

Possible Approaches to Introducing Students to the History of Automatic Control: Adding Competitive Elements

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Abstract: The paper considers using gaming technology at higher school, advantages and disadvantages of this method. The results of students' opinion poll based on associative arrays are presented. The authors give recommendations how to implement gamification in teaching process, and an example of using this method in introducing students to the history of automatic control.

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1. INTRODUCTION

The theory of automatic control is a rather difficult subject for students. Therefore, it is necessary to include in educational process elements for strengthening internal motivation.

A powerful motivational factor is to introduce students and undergraduates to historical aspects of the discipline, to the scientists who were the pioneers of the science. This helps make studying this discipline more interesting.

Currently, there are many approaches to classroom teaching which deals with the history of science. First of all, traditional presentations and videos should be mentioned.

One of the most effective forms is Web-quests. They are worth using when learning historical background of scientists and inventors. Web-Quest develops critical skills to work with information, to classify and choose the most important and to communicate thoughts clearly (Pakshina et al., 2015a). But there is one thing: work with Web-Quests requires 4-6 hours of continuous study time.

This paper considers some approaches which help make lessons interesting and lively. For this purpose, competitive elements are added in computer learning tools.

2. ADDING COMPETITIVE ELEMENTS

2.1 *The feasibility of using gaming technology (adding competitive elements)*

In recent years game elements and forms are being introduced in many spheres, and particularly in education. This phenomenon is often referred to as gamification, i.e. using game design and elements of game. Introduction of gamification does not imply a change of educational content

(Govorov and Govorov, 2014). System of monitoring and evaluation is organized in a new way.

Gamification is a relatively new trend. The term "gamification" was proposed in 2008 (Terill, 2008). By the use of gamification treated very many authors (Huotari and Hamatary, 2012; Attali, 2015; Becker, 2014; Lee & Hammer, 2011; Goehle, 2013).

Will this approach be widely used in higher education? It all depends on whether:

- students are ready and want to use game forms;
- teachers are sure in effectiveness of this approach.

There is no consensus among experts regarding use of game elements in teaching process, whether it is gamification and game technology. Moreover, there exist two diametrically opposed approaches to this issue.

Some teachers consider training period to be some rehearsal before further employment, and, therefore, the main task is learning to work. In other words, training is a process which results in developing such qualities as patience and persistence. The words of the great general Alexander Suvorov "Train hard, fight easy" can be a motto for this approach. But this method of teaching can at the same time lead to students' rejecting the chosen specialty, institute, field of activity.

On the contrary, other teachers are ardent supporters of innovative approaches to teaching, in which competitive elements play a significant role. The aim of interactive gaming technology is to make learning process comfortable for modern students.

But you should not forget about side effects. There is a possibility that creation of "ideal" conditions for learning (game elements, creative tasks, friendly atmosphere in the classroom, etc.) can make the process of adaptation to the realities of life more painful.

Speaking about the feasibility of introducing game elements in the educational process at higher educational institutions, we cannot ignore the most important problem which is to define whether the majority of students are prone to using these methods, i.e. are they "players" by nature.

The authors of this paper do not consider themselves to be "players", and no matter how correct their own views may seem to themselves, these views do not always objectively reflect the opinion of the majority of other people. Judgment of the majority based on several people's opinions is not right.

The study of this issue was done on the basis of associative arrays. Associative arrays are now widely used in various fields of knowledge. An associative experiment in which participants are to select objects or to name words was carried out (Pokrovskaya, 2013).

A survey was conducted among the students of Arzamas Polytechnic Institute of R.E. Alekseev Nizhny Novgorod State Technical University. Respondents were asked to write associative arrays to a number of words and phrases. These were the words "institute", "Internet" and "game", the last word not being specified whether it was a real or a computer game.

Students were given one or one and a half minutes to write everything that is associated with each of the words. The number of associations was not limited, but most students wrote only three or four words. The survey was anonymous, which gives reason to believe that the results are quite valid. Lists of associations were processed with Microsoft Excel 2010.

Age range of the respondents was from 17 to 44. This brief survey cannot be considered complete statistics because of the number of respondents, there were only 72 students and 3 teachers surveyed. But it allows to carry out qualitative evaluation. What are the results?

In general, it should be noted that the attitude towards the game is positive; most respondents associate it with fun, relaxation, a friendly company. And the word "excitement" was used most of all, being the first association, i.e. the first word which comes to mind. Some respondents used the words "desire", "interest", "intrigue", "competition", which indicates that most participants are keen players (Emelianova and Pakshina, 2015).

Analysis of associative arrays shows that students should perceive game elements positively. The only issue left is the attitude of teachers to such innovations. Let us consider two examples to persuade doubtful teachers to incorporate game and competitive elements in their activities.

Let us consider the approach that can easily be used by any teacher, regardless of their attitude to e-learning tools. This approach is based on mixed method when in the classroom students work on computers and communicate with each other.

2.2 Mixed method of teaching

At the lesson students are given 25-30 minutes to get acquainted with theoretical material (in our case with biographies of outstanding scientists). The forms are different: a slide show, a short film, an electronic tutorial, etc. At the same time students do not know what the next task is. And the next task is to make at least five questions on the material and write down the correct answers to them.

Then all the participants sit in a circle, preferably in alphabetical order, so that the distance between the players should be not less than a meter and begin to ask each other these questions. This list of participants in a table form is passed around the circle (table 1). The number of columns depends on the studied material.

Table 1. Form with a list of students

	Name of student	1	2	3	4	5	6	7	8
1.	Student 1								
2.	Student 2								
								
N	Student N								

A student asking a question puts "plus (+)" beside his/her name for the asked question and "plus (+)" beside the name of the player who answered the question correctly and gives the form to others. Questions and answers should be read loudly enough to be heard by all participants. The questions should not be repeated. The game stops when the last question is asked. It is not necessary to total all the pluses, as the form clearly shows who the winner is (Fig. 1).

АСПМ 14-1									
1	Орьевиц	+	+	+	+	+	+	+	+
2	икторовна	+	+	+	+	+	+	+	+
3	ина Олеговна	+	+	+	+	+	+	+	+
4	Орьевиц								
5	ав Игоревич	+	+	+	+	+	+	+	+
6	Сергеевич	+	+	+	+	+	+	+	+
7	еславоич	+	+	+	+	+	+	+	+
8	р Сергеевич	+	+	+	+	+	+	+	+
9	ександровна	+	+	+	+	+	+	+	+
10	анович	+	+	+	+	+	+	+	+
11	Эдуардовна	+	+	+	+	+	+	+	+
12	др Алексеевич	+	+	+	+	+	+	+	+

Fig. 1. Example of completed form.

It is advisable for all the students to take a computer test on the topic. After that the teacher puts a final score (the form + test result) (Fig. 2).

The authors conducted a lesson organized in a similar way with third-year students. The topic was "The founders of the control theory", the goal being to introduce students to biographies of the founders of the control theory: James Watt, Ivan Polzunov, Aurel Stodola, James Clerk Maxwell and Ivan Vyshnegradsky (Fig. 3). The final testing program offers each student to answer 10 questions with a random sample of 35 questions from the database.

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