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### Synthesis of the Use of Information Technology and Interactive Methods in the Educational Process

*Síntesis del uso de la tecnología de la información y de los métodos interactivos en el proceso educativo*

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#### ABSTRACT

The experience of synthesized use of information technologies and interactive methods in educational activity is considered. It is noted more effective mastering of the competencies revealed by the discipline by students as well as the formation of practical skills and mastering the methodology of calculating the estimated cost of the facility construction. The assessment of mastering the discipline by students was made. The results showed a significant increase in the effectiveness of teaching the economic disciplines and increasing the motivation of students when using software packages and information technologies, which allowed us to recommend their use in the educational process.

**Keywords:** Information technologies in education; interactive teaching methods; software packages; the effectiveness of the educational process.

#### RESUMEN

Se considera la experiencia del uso sintetizado de las tecnologías de la información y los métodos interactivos en la actividad educativa. Se observa un dominio más efectivo de las competencias reveladas por la disciplina por los estudiantes, así como la formación de habilidades prácticas y el dominio de la metodología de cálculo del costo estimado de la construcción de la instalación. Fue hecha la evaluación de dominar la disciplina por los estudiantes. Los resultados mostraron un aumento significativo en la eficacia de la enseñanza de las disciplinas económicas y el aumento de la motivación de los estudiantes al utilizar paquetes de software y tecnologías de la información, lo que nos permitió recomendar su uso en el proceso educativo.

**Palabras clave:** tecnologías de la información en la educación; métodos de enseñanza interactivos; paquetes de software; la eficacia del proceso educativo.

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## INTRODUCTION

Qualitative training of students in modern conditions is one of the primary tasks of the educational process. Employers make high demands on potential employees – graduates of educational institutions, therefore at present the educational process should be close to the production conditions and aimed at maximizing the learning skills and those required in future professional activities. The solution of the tasks in full is not possible only with the use of classical teaching methods, and therefore interactive methods and information technologies are widely used to increase the effectiveness of the educational process.

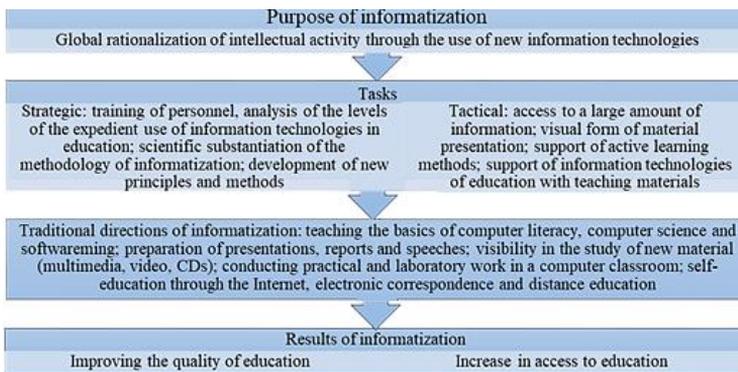
In the context of a decrease in students' interest in engineering and construction directions in the study of economic disciplines it is especially difficult for the teacher to motivate them to work productively in the classroom and mastering the competences discovered by disciplines. The use of simulation of practical situations in the educational process, application of software products and modern information technologies increases the motivation of students and the educational process becomes more cognitive (Shcherbakova, 2017).

Thus, the increase in the effectiveness of the educational process, determined by factors such as student motivation, teacher's professionalism and teaching methods (Mormuzheva, 2013), are also significantly influenced by the means of providing the educational activities and information technologies used in the learning process. In addition, the use of information technology allows simulating the situation and prediction the options for solving the tasks posed and visualizing the educational information, which is important when carrying out assignments for economic disciplines of an applied nature.

## SUBJECTS AND METHODS

Rapidly growing informatization of the society is accompanied by computerization of educational institutions, which ensures the wide introduction of electronic educational resources and technologies into the learning process. Under informatization according to the interpretation of the UNESCO Institute for Information Technologies (Badarch, 2014), the application of methods and means of collecting, storing and disseminating information on a large scale, systematizing existing and forming new knowledge for the purpose of their application to management and further improvement and development is meant. It is possible to single out the main elements of the informatization process in accordance with the position of T.E. Platonova (2012), which was reflected in Figure 1.

**Figure 1: The main elements of the informatization process**



The introduction of modern information technologies into the educational process and the formation of tasks, which solution involves the use of software packages and a certain level of independent participation of the learner, contributes to a change in the interaction and relationship between the teacher and the student. In this case, the student, previously an object of training, becomes an equal subject of that, and the teacher becomes the organizer of the educational process.

The most interesting example of such training is the synthesis of interactive teaching methods (case studies) and information technologies in the teaching of economic applied disciplines for students of engineering and construction training directions. Case methods (case technology) are one of the most frequently used interactive teaching methods. Case-technology is considered to be an active training method, oriented towards independent, conscious participation by the student in his training, gaining new knowledge, mastering professional competencies and skills (Igonina, 2015). The case assumes the student's consideration of a simulated real situation, which can arise in production conditions, with a problem formulation, both package and private (Telnov, 2015).

As conditions for the effective application of case-methods are:

- description of the problem situation;
- availability of educational and methodological materials providing for the students' independent work;
- control and correction by the teacher of the decision-making process by students in relation to the problem posed.

When studying by students trained in the direction 08.03.01 "Construction", on the training software "Roads...", economic disciplines "Pricing and Estimates in Construction" and "Branch Economics", case technologies and information technologies in the system are applied. So, practical classes on "Pricing and Estimates in Construction" are connected with laboratory studies and subjects of the course work on the discipline "Branch Economics". Within the framework of both disciplines the case developed on the topic "Forming the estimated cost of construction products" is solved, but only on laboratory work the students also use the "GRAND-Smeta" software package, in which the necessary calculations are carried out, which corresponds to the definition of the cost of facility construction at enterprises investment and construction package. According to the typology of case studies, it is a case of an applied nature, teaching the assessment, analysis and decision making. The mentioned developed case includes:

- a set of tasks within the framework of the indicated problem or task, which are simultaneously sources of information for solving it. The specified tasks are reflected in various design solutions implemented in the field of road construction in modern conditions;
- options and ways to solve the indicated problem or task;
- control questions which allow analysis the results and choose the optimal solution.

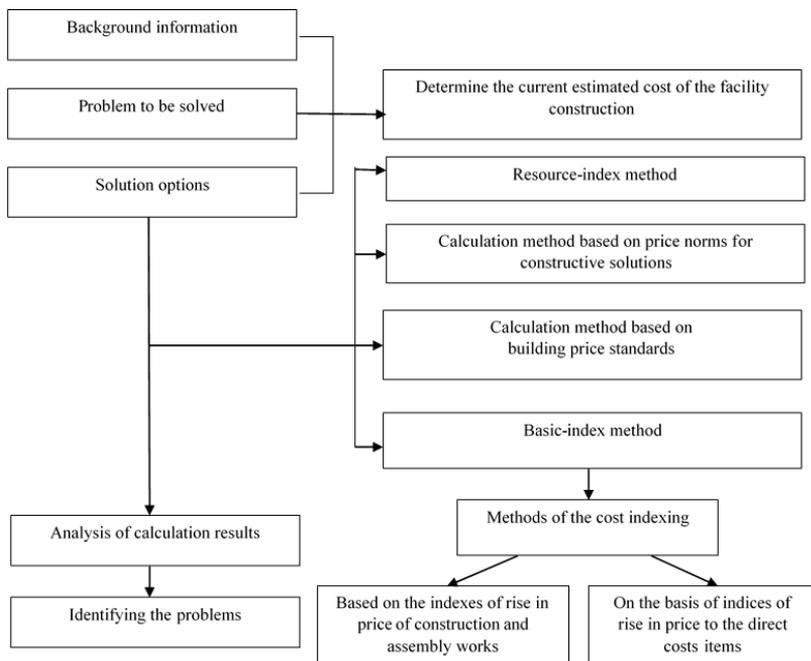
When solving a case in a practical lesson, students are engaged under the strict guidance of the teacher. When laboratory and course project work, the main activity of the student is the independent activity, which is directed and supervised by the teacher. When performing the laboratory work, students are engaged in the software package, using the developed methodological support. Execution of the course project is carried out on individual variants in the software package by the student independently, with the purpose of fixing the technique of mastering certain skills in calculating the estimated cost of the facility construction, obtained in practical and laboratory classes. Course design also has a methodological support.

The purpose of the case is to master by students practical skills in the alternative substantiation of the cost of facility construction using modern information technology and the formation of primary accounting documentation for capital construction (Ostapchuk, 2017).

The developed case-method includes four stages (Figure 2) (Ostapchuk, 2017):

1. Obtaining of initial information and its analysis;
2. Performance the necessary calculations to determine the estimated cost of the facility construction in the GRAND-Smeta software package according to alternatives options under consideration;
3. Analysis of the results obtained, aimed at solving the indicated problem, achieving the task posed;
4. Substantiation of the chosen variant for the achieving of the goal, discussion of the results obtained, identification of the problems and evaluation of the work performed.

**Figure 2: Case structure "Formation of the current cost for a highway construction"**



As E.G. Ostapchuk, in the process of working with cases and in the GRAND software package the trainees assess the adequacy of regulatory support for the implementation of methods for estimating the cost of construction products, the merits and demerits of the methods used, the preference for methods to objectively determine the level of the estimated cost of construction products, which predetermines the analytical and research type of the developed case (Ostapchuk, 2017).

A similar example of the effectiveness of integrating information technologies and interactive teaching methods in the educational sphere is the fulfillment of final qualifying work by students. For students in the engineering and construction training directions, the final qualification work is a project which the student develops completely from the green field. Preparation of final qualifying work in this case is also made on the

basis of the implementation of one of the interactive methods, the project one. When preparing engineers, V.V. Pak (2016) also notes the extensive use the project method in the course and diploma design projects.

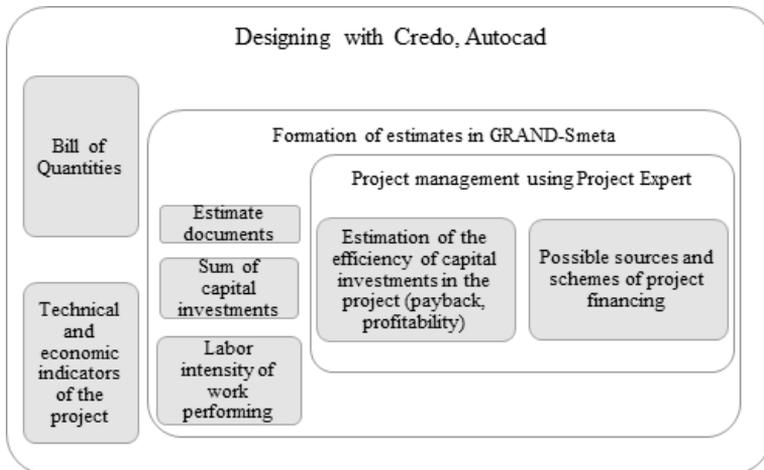
In accordance with the definition of E.S. Polat (Polat *et al.*, 2008), the project method is considered as the method of achieving the didactic goal through the detailed development of the problem (technology), which must end with a very real, tangible practical result, designed in one or another way (Telnov, 2015).

When carrying out the feasibility study of the design solution presented in the final qualifying work, i.e. implementing the project teaching method, the students of the training direction 08.03.01 "Construction" use various software packages. And the result of work in one software is the initial information for work in another software package.

So, students design a construction facility using the software packages CREDO, AutoCAD, which allow calculating the amount of construction and assembly work for the facility construction. Volumes by work types become the initial information for determining the amount of investment in the facility construction, which is calculated in the software package "GRAND-Smeta". Further, the results of calculations, namely, the size of capital investments, are taken into account when assessing the project's payback and its profitability. The payback and economic feasibility of the project can be estimated in the Project Expert software package. And the work complexity, determined from the estimates, is the basis for drawing up a work schedule on the construction site and its optimization.

The process of using the obtained information based on the results of applying certain computer software for calculations in other software packages when performing the final qualification work is schematically shown in Figure 3.

**Figure 3: Synthesis of software packages used in the educational process**



Formation of case studies carried out with the use of software products in the relevant disciplines and the availability of the developed methodological support allows the students in the learning process to obtain the necessary skills for working in software packages and for carrying out calculations. Moreover if they independently perform the final qualification work, they should reproduce these skills (Dvoretzkii, 2003).

In this case, the level of training of a graduate of an educational institution is much higher, since he/she owns modern information technologies. The employer is interested in attracting such graduates, since it reduces the costs of training a new employee at the beginning of his professional activity.

## RESULTS

As part of the study of applied economic disciplines, students acquire practical skills in the GRAND-Smeta software, namely:

- work with normative documents and application of estimate-normative base;
- formation of estimate documentation and accounting forms for completed construction and assembly works;
- selection and application of the optimal method for determining the estimated cost in the existing conditions;
- estimation of volumes and types of resources consumed in the performance of construction and assembly works
- calculation of the contractual estimated cost of works (contract price) for the facility construction.

As a result of the integration of information technologies into the educational process using case studies and the design method of teaching, the following results can be noted:

- students form the knowledge, skills and abilities in economic disciplines, they acquire certain competencies, discovered by the discipline, necessary for the implementation of professional activities in the future;
- students develop visual-figurative, creative, constructive thinking;
- the students form and develop the spatial imagination and representation of objects
- a high level of motivation among students on engineering and construction areas of preparation for studying economic disciplines is maintained;
- students get skills in working with information perceived from software packages, its further processing and use;
- students receive a knowledge base that meets the current requirements of employers for potential employees – graduates of educational institutions.

## CONCLUSION

Modern education provides intensification of the process of education, the implementation of developmental training, the transition from the mechanical learning, refining the content of training, improving the forms and methods of organization and management of the learning process, thereby ensuring the level of training today's students, future specialists and their readiness for harmonious existence in society. With the development of information technology education linked changes in education.

Educational activity based on the synthesized application of interactive methods and modern information technologies, facilitates the acquisition of practical knowledge and experience by students in the most optimal and effective form for them that is through the performance of a certain type of activity that is as close to production conditions as possible. This makes it possible to solve the problem of qualitative training of students and increasing the effectiveness of the educational process.

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