

SMART TECHNOLOGY IN TEACHING ENGINEERING GRAPHICS

**N. J. Yodgorov,**

professor of the Bukhara State Pedagogical Institute, DSc

**Annotation.** This article discusses the pedagogical features of future teachers, aspects of educating mature specialists from them by strengthening their sustainable interest in science, achieving a broad and deep understanding of the foundations of science.

**Key words:** mastery, spatial-visual 3D images, smart technologies.

Determining the specific characteristics of the professional activity of a drawing teacher and the specific aspects of developing professional skills in them is of great importance in graphic education. Their professional activity represents an integrative unity of three components - pedagogical, engineering and specialist components [1].

It remains one of the main conditions for the effective organization of drawing education for students of higher educational institutions based on STEAM (Science - natural sciences, Technology - technologies, Engineering - technical creativity, Art - art, Mathematics - mathematics) technologies.

STEAM is based on the application of a practical approach, as well as the integration of all five areas into a single educational system. How does the STEAM approach affect academic performance? Its main idea is that practice is as important as theoretical knowledge. That is, during learning, we need to work not only with our brain, but also with our hands. Learning only in the classroom is not keeping pace with the rapidly changing world. The main difference of the STEAM approach is that children use both their brains and hands to successfully learn different subjects. They "read" the knowledge they received [2].

STEAM education is not only a way of teaching, but also a way of thinking. In it, students will have the ability not only to acquire knowledge, but also to use it. Therefore, when they grow up and face life's problems, whether it is environmental pollution or global climate change, they realize that such complex issues can only be solved by relying on knowledge from different fields. It is not enough to rely on knowledge of only one subject.

How did this new approach to education come about? This is the logical result of combining theory and practice. STEAM was developed in America and combines subjects such as science, technology, engineering and mathematics. Later, Art was added here and STEAM was formed. Teachers believe that these subjects, or more precisely, knowledge of these subjects will help students become highly qualified specialists in the future. At the end of the day, kids want to learn well and put it into practice right away.

A famous example of the STEAM approach is the Massachusetts Institute of Technology (MIT). The motto of this world university is "Mans et Manus" (Mind and Hand). The Massachusetts Institute of Technology has developed STEAM courses to give children an opportunity to learn and be exposed to the concept of STEAM in advance, and even created STEAM Learning Centers in some educational institutions [3].

Integrated education. What is the difference between this education system and the traditional way of teaching science? STEAM education provides a blended environment where students begin to understand how to apply scientific methods in practice. In this program,

students study robotics, designing and building their own robots, along with mathematics and physics. Special technological equipment is used in the lessons.

At the international conference "STEAM forward" held in Jerusalem in 2014, the following statements were made: involving young people in STEAM. This education should begin at preschool age, so programs should be included in kindergartens.

Currently, the language of science is English. If you want to study science and become a scientist, you need to know this language. STEAM education programs are needed for girls. Girls in science can do things that boys can't because of their discipline.

We would like to emphasize that, compared to traditional teaching methods, the STEAM approach encourages children to conduct experiments, build models, independently create innovations, turn their ideas into reality and create a final product.

Various approaches to the concept of integration in the pedagogical process have been developed in the psychological-pedagogical literature. K. Yu. Kolesina [4] states that the organization of the educational process based on the integration approach ensures an increase in effectiveness and reliability. He considers general didactic aspects of integration as material and spiritual aspects of the content of the educational process. K. Yu. In Kolesina's research, content updating integration processes are transferred to the didactic principle (the principle of integration in education). A more complete analysis is carried out on the basis of a detailed analysis of the technological aspects of content integration (mutual distribution of interdisciplinary educational tasks). K. Yu. Kolesina's research analyzes the psychological aspect of this problem. Considers the general approach to educational integration according to the individual characteristics of requirements [4]. To integrate academic subjects into one subject: research objects must be the same or close to each other; the same or similar research methods are used in the subjects being integrated; integrated academic subjects are built on the basis of general laws and general theoretical principles.

Organization of educational activities using SMART ("smart", "intellectual") technology serves to increase educational efficiency. SMART technology is an interactive learning environment based on the use of mobile devices in content around the world, regardless of time and space.

What is SMART technology? An interactive learning environment based on the use of mobile devices using content from around the world, regardless of time and place.

SMART (translated as "smart") is characterized, first of all, by the presence of communication technologies of collective activities aimed at its use, which significantly change not only education, but also other types of activities [5].

S - Self-directed - self-directed, M - Motivated - encouraging, A - Adaptive - flexible, R-Resource - free resource T - Technology Embedded - compatible with technologies. It implies the diversity of intellectual education (audio, video, graphics), the ability to quickly and easily adapt to the level and needs of the student. This is a completely new educational environment, in which educational activities are carried out on the Internet based on common standards and technologies established between the network of educational institutions and teachers, and common content is used. The peculiarity of this type of education is that it creates an opportunity for education "everywhere" for all strata of the population, regardless of their place of residence and financial capabilities [6].

SMART technologies are based on information and knowledge, which allows to create radically new methods of teaching. Innovation and Internet opportunities are also used in the

educational process. It allows you to acquire professional skills based on the study of sciences, taking into account the rapid and constant updating of this technology.

This technology also affects the work of the teacher. He is not only a source of knowledge, but also an organizer of students' independent study, knowledge and research activities, that is, a person with the ability to help. The teacher guides the participants in the learning process in creating new knowledge in the learning environment. Now, teachers should not only be knowledgeable in their professional field, but should also know modern information and knowledge related to the field and be able to use various technologies.

Conditions of teachers' SMART environment: new type of adaptive education; ability to use smart devices; exchange of experience with pedagogical teams; teaching taking into account the professional skills and personal qualities of the teacher.

SMART technology creates a wide range of opportunities for teachers: sharing knowledge, experience and ideas, engaging in theory and practice, saving time. Teachers can tailor their content to each student individually.

The use of new smart technologies is not limited to schoolchildren and students; but it should also increase the interest of adults in new knowledge, so that they can successfully communicate in the world community, involve all students in the active process of self-education. This makes learning much more effective and improves life-long work skills, as required by the ever-growing modern economy [7].

This will help students studying drawing in the higher education system to strengthen their knowledge, to work independently on their own, in these online and offline courses, and in the subjects of "Drawing", "Drawing geometry", computer animation model and " allows them to get the new knowledge they need through technologies such as "augmented reality".

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