Abstract—The aim of this project is the development of a smart tutor which will replace the feedback of students with teachers that is the feedback from the smart tutor during the intellectual training which will also replace a test or an oral examination conducted by the intelligent smart tutor. Teaching and control may be carried out with the help of the smart tutor without human intervention. We have created a new form of representation and storage of knowledge in the form of XBSH and a new method of knowledge processing as well. We also developed the interface of intellectual training and control of the knowledge in Kazakh language.

Keywords—Knowledge base; semantic-frame network; XBSH; the globals; smart tutor.

I. INTRODUCTION

A. Urgency of the research

Computerization of society in the background of rapid development of information and communication technologies (ICT) leads to the change of the situation in the labor market, requiring new skills and competencies. Specialists have to study constantly new processes, technologies and equipment for the improvement of their professional level. Changeable situation on the labor market makes most people radically change their specialization or learn new skills and knowledge. Traditional forms of education and types of educational services are changing. In the world of the era of e-learning the number of students has become more than 150 million [1] and the amount of funding the global e-learning industry is about 56 billion US dollars [2].

It should be taken into account that e-learning is 25-60% shorter in duration than traditional classes and its quality is very low [3] due to the electronic textbooks (ETB) which can only be used as supplementary teaching materials and may be presented as a text, graphics, animation, audio and video materials without the possibility of a dialogue (the possibility to answer the student's questions and answer them) in real time. After all, in the process of studying teaching materials presented in the ETB there may be lots of questions which the student wants to ask and ETB are unable to answer these questions. The more he studies the more questions he will have. In addition, modern methods of monitoring and evaluation of knowledge does not always give an objective assessment of knowledge.

These problems can be solved if intelligent control system and evaluation of students' knowledge in which the passive static electronic educational resources will be implemented, developed and replaced with active dynamic smart tutors, e-learning with smart-learning, e-testing with intellectual knowledge assessment system to develop and. In this intelligent electronic training will be shorter in duration and will have a high quality [4].
In the work such things are presented for the first time: to conduct intelligent analysis of the data which are used in the educational process (teaching, monitoring and evaluation of knowledge); to present the course material in a specific discipline in terms of representation of knowledge based on the extended base semantic hypergraph. Each theme in the educational material will be provided with key words, ontological model and theory, examples, assignments, questions and tests. This will allow us to achieve the following learning objectives: for reviewing of educational material theoretical information is given; for comprehension of educational material examples are dealt; for consolidation of educational material assignments are offered; for checking the studied material questions are given; for the assessment of the obtained knowledge written examinations are carried out without human intervention. To sum up, the obtained results are necessary for the development of the smart learning as a whole which justify their scientific novelty and significance of the application.

II. PROGRAMMES OF THE DEVELOPMENT OF SMART TUTOR WHICH HELP TO PREPARE INTELLIGENT ELECTRONIC EDUCATIONAL EDITIONS.

First, confirm that you have the correct template for your paper size. This template has been tailored for output on the US-letter paper size. If you are using A4-sized paper, please close this file and download the file “MSW_A4_format”.

In this chapter we will begin the description of the developed programme of smart tutor which helps to prepare intelligent electronic educational editions. Smart tutor has been developed on the base of the post-relational database Cache. While designing, the following programming languages and technologies have been used: CSP, CSS, angularjs, nodejs, globals, mumps, COS. As a smart tutor language Kazakh language has been chosen. In subsequent papers we will add the English and Russian languages. The knowledge base of smart tutor will be constructed using the ontology-based CBCs, which is described in the chapter "Programme processing base of knowledge." As we know, students in higher education study the approved modular educational programmes that include discipline. Students choosing the specialisation elect some disciplines. On the basis of the selected disciplines individual curricula of students are created. These plans are summarized in academic departments' plan. In order to create a smart textbook a teacher should choose a discipline (subject) of the curriculum. For example, we took the subject of geography. We create a smart tutor and fill it with content. The smart tutor is an enhanced version of the electronic textbook in which the functions of smart education have been added. The structure of the content of smart tutor is based on the state standards of the Republic of Kazakhstan "Information technology. The electronic edition. Electronic textbook".

Next, it is necessary to build the structure of the textbook. The content is divided into three-level semantic learning unit: level 1 - modules, Level 2 - units, level 3 - lessons. We create the modules, blocks and lessons.

The module is a large syntactic, semantic and pragmatic and training unit consists of a sequence of logical blocks associated with semantic links from the increase in volume and content of the information from block to block. The unit is the average of syntactic, semantic and pragmatic training unit and consists of a sequence of logically related classes with semantic links from the increase in the scope and content of the information from lesson to lesson. The lesson is minimal syntactic, semantic and pragmatic training unit and consists of several elements of training. The mandatory training elements of the lesson must include theoretical material, examples, assignments, questions and answers and tests. Optional items can be training handbook, graphics, audio and video material that help to build awareness, to understand and remember the information and provide the information density. The theoretical material should contain relevant information on the chosen course of study and be sufficient for independent study, assignments and passing the control of knowledge, without duplication of presentation of acquired knowledge in previous lessons. The theoretical material should have specific didactic means in the form of underlining and changing the text colour. The examples should provide a detailed analysis of certain important aspects of the theoretical material in the form of exercises, problem solving, formulation of answers to questions, etc. The assignments should be aimed at identifying the internal connections of the studied objects, processes and phenomena, studying their functional features at various external influence and acquiring practical skills in doing exercises and problem solving. The wording of tasks should be accompanied by an explanation of the order of actions performed, as well as the requirements for the expected results and the form of their presentation. The questions and answers must be aimed at the assimilation of knowledge and the acquisition of practical work skills. The questions have to vary in terms of complexity, the nature and form of responses to activate the cognitive activity of students. The answer input means should be simple. The learner will be able to answer questions and must not think about the technique of the input, he must also have a mechanism to validate the answer, to know that he has entered the correct answer. The graphics, audio and video are intended to provide additional teaching materials which are required to disclose and demonstrate the most important aspects and conditions of objects, processes and phenomena studied in the training course. In addition, each lesson is based on ontology (knowledge base) and Thesaurus.

After that we fill the lessons with content. We fill theory, references to the multimedia, examples, questions and answers, tasks.

In order to fill the knowledge base and thesaurus, one should click the button to complete the lesson knowledge base.

Next, one click the add button concept. The modal window will be opened in which the data will fill the top of the name (of the concept), the definition, hyperon, hyponym, meron, a synonym for thesaurus. It is described in figure 1.
Next, one should fill the properties and functions of the summit. We create connection between the nodes. It is described in figure 2.

The student is trained by a tutor created an electronic textbook, i.e. he is acquainted with the theory, the examples, he answers the questions and performs tasks. The learning process is not only to study the material, but also the possibility to ask the system, i.e. to conduct a search for the necessary information by asking a specific question to the lesson. This process is called "intelligent (smart) training." The work of the electronic textbook is to answer questions, to explain the student and to give him a property of intelligence. Intelligent learning model is presented in figure 3.

For the intelligent training (response to a question) the form of the question is primarily determined. Depending on the form the type of search method is determined. Search is made in the knowledge that created by the tutor. Intelligent search is held in Kazakh language. The algorithm is presented in the picture 2 below. In figure 4 an example of smart tutor is shown.
If a student asks a question such as "What is soil?", the programme determines the form of the question №1 and launches WhatIs method. The argument of the name of the desired peak is passed to the method. This method is the top of the knowledge base, and outputs a value determination of the vertices of the thesaurus.

The form №2 launches WhoWhat method that searches for concepts and connections and displays the definition of relations. WhoWhat argument are to be the name of the summit and communication.

The form №3, as well as the form №2, starts WhoWhat method. But the method has an offshoot in which arguments are passed as a property name and property value. In this form there is a search vertex concepts which have reasoned property with specific value.

The form №4 launches HowManyWhichOne method. The name of the top of the concept and property of this concept are passed to the arguments. In this form there is a search of the value reasoned properties summit.

Form №5 as well as form №4 starts HowManyWhichOne method. The name of the peak of the concept and connection with this concept are passed to the arguments. In this form there is a search related to the value of the peaks [6].

№6 form launches the method How. The name of the peak of the concept and connection with this concept are passed to the arguments. In this form, there is a search of the value of the relationship determination in the thesaurus.

IV. SMART TUTORS WHICH PROVIDE TO CARRY OUT THE ASSESSMENT OF LEARNER’S KNOWLEDGE.

The property of the intelligent smart tutor enhances the electronic textbook ability to carry out control of knowledge of students. For the intelligent control of the tutor, one must create a question and indicate the correct answer to this question. The answer to the question is indicated in the knowledge of the concepts and properties of connection. A student is transformed into knowledge and it is compared with the correct answer which has been made up by the tutor. Figure 5 shows the model predictive control. Figure 6 displays the algorithm intelligent control.
For the intellectual control, one must create a question and specify a response form. If the student answers a question such as "What is the earth?", the programme determines the form of the answer to the question №1 and launches WhatIsControl method. The name of the desired response peaks and the answer of the learner are passed to the method. This method is the top of the knowledge base, and there is a processing input text with the text of the correct answer. The student receives in response estimate percentage of the text from 0 to 100%. To indicate an answer to the question it is necessary to indicate it in the previously established knowledge. In this example, one has to select the concept X so that his answer has to have the correct definition.

The student chooses a question in the content of the textbook while having a test.

Then, he indicates (writes or answers) the correct answer. Depending on the answer he receives a mark (a score).
Form №2 launches WhoWhatControl method that searches for concepts and connections and displays the value of the name of the top of the concept. WhoWhatControl argument is to be the name of the top, communication and response to the learner. The student receives in response estimate percentage of the text from 0 to 100%.

Form №3 as well as form №2, starts WhoWhatControl method. But the method has an offshoot in which arguments are passed as a property name, property value and the response of the learner. In this form there is a search vertex concepts which argumentative property with the specific value. The student receives a mark in the percentage of the text from 0 to 100%.

Form №4 launches HowManyWhichOneControl method. In this case the name of the peak concept, the property of the concept and the learner's answer are transferred. In this form, there is a search of the value of the argumentative summit property. The student receives a mark in the percentage of the text from 0 to 100%.

Form №5, as well as form №4, starts HowManyWhichOneControl method. The name of the peak concept, the connection with this property of the concept and the learner's answer are transferred. The student writes the date and the time in his answer. In this form, there is a search of the value connected with the summit property. The student receives a mark in the percentage of the text from 0 to 100%.

Form №6 launches HowControl method. In this case the name of the peak concept, the connection with this property of the concept and the learner's answer are transferred. This method is the top of the knowledge base and connection with this vertex, further processing of the input text with the text of the correct answer is taken place. The student receives a mark in the percentage of the text from 0 to 100%.

V. CONCLUSION

In conclusion, it should be noted that the intellectual training and intelligent control of knowledge of smart tutor have been developed with the assistance of the Research Institute "Artificial Intelligence", technology of natural language processing (natural language processing) of Kazakh language. They include 40,000 Kazakh words, morphological, syntactic analysers and synthesisers of Kazakh language.

We also aim to integrate speech recognition and speech synthesis systems to smart tutor in the future as a speech user interface for natural human dialog. Conception of natural dialogs occurs in the smart tutor application performs as an efficient platform for a speech interface design. The base of the speech interface will be an automated speech recognition (ASR) with acoustic model trained using deep neural networks for Kazakh language. A language model for the ASR will be based on n-gram approach. After generating an answer by smart tutor, the answer text will be converted to speech as well.

REFERENCES