



Elements of Information Modeling in Classic Engineering and Computer Graphics Courses

Suvonov O. Sh., Qosimova F.

Samarkand State Architectural and Civil Engineering Institute

Abstract: The paper deals with the issues related to the formation of students' competencies, including mastery of information modeling technologies in construction. The author suggests that BIM should be taught from the first stage of university education, and included in such disciplines as engineering and computer graphics or descriptive geometry. The article's most important aspects relate to methodological issues relevant to the formation of training content and process components based on modern information technology. The author emphasizes the importance of the timely adoption of information modeling elements at all stages of training for future construction professionals.

Keywords: information modeling in construction, educational technologies, graphics courses, modern software systems.

Information modeling (BIM) inevitably penetrates into all areas of building design. A sharp jump in the interest of the professional community in various aspects of information modeling technology causes a response from the information environment. There are new platforms where specialists share their experience, post educational materials or technical documentation. At the same time, experts state that the level of general information literacy of specialists is still very low. Not all organizations in the industry have joined the process of introducing BIM technologies. There are probably several reasons. But the main thing, in our opinion, is that universities are not yet able to fill the labor market with BIM specialists, BIM managers, and BIM coordinators that are so in demand today. We are seeing a constant increase in demand for these positions.

To solve the problem, it is necessary to develop appropriate areas of training in industry universities, as well as to revise approaches to building educational trajectories for students studying in classical construction specialties and areas. In order to provide the labor market with professionals with the necessary set of competencies in the field of information modeling, it is necessary to introduce specialized training courses into the educational programs of universities, restructure the programs of existing disciplines. It is necessary to consolidate the efforts of special and general education departments, build a consistent logical chain of levels of mastering digital competencies by students, and create conditions for the formation of the necessary knowledge, skills and abilities. Only the joint efforts of all participants in the educational process will help create the form of the student's educational space that is necessary to master the complex of modern knowledge and skills.

The gradual introduction of information modeling elements into the educational programs of universities has already begun. There are quite successful practices, for example, at the Samarkand State Institute of Architecture and Civil Engineering, at the Tashkent University of Architecture and Civil Engineering, and others [1–2].

The basis for understanding information modeling technology can be laid even in the junior years of the university, in the process of studying such disciplines as general computer science, engineering graphics, descriptive geometry, computer graphics, spatial modeling and others. This experience has

already been accumulated. The departments of general engineering training form the very basis on the basis of which the entire system of professional knowledge is then built. The introduction of sections into the programs of general engineering disciplines focused on mastering the basics of information modeling in construction by students is, to a certain extent, propaedeutic in nature and allows the student to be prepared for immersion in BIM technologies in senior years.

If we digress for a second from those global tasks that are solved with the help of BIM at industry enterprises and go down to the level of elementary basic knowledge, we can see that even the classic tasks of the Descriptive Geometry course can be solved in one of the BIM complexes.

Let's take the following example to illustrate. In most construction universities, the bachelor's curriculum includes the course Descriptive Geometry and Computer Graphics. In this course, as a rule, there is a section called.

"Projections with numerical marks", within which theoretical and practical issues related to engineering approaches to the image of these topographic surfaces and earthworks (dams, platforms, pits, etc.) are considered. In the classical course of descriptive geometry, the student is asked to solve several problems related to the construction of earth contours and projections of earthworks. Most often, it is assumed that the problem will be solved in 2D graphics on a computer or on paper in a pencil. In this case, the solution looks like the illustration shown in Fig. 1.

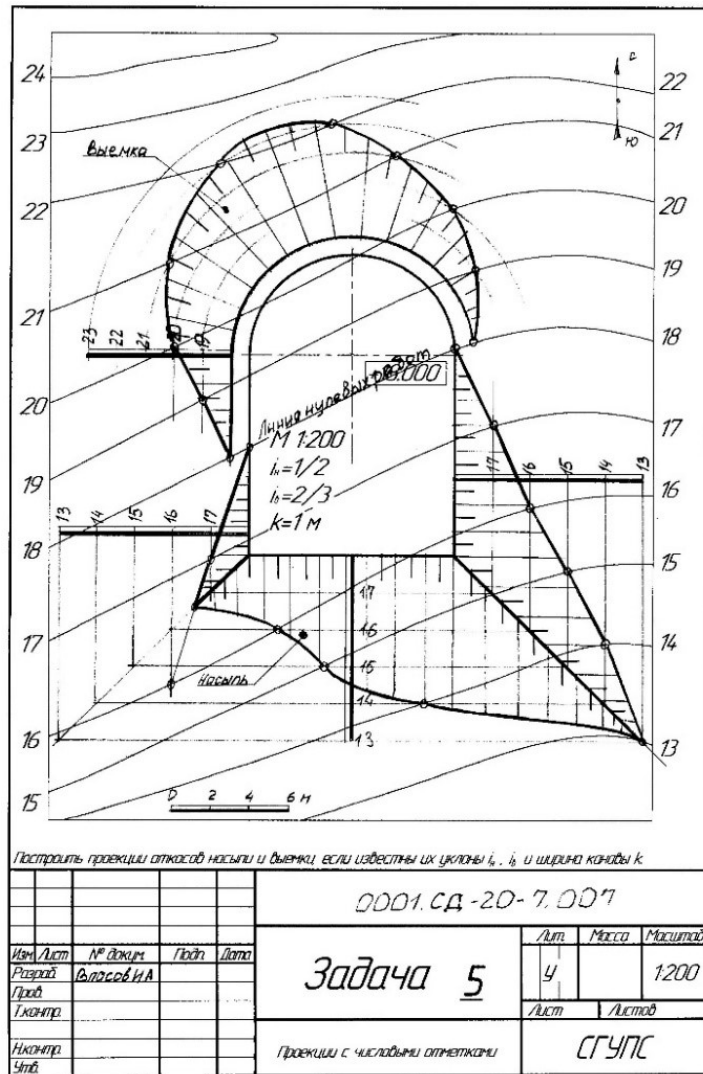


Fig. 1. The work of a 1st year student of SGUPS, Vlasova I.A. (made in pencil)

Now imagine that a student was taught the basics of working in the AutoCAD Civil 3D software package already in the first year. Then, the same topic, within the framework of the same discipline,

acquires a completely different level of implementation. On fig. Figure 2 presents the results of a control exercise performed by SGUPS students after only one lesson conducted using the AutoCAD Civil 3D software package. At the same time, the student gets acquainted not only with the theoretical foundations, he masters a modern tool that will be useful to him in the future.

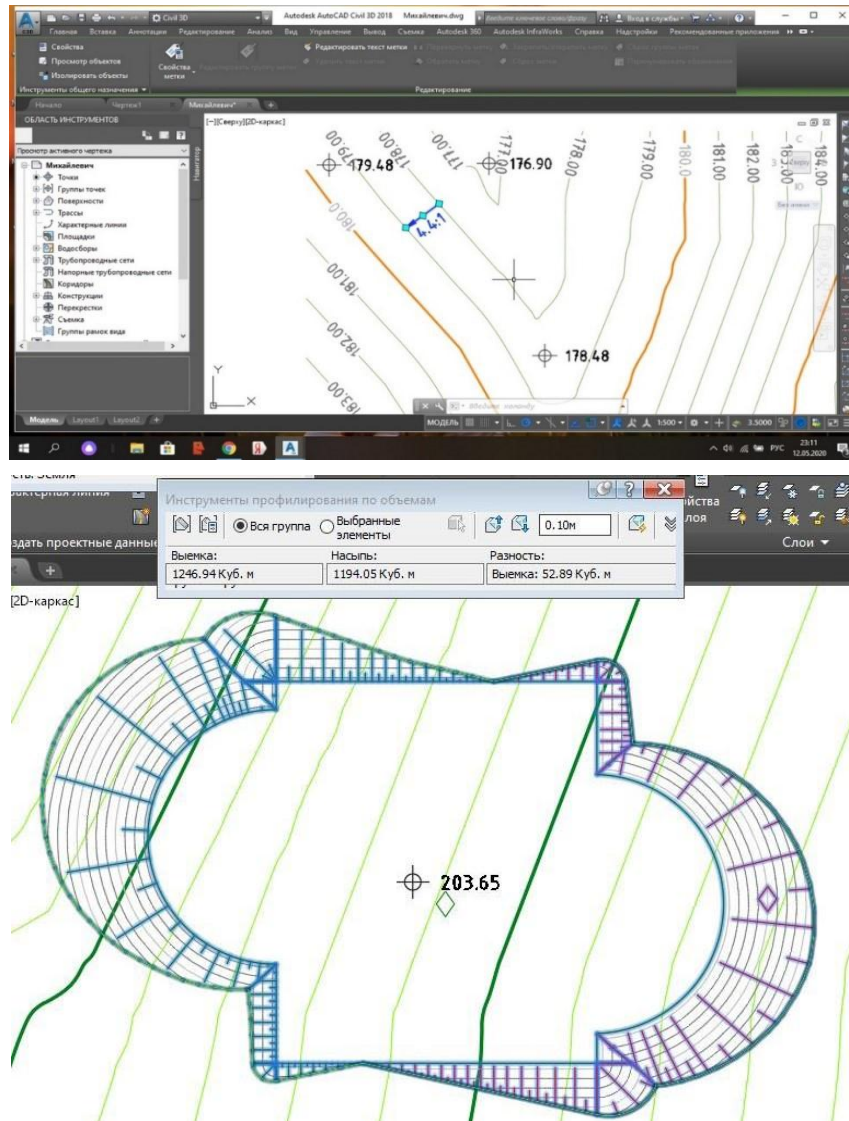


Fig. 2. An example of a control task (work done in AutoCAD Civil3D)

Similar examples can be given for other topics studied within the framework of general education disciplines. We have experience and examples of using software systems Autodesk Revit, Autodesk Navisworks, AutoCAD Civil 3D and others to solve the classic problems of courses in descriptive geometry, computer graphics and engineering graphics. It is worth noting that the use of these rather complex programs is not felt as "burdensome" for students, rather, on the contrary, it develops professional horizons and motivates them to master new knowledge.

From a pedagogical point of view, such elements play an important role in the formation of professional competencies of a future specialist, create interdisciplinary connections, allow the student to understand the relationship between theoretical knowledge and practice, and also form a reliable basis for further education.

The concept and tools of information modeling in construction are more and more in demand in the fields of architecture, design and construction and have already become part of the modern world. Therefore, the mastery of these tools and the formation of the student's practical experience in their use should be carried out as early as possible. Despite the fact that general education engineering disciplines have a quite stable strict structure, even within the framework of these disciplines, it is

possible for a student to get acquainted with the basic functionality of some advanced BIM complexes.

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