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# Peculiarities of application of instructional interactive technologies in teaching fundamental disciplines at higher educational institutions

One of the priority trends in current changes taking place in higher education is to introduce effective methods for increasing students' learning activity. This can be primarily explained by high standards of modern society to be complied with by university graduates: high level of knowledge and professional skills; ability to adapt to various life situations applying acquired knowledge; ability to find effective ways for reasonable problems-solving; ability to make constructive decisions; ability to effectively co-operate and socialize with other people; self-training and self-development capability etc.

The issue of finding methods for enhancing learning activity has been examined by numerous scholars in different time periods, and various methods have been offered: to increase the volume of educational information with the latter being boiled down; to bring into being specific psychological and didactics learning terms; to use widely educational technologies and the like.

The aim of this article is to highlight the advantages of interactive instructional technologies in studying fundamental disciplines at technical universities.

The competence-based approach to teaching fundamental disciplines is characterized by transition from traditional instructional methods to more efficient result-oriented technologies. As practice shows, with little time allocated to fundamental disciplines in the curriculum, traditional teaching methods today have little effect. As a matter of fact, when using traditional methods, teacher transmits academic information to students and receives information about the their level of knowledge. However, we are interested in developing the students' competence for planning and organizing learning activity, independent retrieving knowledge and applying it in new situations for solving practical tasks.

According to the new curricula of higher technical educational institutions, the study hours allocated to fundamental disciplines have been dramatically reduced. As a result, teachers try to introduce brief theoretical material and further they expect students to practice solving a number of tasks. Generally, the results of students' performance are unsatisfactory. Most students fail to cope with an unknown type of tasks making teacher provide explanation of the material over and over. Thus teacher has either to change his teaching methods or make students solve more tasks.

As statistics shows, in higher technical educational institutions first-year students are supposed to master educational material 2,7 times as much as they were at comprehensive school [Сухарев 2009]. Due to the extremely large volume of knowledge that university students must comprehend, needed is the new method for mastering information and keeping it in mind.

Interactive technologies are believed to be one of the most favourable methods for improving teaching-learning process at universities. Instructional interactive technology represents a system of forms of organization, which are designed for „teacher-student" interaction as well as for „student-student" cooperative learning. This kind of interaction results in creating wholesome conditions for developing motivational, intellectual, emotional environment the end-point of which is to educate a competitive university graduate. Didactics capabilities of instructional interactive technologies designed for learning fundamental disciplines (to enhance student's strive for acquiring knowledge, to develop student's both learning and professional skills, to provide students' interaction and independence, to develop their reflexive and critical thinking) allow us to regard them to be an effective means for formation of the basic professional cognitive-creative competence. Most interactive technologies are used for organizing educational activity in microgroups. The results of scientific researches in the field of pedagogy and social psychology (Avdeiev V.V., Artyushina M.V., Vasil'eva T.V., Lomov B.F., Lyaudis V.Ya., Myers D., Nemov R.S., Ovchinnikova M.V., Tantsorov S.T., Yatsenko D.O. and others) testify that joint activity in small groups is more productive by comparison with the traditional form of organization of learning activity.

In scientific-pedagogical literature described are numerous ways of implementing the idea of interactive learning along with devising appropriate methods. Nevertheless, having set the objective to develop students' ability to work autonomously, teacher is to adopt experience of teachers-researchers as well as to use his own ideas adapted for specific groups of students. Nobody can do it better than a person directly working with students. Positive results can be obtained provided that these methods are used regularly rather than occasionally.

When preparing for the interactive lesson, teacher must follow the followings stages:

- take into account the level of students' readiness to this kind of lesson;
- work out a scenario along with rules and instructions;
- select the appropriate methodical support for both theoretical material and practical tasks;
- select educational technologies and, if necessary, instructions for their application;
- devise methods for evaluating the lesson results.

If students are not ready for this kind of learning, teacher may face negative final results which show up in misunderstanding and non-acceptance of such

form of studies. To our opinion, there is need in taking introductory measures, when students are offered to do some educational and scientific-research tasks as well as creative assignments in pairs or microgroups in order to prepare students for active work at interactive lessons.

Instruction with the use of interactive technologies has few disadvantages time consumption in preparation for the lesson being one of them. Tight time prevents teacher from experimenting on innovative technologies. On the other hand it is tight time that makes teacher select original types of activity. Indeed, at the primary stages, such organization of students' activity takes much time, since freshmen, studying fundamental disciplines in their the first year, lack in abilities to work unassisted [Петрук 2001: 99–103].

Let's consider application of instructional interactive technologies in teaching fundamental disciplines on the example of higher mathematics for students majoring in system engineering at technical higher educational institutions: practical class „Auction of knowledge" in the course of studying „Linear algebra" unit.

When training future specialists in system engineering, it is essential to take into account negative effects of this occupation. People working on the computer over a long period of time find it difficult to associate with other people. These effects can be broken through when group forms of professional training are used in learning activity since they facilitate students' social-psychological adaptation and consequently they have a positive impact on future specialists. As our experience shows, group work enhances students' activity and motivation, increases the level of knowledge and skills, develops positive personality characteristics, communicative skills, team performance skills, active listening and constructive criticism skills.

State-of-art computer networks are a complex multilevel system which needs permanent maintenance. Any problem within corporate network can result in the pause in the operation of enterprise. The main task of a system engineer is to create and support corporate computer network. Usually his duties are to work servers, hardware, software, taking care of data security. The peculiarities of this profession imply independence in decision-making, free operating schedule, continuous self-education, favourable conditions for self-training and regular contingencies, which require immediate decision-taking. Therefore a future specialist in system engineering must be patient, able to be concentrated and instantly switch over to different types of work, able to find instant solutions to various problems, and cope with both routine work and creative tasks.

The objectives of the lesson were as follows:

- to actualize and correct the basic knowledge, abilities and skills;
- to develop students' ability to use the acquired knowledge in putting down technical tasks in the form of matrix using production information;

- to verify students' ability to independently apply the knowledge in solving technical tasks and make decisions unassisted;
- to enhance the students' willingness to study the material profoundly;
- to facilitate the development of team interaction.

Let's imitate the auction of knowledge. In the modern informative world knowledge has become intellectual capital and as the saying goes, he who controls the information controls the world. Teacher coordinates the auction. His task is to suggest a task to be sold and provide an idea how to solve it. He chooses experts from among the students having high level of learning achievements. The experts further evaluate each task and set its initial price. Put up on auction are applied problems. We should notice that the problems to be solved by students at this type of interactive lesson have never been solved before by this very group of students either at lectures or practical classes. The participants of the auction are teams of developers. They delegate a representative to take part in the auction. The most expensive idea is passed into the ownership of the developers, so that they would test it in solving applied problems.

The examples of lots on the auction are the tasks for calculating general costs of materials, labour force, electric power for making a unit of product etc.

At the preparatory stage the host of the auction (teacher) provides experts with condition of the tasks, so that they could assess their complexity, make mathematical models and algorithm for solving these tasks. Then experts fix a mark for each task, which students can get provided that they solve it. Auction begins with handing out envelopes with tasks to teams of developers. They have a few minutes to assess their complexity degree and feasibility of finding the solution to it. The first lot put up is task 1. Experts announce its cost. Then the second lot and its cost etc. Representatives of the teams of developers, voting by a signal card, can select tasks they want to do. He who is the first to raise a signal card wins the auctions and starts solving the task. Teams are not entitled to take part in auction unless they do not prove the experts their „ability to pay", that is unless they do not solve a task. If the teams of developers do not know how to solve a task, they buy an idea, algorithm for the solution from experts. Experts set a price for the solution to the task and initial cost of the algorithm for the solution. Team representatives offer a price they can pay for the algorithm, which is deducted from the marks that were fixed for the correct solution of the task. On executing a task, teams of developers show it to the experts. The latter check the task and put marks for the solution. Teacher controls and coordinates the work of experts. Thus, the marks of teams of developers are correlated with the marks gotten for the task solution. The marks of experts in turn depend on how correctly they verified the solutions and set points for the sale of algorithm for task solution.

We should notice that the role of traditional instructional methods is not underestimated. It is not possible to arrange teaching fundamental disciplines using interactive technologies solely. Instead, we emphasize that the latter allow us to diversify teaching-learning process in order to raise students' interest to studies and future profession. In fact, the task of fundamental disciplines teachers is not only to help students to acquire good knowledge, abilities and skills but also elucidate what they can benefit from their future profession, to cultivate respect and love for it as well as to raise confidence in their correct choice.

## Literature


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## Abstract


The article deals with issues of application of instructional interactive technologies in teaching fundamental disciplines as higher technical educational institutions. Cited is an example of interactive lesson on higher mathematics.



**Key words:** instructional interactive technologies, interactive lesson, fundamental disciplines, auction of knowledge.


## Specyfika stosowania instruktażowych technologii interaktywnych w nauczaniu przedmiotów podstawowych na wyższych uczelniach

## Streszczenie


Artykuł dotyczy kwestii stosowania instruktażowych technologii interaktywnych w nauczaniu przedmiotów podstawowych na wyższych uczelniach technicznych. Podstawą opracowania są interaktywne zajęcia z matematyki wyższej.



**Słowa kluczowe:** instruktażowe technologie interaktywne, zajęcia interaktywne, przedmioty podstawowe, wymiana wiedzy.