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E-tutor for E-learning

Abstract

The article elaborates on the concept of the e-tutor providing high academic achievement in electronic and blended learning. Moreover, the arrangement of the e-tutor, the instructional process features, and the scheme of the whole system functioning are given, while the concepts of a task kit, a normalised lesson, e-tutoring, and an e-tutor are introduced.

K e y w o r d s: electronic and blended learning, electronic tutor, educational material presentation and assimilation, task kit

Introduction

Having barely begun, the era of e-learning has faced the fact that a very low percentage of students complete their education at an acceptable level (Sun et al., 2008). This fact has brought to life numerous ways to increase the level of academic achievement. Formative assessment, SOLO taxonomy, educational analytics, and artificial intelligence require either very serious statistics or intervention by tutors. Every method has its advantages and disadvantages, but no one gives the ideal results, so educators continue developing methods to guarantee high academic achievement in electronic education.

One of the methods that can improve the situation with academic achievement can be the creation of a special type of textbook for use in e-learning. In such a textbook, attention is paid not only to the presentation of educational material,

but also to its assimilation, for which it is provided with all necessary elements. The peculiarity of the approach lies in the fact that the conditions are created for the achievement of high performance by all students in advance, which greatly simplifies both the management of the instructional process and the accumulation of the relevant statistics. Let us now consider the cognitive textbook concept.

Necessary Definitions

A task kit – the number of different tasks for assuring the assimilation of a portion of the educational material relating to all aspects of the material to be mastered.

A normalised lesson – an electronic resource with educational material, subject to mastering at one time. It contains a presentation of the material, limited by the number of elements to be learned, and a task kit that ensures their assimilation. Elements can include concepts and connections between them.

E-tutoring – a set of procedures that ensure a cyclic (in the case of failing to complete a task kit) presentation of the curriculum material of a normalised lesson with the subsequent presentation of a task kit to be completed. Procedures provide:

- evaluation of the completion of tasks;
- fixing the assimilated lesson;
- the student's return to the study of that part of the lesson the tasks for which turned out not to be completed (for this case it is desirable to have a more detailed presentation of the educational material);
- presentation of a modified task kit; and
- teacher information tools.

E-tutor – a set of normalised lessons on the subject with procedures that provide e-tutoring. The Russian term *uchebnik* has no equivalent in English, and is usually translated as "textbook." What is being discussed for e-learning can still be called an *uchebnik* in Russian, but for the English equivalent it is necessary to use a different term.

A Normalised Lesson and a Task Kit

The reasons for limiting the number of knowledge elements presented to students in one electronic session, as well as the necessary number of tasks corresponding to these elements, are detailed in the author's article (Fedoseev, 2016).

The point is that a person can keep in mind only a few elements at a time. For the purposes of education, the maximum number of these elements is recommended not to exceed five. At the same time, if the number of studied elements is less than three, then it is not possible to attract the attention of students. They perceive such a lesson as empty and not deserving attention. Thus, the number of elements is in the range of three to five (Petrova, 2014). Apparently this is what Salmon Khan said in his lecture delivered to the students of the Massachusetts Institute of Technology in 2012 (https://www.youtube.com/watch?v=VA273i3z7Mk&nohtml5=False), tracing the fact that – if possible – video clips should be short. It is desirable for them to last three minutes. He did not count elements, but understood that the video lesson should be as short as possible. What are these elements? Each element of new knowledge must be indivisible, single. If in the presentation of the material elements of already assimilated knowledge are used, then they can be arbitrarily complex, for example Newton's binomial, Ohm's law, or even dynamics or electricity – according to how the acquired knowledge fits into memory.

As for the task kit, it is necessary to have as many types of tasks as necessary for a convincing demonstration of the assimilated knowledge. So, we need conceptual (Geller, Son, & Stigler, 2017) questions for each new element. Next, we need tasks on the correlation between the new elements, as well as between the new elements and the ones which have already been mastered. Should there be a need, there must be tasks on the correlations between the three elements, with each element being a parameter in turn. There could be other types of tasks according to the subject.

The author has not managed to find pedagogy publications about the normalisation of the number of elements of the material presentation and the formation of a task kit. So it would not always be possible to do both in the best way from the first attempt without any methodical advice. What can happen in this case will be described below. Now we can only note that such a normalisation both in the number of elements of knowledge and in the number and type of tasks is already better than an arbitrary presentation of the educational material, provided with a random set of control tasks.

Instructional Process with an E-tutor

The most effective organisation of the instructional process with an e-tutor is the flipped classroom method (Bergmann & Sams, 2012). In the after-hours, students study the educational material of the normalised lesson, after which they perform the tasks from the kit. If necessary, the e-tutoring procedures control their performing until the tasks from the kit have been completed, which indicates the mastery of the lesson material. In the next lesson, those students who have coped

with the task come fully prepared for further study. Information about the ones who could not complete the tasks or did not fulfil them comes to the teacher before the beginning of the lesson so that appropriate measures can be taken. Since the new material will also be studied in after-hours time, the teacher has the opportunity to pay closer attention to the lagging students during the lesson, offering others individual or group work, for example a project. In any case, with the help of the teacher or without it, the student will have the opportunity to begin the next lesson only after completing the set of tasks. It should be noted that during the lesson, no marks are given to the students. The fact that one of them has not coped with the task can generally remain unnoticed by the class. This situation positively affects students because there is no comparison among them (Wiliam, 2011).

During the execution of the tasks, it may turn out that the unexecuted tasks do not point to the new material of this lesson, but to the one that has supposedly already been learned. Then the student will automatically be offered the portion of the material which caused him or her difficulties, accompanied by a corresponding task kit. After their completion, the e-tutor will return the student to the current assignments. It may happen that the material of another subject causes difficulty. For example, in studying Ohm's law, one of the elements of the material already studied is the element named "algebraic transformations" related to mathematics. In this case, if there is a corresponding e-tutor in mathematics, the student will also be redirected to the topic of algebraic transformations. If there is no such e-tutor in mathematics, the student will be given a recommendation to individually find and study the relevant material.

The feature of an e-tutor use is that the assessment of academic achievements is not carried out at the level of the whole subject, but rather at the lesson level. At the same time, an acceptable level of achievement is accomplished, determined by the completion of task kits. Once placed at the disposal of the student, an e-tutor remains with him or her, which makes it possible to refresh knowledge on a particular topic at any time. In addition, as has already been shown, there is a method of sending the student to those topics which he or she has forgotten, which makes it possible to refresh the weakened knowledge. The system as a whole allows one to abandon any other types of evaluation. Examinations become unnecessary because the successful completion of the task kits for each lesson for every student is fixed.

Self-diagnostics and Improvement of the E-tutor

The best proof of mastering an educational material is the ability to use it in practice. Since most of the topics of the subject are related to each other, the usual

situation is that the knowledge obtained earlier on other topics – and often in other subjects – is used to perform the tasks of the current topic. Since all the results of students in all lessons are fixed, statistical analysis becomes available. For example, all students in accordance with the action of the e-tutoring have received acceptable assessments on one topic. Knowledge obtained on this topic should be applied in some other topics where it is found that the use of this knowledge causes difficulties for the majority of students. Thus, the e-tutoring sends students to repeat that topic. They successfully complete the task kit on it. After that they again have difficulty in performing tasks for current topics. Obviously, the developers of the e-tutor should carefully consider the topic. Most likely, there is something wrong with the task kit.

Let us consider another example. At the level of a universal stable performance, one of the topics causes such difficulties that most students have to turn to the teacher's help. The situation indicates that the material in this topic is too difficult to master in one session. Apparently, there is a violation of the limitation on the number of elements of knowledge in the discussion.

These elementary examples show what opportunities exist for improving the electronic tutor used. This means that, perhaps, if the first experience is not successful, it can be improved quickly.

How It Should Work

First of all, there must be a coordinator of electronic tutor developers, whose task is to:

- provide relevant developers with appropriate instruction and software to develop normalised lessons;
- ensure following the rules of normalised lessons, including task kits;
- form and maintain versions of electronic tutors; and
- conduct statistical studies on the quality of electronic tutors, as well as collect comments from teachers, transfer the accumulated material to the developers, and monitor the correction.

It is not necessary for the authors of the electronic tutors to be the authors of the corresponding textbooks. Electronic tutors can be collected from separate normalised lessons created by teachers together with their students by the method of so called "people's construction."

Let us assume that an electronic tutor has been created. Now we need to bring it to schools and start the process. The easiest way to do so is to place the e-tutor in the cloud and provide access to it for students of schools that have a contract with the provider. However, with regard to Russia, there are still a lot of schools that do not have enough communication bandwidth to ensure the daily work of

all students in the system of e-tutors. Therefore, along with the cloud location of e-tutors, S+S (Software + Services) technology (Wilson, 2008) will have to be used, whereby the bulk of data in the form of multimedia content of e-tutors will be on students' computers, and a relatively small amount of information related to learning management will travel through communication channels. This information includes data such as the identification of the student, including a class and a school, the page number of the e-tutor visited during the last session, the results of the assignments, and other official data.

It is assumed that the student can work with the electronic tutor on any computer which has access to the Internet if in advance he or she made sure that the tutor's content was posted on this computer. If one makes sure that the content is protected from unauthorised use, then it can be distributed completely free of charge. It becomes effective only under the control of the cloud system, after identifying the student.

What is most currently acceptable for the operation of the system of electronic tutors is a distributed network using Blockchain technology (Bogdanova, 2017). This technology is protected from unauthorised access. It allows one to accumulate and use data about subjects and lessons learned by students. Data are saved when the student moves from one school to another. Each school or group of schools can have nodes of the Blockchain network. Naturally, a certain coordinator is needed, connecting and disconnecting schools, providing access to students and teachers, as well as issuing certificates or other documents upon completion of tutoring.

The general scheme of the functioning of the system is as follows. A school signs a contract with the provider of e-tutors. On the basis of the contract, the school is supplied with software to ensure students' access. Herewith the name of students and other personal data circulate only within the school. Outside, the student is represented only by a unique code. The school is also provided with copies of the content of electronic tutors in the case of communication bandwidth absence for students' work. Each student copies the content to any computer that he or she is going to use for learning in the system. After the codes are assigned and transferred to the provider, and the content is copied to the desired computers, one can start work. Students receive a task to study a certain lesson at home with the help of the e-tutor. Each student performs the task at a convenient time, using the computer which he or she has access to. Some of them will reach an acceptable result on their own. Someone will need help from parents or other relatives. And someone does not cope with the task. The results of all the achievements of the students come to the teacher in such a way that the teacher can study them before the next lesson with the class. The work of the teacher with students who cannot cope with the task is to explain their mistakes and encourage them to complete the task kit of the e-tutor. Those students who did not fulfil the task will have to fulfil it; otherwise, they will not be able to proceed with the materials of the following lessons. As students complete the task kit, data about this fall into the nodes of

the Blockchain network. The accumulated data are used to admit students to the materials of the following lessons, to issue appropriate certificates, to get acquainted with the students' achievements at their admission to the university, and to improve electronic tutors on the basis of statistical analysis. If the student moves to another school, the relevant code of the system is transferred to the new school by the administration, after which the administration of the new school can get acquainted with the student's achievements and propose a further educational trajectory for him or her.

Conclusion

The e-tutor system outlined above supports a full didactic cycle, and not only the presentation of educational material. It offers a special organisation of the educational process, which removes the limitation of time during a lesson. It takes into account the recommendations for the volume of the lesson's teaching material and offers a task kit necessary for mastering it. At least theoretically, all the problems that prevent high achievement in all students are solved. To test theoretical positions in practice, several Moscow schools have now taken part in an experiment to create and use several standardised lessons in physics and history. Achieving a positive result will make it possible to recommend the system for widespread use.

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E-tutor w e-learningu

S t r e s z c z e n i e

W niniejszym artykule przedstawiono pojęcie e-tutora, który pomaga osiągnąć wysokie wyniki podczas zdalnego uczenia się oraz kształcenia łączącego zdalne i tradycyjne modele uczenia się. Zaprezentowano strukturę pracy e-tutora, cechy procesów szkolenia, a także schemat funkcjonowania całego systemu oraz wprowadzono pojęcia zestawu zadań, lekcji znormalizowanej, e-tutoringu oraz e-tutora.

S ł o w a k l u c z o w e: nauczanie drogą elektroniczną i mieszane, tutor elektroniczny, prezentacja i asymilacja materiału kształcenia, zestaw zadań

Andrei Fedoseev

Электронный тьютор для электронного обучения

А н н о т а ц и я

Предлагается концепция электронного обучения, обеспечивающая высокие академические успехи в электронном и смешанном обучении. Предложено построение электронного учебника, особенности учебного процесса и схема функционирования всей системы. Представлены концепции набора задач, нормализованного урока, электронного обучения и электронного тьютора.

К л ю ч е в ы е с л о в а: электронное и смешанное обучение, электронный тьютор, презентация и ассимиляция учебных материалов, комплект задач

Andrei Fedoseev

Tutor en línea en la educación en línea

R e s u m e n

El artículo explica el concepto de tutor en línea, quien ayuda a lograr altos resultados en la enseñanza a distancia o en el aprendizaje que combina modelos de enseñanza a distancia y tradicionales. Presenta la estructura del tutor en línea, características de los procesos de enseñanza, y también el esquema de funcionamiento de todo el sistema; se introducen los conceptos de conjunto de actividades, de clase normalizada, de tutoría en línea y de tutor en línea.

P a l a b r a s c l a v e: enseñanza en línea y aprendizaje combinado, tutor en línea, presentación y asimilación del material educativo, conjunto de actividades