

Experience of Use of Knowledge Relative Assessment System for Training in Area of Civil Engineering

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Abstract. Nowadays E-Learning is becoming more and more relevant in training civil engineers. Electronic resources are used for classroom activities and for independent work. It allows allocating extra time for development of practical skills. Experience of remote knowledge control application in the educational process of Moscow State University of Civil Engineering is presented in the article. The control system is called Knowledge Relative Assessment System using Bekker's method. The following steps of system using are described in detail in the article: loading test material, action of users, protection from wrong acts and calculation of rating. The main merits and demerits from the point of view of teachers and students are listed.

1 Introduction

In the modern world the most valuable resources are time and information. Internet technologies give the chance to teachers and students to reduce time of stay in audience and allow releasing hours for the new educational purposes, scientific research, acquisitions of practical experience [1, 2].

Training process goes to virtual space more and more. Interactive interaction of the student and the computer exists at all education levels: in preschool training [3], at school [4], in professional education [5, 6, 7].

In educational process e-Learning showed the greatest efficiency in two cases. First, it is electronic textbooks, exercise machines, virtual laboratories, training games [8, 9]. They can be used during studies in a class or in independent work. Secondly, Internet technologies allow carrying out assessment of knowledge online [10, 11, 12, etc.].

Many of these systems differ from traditional test control a little. The student comes in due time to a computer class, gets access to system of testing (login and the password) at the teacher and answers questions.

In case of failure repeats this procedure so many time how many the teacher will permit. Some students receive answers to questions in the illegal way. Also receive assessment above the valid level of training.

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2 Methods

In this research the method is used Knowledge Relative Assessment System using Bekker's method [13].

This system allows the user to compare knowledge level concerning other users of system. The author Yu. Becker claims that this control system of knowledge solves three main problems of other systems of testing.

1) Restriction in time. (The student can interrupt process of testing and return to him at any convenient time.)

2) Fixity of base of questions. (Student can add own questions, appeal to formulations of questions and answers of other students.)

3) Ban on use of reference materials. (In the course of testing the student can use any reference materials and discuss the correct answers on social networks.)

Friend of advantage of this system:

- methods that underlie the functioning of this system are protected by Patent Laws in 184 countries around the world,
- the system exists in the Russian and English version,
- registration and use of system for free,
- the topics covers the most different fields of knowledge and can be expanded at any time.

3 Results

Knowledge Relative Assessment System (KRAS) is used in educational process of several Russian universities. The department of «Social, psychological and legal communications» of Moscow State University of Civil Engineering used this device as one of forms of total knowledge control of students in 2011-2016 [14]. In parallel with it oral and written poll was applied.

KRAS choice was positively influenced by factors:

- *mobility*. In Moscow State University of Civil Engineering the use schedule of computer classes is constituted for the half a year ahead. For monitoring procedure by means of KRAS it isn't necessary to reserve the room and to fix time;
- *comfort of work*. Teachers of psychology consider important that the student can pass test in time, optimum for himself (taking into account biorhythms). It reduces psychological tension during testing, reduces an examination stress [15];
- *security of content*. If one or several students answer correctly all questions of the test, their hints don't help other students to receive positive estimates (it is stated below in more detail);
- *activity of users*. Students can estimate quality of the offered questions, defend the opinion in disputable cases. It turns traditional claims to incorrect questions into didactic means of increase in informative activity;
- *freedom of the teacher*. In time as students pass test, the teacher doesn't perform function of «supervisor» in the classroom. It can control process of any place where there is an Internet, at any time;
- *friendliness in relation to the student*. Results of each attempt of testing are summed up. The report on results is available to the student at any moment of testing. It isn't necessary to wait for assessment by the teacher.

The students of 1 course studying «Civil Engineering» (more than 800 people) have acted as experimental group. KRAS has been used for carrying out the current and total control on discipline «Psychology of social interaction». In detail about the content of this discipline it is possible to read in our early article [16].

At the beginning of academic school year the professor has created in a KRAS topic with the corresponding name. Then he has filled in «Topic Rules». Here the main sections and themes of the studied discipline are specified. Users of KRAS have to add own questions by rules. The topic can be used when the author has placed in it at least one question. In a research we have loaded 22 questions (one on each section from Rules). All our professors used the created topic unlimited number of times. Also professors and students of other universities can use it.

Each professor independently creates educational groups in KRAS. One group can participate in different topics. It allows constituting easily rating of students and the whole groups on different disciplines.

After completion of preparatory work, professors informed students about opportunities and the principles of using KRAS, specified the name of the main textbooks which are recommended to be studied for preparation for offsetting. (Why it is important, told below.)

Results of the first two weeks of using KRAS showed informative activity of students and made the forecast of educational success. During this time less than 10% were registered. After that professors declared that students from more than 50% of rating can be exempted from the current control. The quantity of registered increased to 80%. Other students were registered in KRAS in two weeks before offsetting.

The student can lift the rating by three methods.

The *first method* – the most clear, but not the most effective. It is to answer questions. After the answer to the first question (average complexity) KRAS determines the level of knowledge of the user and asks it questions of the corresponding complexity. The correct answers lift the student to higher level of complexity. Here specific weight of each question higher. The wrong answers lower it on lower level of complexity. Here each question has smaller value. This mechanism forces users to think over a question, but not to answer «at random». If the student doubts the answer, he can look at the textbook, it is correct to find the answer and answer as there are no restrictions in time. He can even ask the answer the companion. But the more will correctly answer of users the matter, the rating and specific weight of the matter will be lower! The «smart» students who answered a difficult question don't give hints «to less smart». With downgrade of a question also own rating of the student falls. It is the *first protective KRAS block* from dishonest increase in assessment.

The *second protective block* turns on when enterprising students connect the Auto Clicker program to system. This program in a random way answers a large number of questions. For one educational semester we revealed up to 10 such students. The Auto Clicker often gives the wrong answers therefore the user falls by lower rating. Such students have no chances to be highly appreciated. In our research, any of them hasn't risen even to the average rating.

The *second method* of increase in rating – to ask the questions in a subject for other users. This way is used by «cleverer» users. It is difficult to make this process ordered. The professor advises to students to make questions of the recommended textbooks. If students implement this recommendation, they study a minimum of didactic material. But in this case questions receive the low specific weight (they are correctly answered by a large number of users). To ask more difficult question, to students have to use additional literature. It needs to be specified at placement of a question in KRAS that other users could find the correct answer.

Some unfair students load a large number of questions into a subject to lift the rating. And it is bad questions without the correct answer or questions from other disciplines. Because of such students the amount of the topic «Psychology of Social Interaction» increased from 22 to more than 4000 questions in two months. This method works only if all other users are low-motivated. They answer at random or use an Auto Clicker. As soon

as the bad question drops out to the diligent student, the *third protective KRAS block* from purposeful increase in estimates turns on.

The user who found an incorrect question can complain of it. The question is considered by advisory council. The bad question can be removed from general base. During the research experts removed more than 2000 questions. The rating of the user which asked a bad question and those who answered it and didn't notice an error goes down. The user who noticed an error upgrades the rating. It is the *third legal method* of increase in own rating – search and elimination of other users mistakes. It is used only by those students who show high interest in this discipline. They hold the upper places of rating (sometimes above professors).

At first sight, the third method gives the chance to unfair students artificially to upgrade the rating, for example in case of rating downgrade of other users. The fourth *protective block* – availability of advisory council. Each appealed question is considered by members of council. Most of them are professors. Within five days they discuss the filed claim. If the claim is recognized illegal, the rating of the user who asked a question remains. And the rating of the complainant – goes down. In our research of illegal claims there were less than 10. During the research KRAS allowed to reveal different level of training and informative activity of the students studying discipline «Psychology of social interaction». The link of the student activity and his rating is presented in Table 1.

Table 1. Link of the student activity and his rating.

Rating	Activity in KRAS
low	- answers to ready questions
average	- answers to others questions - placement of the questions from textbook material - removal of very bad questions
high	- answers to others questions - placement of the difficult questions from additional material - removal of bad and controversial questions

The translation of rating points in marks can be chosen randomly. In our research, the student who has gained 50% and more received «is reckoned» (according to the curriculum). Students with result below the test line (50%) passed oral or written poll. Such control estimated their knowledge as «it is very weak».

4 Discussions

4.1 System merits and demerits teacher's eyes

In a research professors confirmed all positive sides which were described by the author of KRAS. The factor «mobility» was the most indisputable. All other factors were accepted with amendments and conditions. Additional advantage of system is an opportunity to build the ratings of groups. The group rating consists of the amount of her members ratings. It strengthens the personal liability of each member of group for general result, increases group unity.

Use of KRAS revealed a number of its shortcomings.

The teacher has limited control over the maintenance of a subject. Students ask many similar questions. Questions often reflect the maintenance of related subjects or consider

private opinions and judgments. The teacher can't independently «clear» a subject of such questions. He can make it as the expert, only if someone complains of a question.

Unsystematic character. The student gets access to KRAS at the beginning of an educational semester when material of discipline isn't mastered yet. And KRAS asks questions from all course. This defect was eliminated in the researching course. The training material was divided into sections. There was so an opportunity to estimate level of students training on separate didactic units.

Restriction of the differentiated control. The teacher can estimate activity of the student: quantity and quality of the asked questions, participation in expert assessment, total number of answers to questions. But information on number of the correct answers – is inaccessible.

Difficult algorithm of estimation. Traditional assessment of knowledge assumes that the correct answer to all questions of the test guarantees to the student high positive assessment. KRAS estimates not knowledge of a topic, but informative activity of the student. The user can't independently choose the complexity of tasks. The system does it automatically after the answer to the first question.

Delays and failures in operability of KRAS at a large number of users. It was a significant factor during a session. Testing was started by students who have got used to pass control actions in recent days.

4.2 System merits and demerits student's eyes

Students gave the current assessment to KRAS in the course of operation and after receiving a total mark. Here what they marked.

KRAS rather large network resource which comprises a set of tests on different topics. It creates to it the positive image.

It is possible to visit the website and to pass test in any place where there is an Internet (including from a pad and the mobile phone).

Time for passing of the test isn't restricted. Nobody forbids finding the response to a question in any source. It is possible most to invent questions and to complain of bad questions.

When you work in KRAS regularly and actively, the personal rating grows. If long you don't work, the rating gradually falls. It supports a healthy competition.

Coding of users through ID (even in a personal account) reduces a communicative possibility of system: it is unclear to whom you send the letter. The coding of a topic in the presence of the name seems excessive.

Success is displayed in a rating level and as a percentage. The teacher estimates on percent. But it is possible to see them only in the academic record which can be seen after long transition according to references.

The claim to a bad question is considered within several days. Only after this time the rating changes. In the time trouble mode such luxury is inadmissible.

Periodically there are failures in system. The rating is updated not directly; it strongly depends on the number of users. All this increases nervousness and feeling of alarm for a final mark.

5 Conclusions

Knowledge Relative Assessment System using Bekker's method can be used as one of the way remote control of students knowledge. Its main advantages - relevance, availability, mobility of users. Application of KRAS in educational process increases informative activity of students. Many students answer questions not only in that topic which to them

was set by the teacher, but also in others which are interesting to them. Results of students rating are confirmed by results of traditional forms of control (oral and written poll).

Russian-speaking part of KRAS has 179 topics now. An English-speaking part has only 9. We hope that the work experience about KRAS described in this article will attract to it interest of English-speaking users, and results of such work will be published.

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