.

This work was supported in part by the Scientific-Research Institute "Artificial intelligence" By budget program 055 «Scientific and(or) scientific – technical activities» Subprogram 100 «Program special financing».

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ISBN: 978-988-19252-7-5
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

They are creating e-learning systems for L.N. Gumilyov Eurasian National University. This university is a place for approbation of our research and to check obtained result. When scientists get necessary positive results, their project will have the same foundation for other universities.

III. METHODOLOGY

In sociology, a questionnaire and an interview as survey methods are used to compile statistical (single questionnaire) or dynamic (with repeated questioning) representation about the state of society and public opinion, the state of political, social and other tensions in order to predict the actions or events.

240 students from the University of Reading and L.N. Gumilyov Eurasian National University took part in the survey questionnaire.

The respondents were asked to define 'e-learning' in the questionnaire and according to most of them 'e-learning' is:

- Learning by reading, listening, and writing in respect of materials available on any electronic media:
- Learning using electronic recourses.
- Finding electronic sources.
- Using web-sites, electronic books.
- Learning with electronic equipment.
- Learning on-line.

Thus, we can see that all students and teachers linked the term e-learning system with the Internet, electronic resources, and electronic equipment. This says that e-learning refers to the use of electronic media and information and communication technologies (ICT) in education process.

The next question was "What elements of e-learning do you use in your education process?" Over 78 per cent of students use library resource and 88 per cent of respondents prefer self-preparation.

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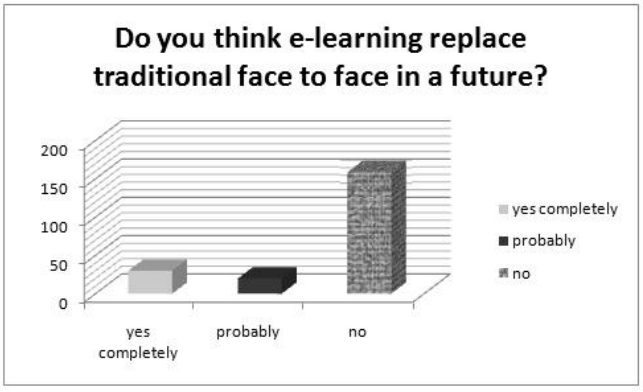


Fig. 1 – Result of research project

This bar chart (Figure 1) demonstrates that many students are not ready to change traditional education system and perhaps at anytime soon we will observe that e-learning system will only complement face to face system. Probably it is a good indication that students prefer to have a personal contact with teachers.

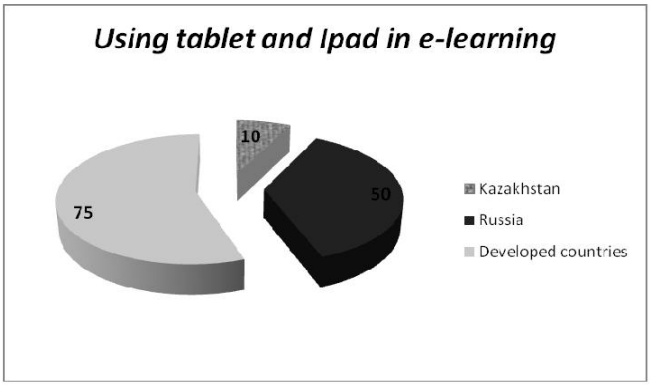
One of the questions that the participants were asked was whether they think e-learning would replace traditional face to face learning in the future. The authors got interesting answer to the question. According to the results 94 per cent don't want e-learning to replace traditional face to face system (Figure 3).

Thus, the result of the research shows that e-learning systems will only support student development, their skills and knowledge, so electronic textbooks have to get improved because a modern student wants to have useful tools for his education.

IV. BACKGROUND

The analysis of current programming products has been translated by the authors. Due to higher costs of living in mature economies electronic textbooks and books for smartphones, Ipad and tablets are being produced actively. In consequence generators for electronic educational editions for mobile phones and tablets are mainly created abroad.

There are a number of different programming complexes, which create electronic educational editions. Nevertheless these kinds of systems are very massive and require additional knowledge (Figure 2 a,b).



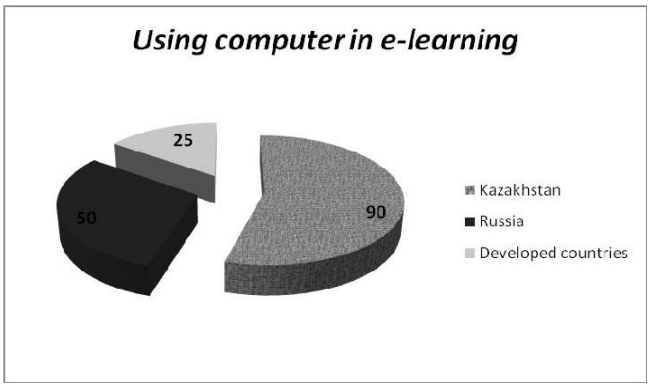


Fig. 2 a, b - Comparative analysis. Charts compare a situation by using kind of devices in different countries

On the basis of Scientific Research Institute of «Artificial intellect» (web-site http://e-zerde.kz) experimental surveys on creation of intelligent electronic textbook (IEET) on the boards of scientific research projects are held by A.A. Sharipbaev, PhD, A.S. Omarbekova.

ISBN: 978-988-19252-7-5
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

Before this project being conducted we developed a new national standard, which consists of fundamental requirements towards electronic text books (Figure 3).

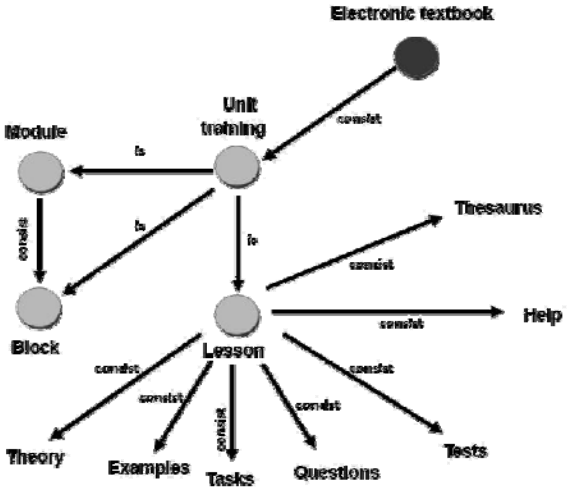


Fig. 3 - This is a part of ontological model of state standard, which illustrates the main elements and links

At present the process of creation of intelligent electronic textbook has advanced in its activity pervading the following stages at:

-- State standard of creation and implementation of intelligent electronic textbook in the process of education has been prepared [2].
-- Scientific research ground for the IEET project development, which includes forming virtual university and distant portal in terms of IEET bank has been created.
-- Basic concepts and definitions concerning IEET are being deduced and tested, as well as ontological models of IEET functioning are being created by the participants of the project.

The authors of the article have also attempted to create ontological models and identify basic terms and definitions.

Intelligent electronic textbook is a set of digital, textual, graphic, audio, video and other information, which have the means of programme control and documentation, possess adaptive character and intellectual interface, and in addition to this it can be placed in the Internet [3].

V. EXPERIMENTAL PART

At the moment the platform for realization of the given project «Methodology, algorithms and programmes of electronic educational editions generation» is being designed (Figure 4).

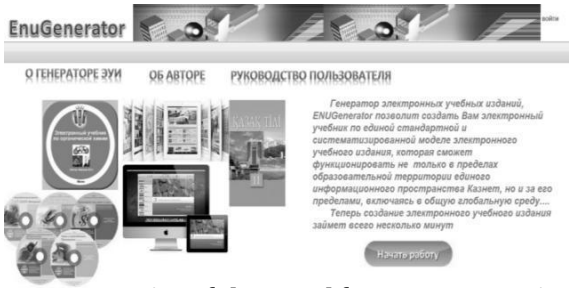


Fig. 4 – Demo-version of the portal for IEET generation

Estimated ontological model of the generator of intelligent electronic educational textbooks with the basic concepts and definitions is shown in Figure 5.

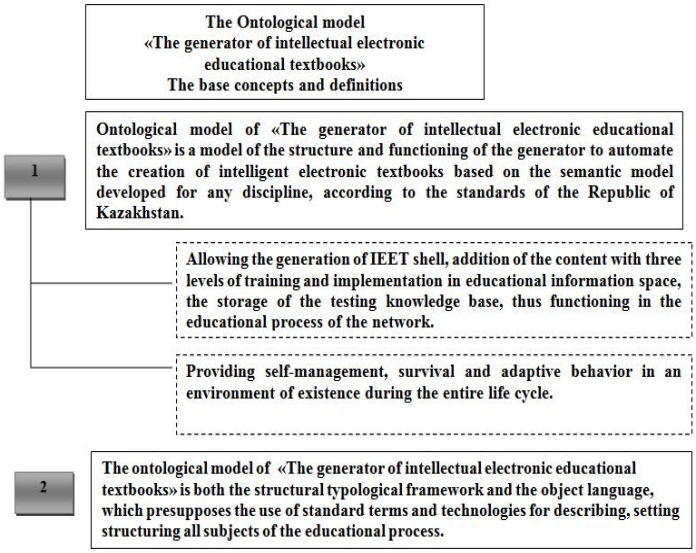


Fig. 5 - The Ontological model «The generator of intellectual electronic textbooks». The basic concepts and definitions

The use of ontologies for modeling domains of automated information systems has become more widespread recently. This approach is mainly used for intelligent systems, in particular, intended to operate on the Internet. The Internet is increasingly becoming an educational platform for the majority of the population not only in Kazakhstan but also all over the world. This is due to the fact that the ontological model allows us to develop a metadata model, which greatly improves the use of a wide range of users in terms of interaction.

Intelligent electronic textbook has to contain 3 stages of training: lower, middle, advanced, each stage consists of training module.

The process of creation IEET by a teacher is realized on the basis of gradual process, which includes the following steps:

1) *Material preparation for information load*. There are many files (lecture 1, lecture 2, lecture N, also lab, practical tasks, tests, questions, references), however all materials are previously divided into stages of complexity. Nevertheless, they have to be realized as one xml file.
2) *Language and category determination*. At this stage it is necessary to choose a definite language of IET: Kazakh, English, Russian and category, in which the textbook is to be published.
3) *Information load.* Xml file is uploaded to the portal, and then the references are arranged according to the following structure: module, block, lesson, traditional elements of control functions (navigation, review, constructor).
4) *IEET preview*. For the final generation preview of the textbook is required.
5) *IEET generation*. In case IEET is in Kazakh, it is necessary to create a second copy in Roman alphabet. If

ISBN: 978-988-19252-7-5
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

it is in Russian or in English, one copy is to be created. IEET is saved in server according to the chosen category, but not shown in web-site http://www.e-zerde.kz/generator/.

6) *Publication in knowledge base.* The key point for the search in the knowledge base will be the category, in which IET is published. The search will be implemented by the following access as in Figure 6:

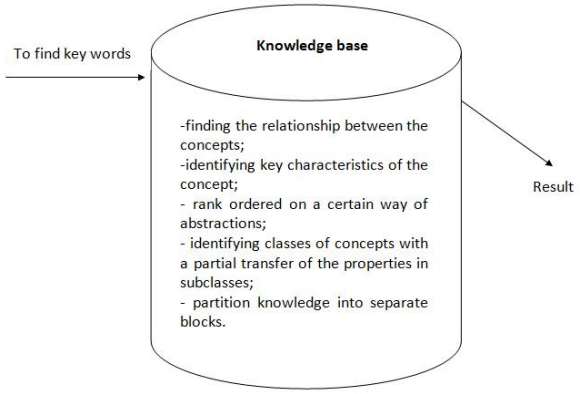


Fig. 6 – Search IEET in knowledge base. In the picture showed work of Knowledge base

1. the system (interrelation between the concepts);
2. abstracting (revelation of the key characteristics of the concept, which distinguish it from the others);
3. hierarchy (ranging to arranged in a certain way abstractions system);
4. typing (revelation of the class conceptions with partial features transfer to subclasses);
5. modularity (dividing the knowledge base into separate blocks) [2].

During the investigation of the given theme one of the main purposes is a creation of national knowledgebase, which will be able to concentrate certificated educational electronic editions, which answer the state standards of the Republic of Kazakhstan [3].

Student can log in with his/her username and password and choose training of the three types: manual, choice of own trajectory, testing choice. At the end of the course student is to be given a certificate.

Tutor checks textbooks and decides whether to publish it or not, if yes, he sends a certificate for the published book to the e-mail of the subject teacher.

VI. CONCLUSION

This paper attempted to study students' attitude to electronic textbook as part of e-learning system. The target of the given research is development and creation of ontological model of the subject sphere of IEET to support the commercialization of the scientific research results and improvement of the education quality in Kazakhstan, and also popularization of distance learning.

ACKNOWLEDGEMENTS

We express our gratitude to two universities, the University of Reading, UK and L.N. Gumilyov Eurasian National University, Kazakhstan.

REFERENCES

[1] T. V. Trishina. «Theoretical aspects projecting of knowledge base electronic textbooks». [«Eidos» Internet-journal]. Available: http://www.eidos.ru/journal/2004/0419.htm.

[2] A.Seifullina, A.Omarbekova. (2012, 22-24 November). «Building automation ontological generation of intellectual electronic textbooks». [On-line]. Available: http://e-zerde.kz/kobe/program-poster.htm#P17-G-12.

[3] ST RK 34.017-2005. Information technology. Electronic publications. Electronic educational publishing. KazNIS, Astana, 2005.