



WAYS OF ORGANIZATION AND METHODS OF TEACHING ENGINEERING GRAPHICS IN THE CONDITIONS OF MODERN DEVELOPMENT OF CAD SYSTEMS

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ABSTRACT

This article discusses the ways and methods of organizing classes in engineering graphics in the context of the development of CAD systems.

KEYWORDS

CAD, technique, AutoCAD, Inventor.

INTRODUCTION

Engineering computerization systems required fundamental changes in the ways of organizing and teaching methods engineering graphics [1]. Changes in teaching methods are associated, in first of all, with the transition to three-dimensional parametric modeling and the use of graphical databases in the design, and in- second, with the transition to computer development technologies design documentation.

The factor influencing the organization of the learning process was the decrease in hours for classroom lessons. As a result, a contradiction arose between the reduction of hours for classroom work and the need to develop professional competencies specified in the federal state educational standard of the third

generation. The solution to this problem was the use of remote technologies for independent study by students of the formalized procedures of engineering graphics, automated verification of typical graphic tasks and testing of the theoretical knowledge gained (described in detail in the first chapter).

On the basis of the conducted research, the educational process was built according to an iterative scheme, consisting of the following types of educational activities:

- lecture part;
- practical part (practical and laboratory classes);



- individual graphic tasks with an automated verification system;
- testing on theoretical material for current self-control;
- final control carried out by the teacher (Fig. 1).

After successfully completed individual tasks and their self-checking, testing with an assessment follows, as a result of which the student either proceeds to the final control on the topic carried out by the teacher, or fills in knowledge gaps and passes the test again. Next, the student is invited to complete independent work on the topic under the supervision of the teacher and proceed to the study of the next topic. At the end of the semester, there is a final control in the form of a test or an exam.

The proposed method of organizing the learning process of students engineering graphics allows you to implement the concept of development abilities, based on the zones of actual and the nearest development [2]. To determine the zone of proximal development testing of the level of meaningfulness of the acquired knowledge is used.

Total score based on test results and performance individual task reflects the level of the zone of actual development.

To implement the described method of organizing the process of teaching students in the section of engineering graphics "Connections", the following teaching materials were developed:

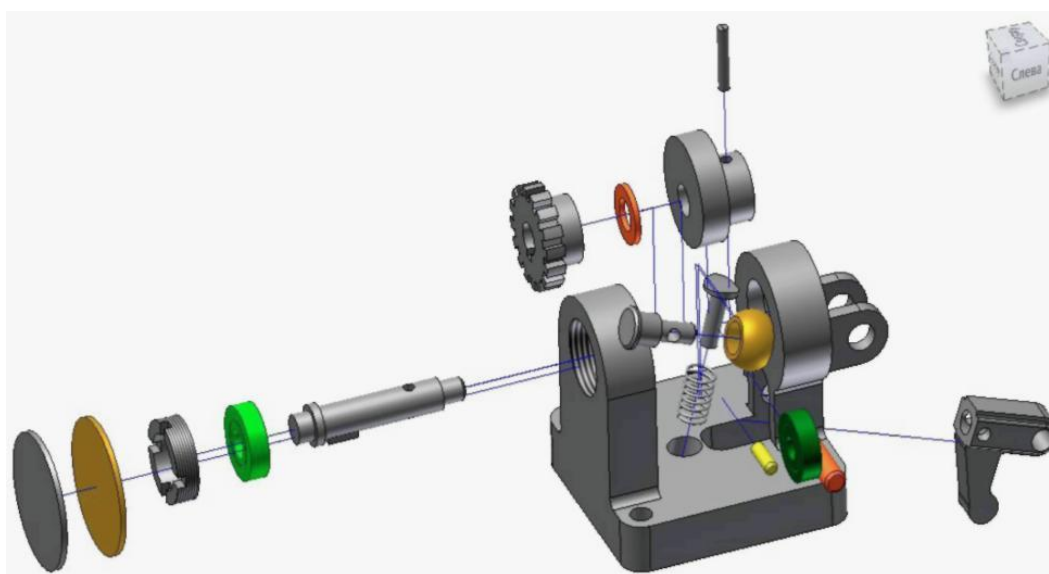
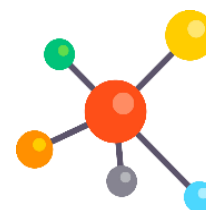
- workbook (including the lecture part);
- individual graphic tasks with automated verification, performed by means of two-dimensional graphics in the AutoCAD system;

- training materials for demonstrating step-by-step solutions to typical problems;
- a set of test tasks for various types of connections.

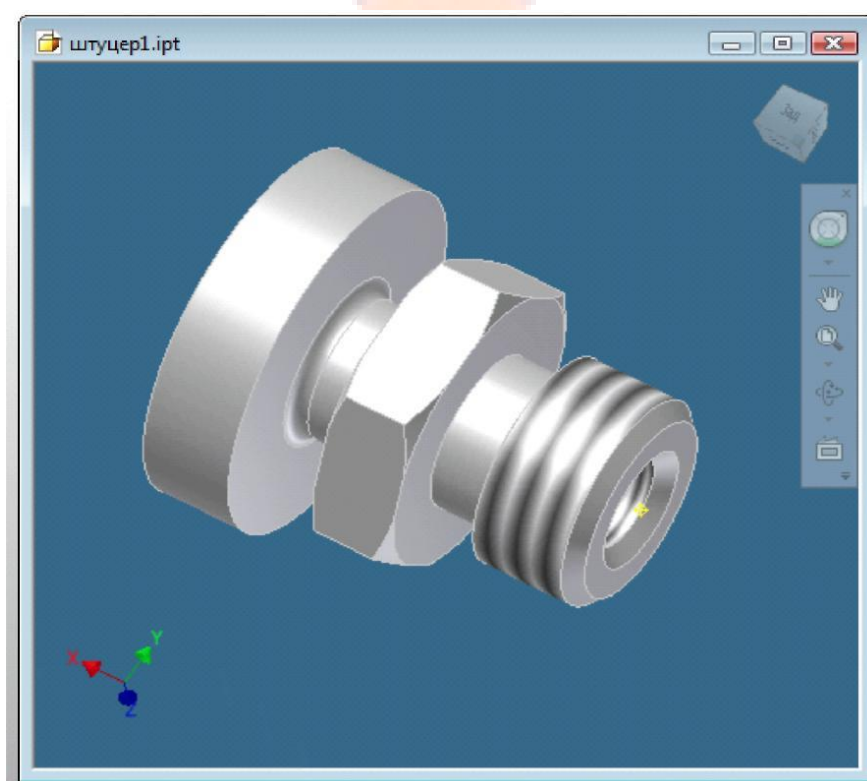
In the process of teaching students in the discipline "Engineering Graphics" on the basis of modern design approaches, the following methods were used:

- verbal;
- explanatory and illustrative, using the possibilities of three-dimensional modeling and multimedia tools;
- systematizing;
- practical, implemented in the laboratory work of students;
- control, using testing and a complex of self-testing of graphic tasks using AutoCAD tools;
- projects.

An important component of the lecture material is schematization. The content of the lecture part of engineering graphics is, first of all, the essence modern engineering activities for the design and construction of objects of varying complexity. So, for example, when studying the section "Assembly units and functional units", at first are highlighted and indicated in the basic abstract of the lecture part assembly components, the assembly composition diagram and its matrix presentation, and then there is a transition directly to the development design documentation. As an example, the functional-structural analysis of the pusher assembly unit is considered. Figure 1 shows its three-dimensional model.



Pic. 1. Three-dimensional model of the pusher.



pic. 2. Three-dimensional model of the nozzle in the Inventor environment



New at this stage is the inclusion in the course of engineering graphics procedures for working with graphical databases for parts and assembly units. The created part or assembly unit, according to the existing use of CAD technology, goes into an individual or corporate graphic database. Due to the fact that parts and assembly units are created as parametric models, it can be referred to as a finished product or used to create another product at a later stage.

Individual tasks are graphic tasks for four types of connections in several variants, performed in the AutoCAD system. They contain not only an electronic assignment (black lines), but also a self-testing solution for the student (colored lines), hidden at the stage of issuing the assignment.

The study of the topic ends with individual independent work, performed entirely in the computer-aided design system. Independent work includes the construction of three-dimensional models of parts and their connections, as well as the creation of a drawing based on the created model in accordance with ESKD. The final control on the topic and test work are carried out in the classroom and are evaluated by the teacher.

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