

Features of the Application of Smart Technologies for the Development of Various Directions of Design Education

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Abstract

The current increase in requirements for designers in various professional fields is due to the challenges posed by globalization and the informatization of modern society as the main trends in its development. The integration of modern technologies into the structure of designers' professional activities requires a revision of approaches to the professional training of both future design professionals and artists in general.

The article aims to study the theoretical foundations and certain practical aspects of the application of SMART technologies in the design education of HEIs of technical and humanitarian orientation.

Methodology. The study applied analytical and bibliographic, systemic and structural, comparative, logical, and linguistic methods, analysis, synthesis, induction, and deduction in the processing of scientific information on the use of SMART technologies in design education. Moreover, the methods of abstraction and idealization served to study and process statistical and analytical data. Analysis, synthesis, induction, and deduction helped to study the scientific literature and summarize the results of the survey.

Results. The study examined the theoretical foundations and results of a survey on the concept and main trends of design education, as well as the prerequisites, patterns, and directions of development of SMART technologies in terms of assessing the experience of their use in the educational process in teaching design specialties.

Keywords: professional training of design specialists, means of design education, modern technologies for training designers, application of SMART technologies, innovative educational technologies

1. Introduction

The high competence of design professionals working in various sectors of the economy is one of the important keys to the development of the economy of these sectors. Given the previously mentioned, improving the quality and level of professional design education is of great importance. This should be ensured by the effective use of SMART technologies and the latest teaching tools to more fully utilize the potential of design as a prerequisite for effective enterprise informatization.

The theoretical part of this study substantiates the main trends in the study of the development of design education, stages, and features of the use of SMART technologies in design education.

The practical part of the study includes the study of the types of pedagogical technologies in the field of design that most need the use of SMART approaches. The approaches in design education that are most often and most successfully subject to the application of SMART technologies are determined. The main types of competencies are outlined, the improvement of which is the primary goal in the introduction of SMART technologies in the field of design. The teaching aids that are the most effective and in demand in the practical implementation of SMART technologies in design education are defined. The skills that are especially noticeably developed through the introduction of the latest SMART technologies in the study of design-related disciplines are highlighted. The multimedia tools that are the object of the widest application of SMART technologies in design education are also revealed.

Based on the results of the study, conclusions have been drawn regarding the issues raised. It has been found that the types of pedagogical technologies that most need to apply SMART approaches to their optimization in the humanities are pedagogical technologies based on a personality-oriented pedagogical process and pedagogical technologies for artistic and developmental learning. In the field of design education of technical specialties, these are traditional pedagogical technologies, technologies based on the activation of students' activities, didactic improvement, and visual updating. According to the survey, the educational approaches that are most often subject to optimization in design education nowadays in terms of the use of SMART technologies concerning them are personality-oriented learning and a modular learning system. The types of competencies, the improvement of which is the primary goal in the introduction of SMART technologies in design education, are artistic and aesthetic, design, and organizational competencies. The study has found that the teaching aids that are the most effective and in demand in the practical implementation of SMART technologies in design education are artistic and graphic equipment and technological equipment for working with materials. At the same time, the survey participants have identified the most important skills that are being developed especially significantly through the introduction of the latest SMART technologies, and will be especially in demand in the future. These are the ability to analyze the design task and the skills of design support for the practical implementation of a design project, and the multimedia technologies that are the object of the widest application of SMART technologies in design education are video resources, graphics, and communication technologies.

2. Literature Review

Design education is an educational approach that focuses on teaching students how to use design thinking to solve problems and create solutions that are aesthetically pleasing and functional (Tang & Tang, 2022). Design education refers to the process of learning and teaching the principles, methods, and practices involved in the field of design, which encompasses various areas such as graphic design, product design, architecture (Wang & Liu, 2022). Today, the process of design education has some shortcomings, which negatively affect the quality of professional training of specialists in this field around the world. A popular trend in higher education institutions that train designers for enterprises in various sectors of the economy is to underestimate the importance of using modern technologies in the artistic sphere in general and design education in particular. The insufficiently widespread introduction of modern technologies in this area hinders the formation and development of a creative personality, impedes the accumulation and assimilation of professional knowledge and practical skills, and delays the formation of high competencies of design professionals (Silva-da-Nóbrega, Chim-Miki, & Castillo-Palacio, 2022).

In HEIs with an artistic profile, the use of innovative technologies is necessary for teaching many professional disciplines, including design education (Chiu et al., 2020).

Given the availability and ability to use SMART technologies as the latest learning tools, the most important professional disciplines needed to implement design developments today are such areas as artistic design, artistic graphics, etc. (Gilman et al., 2020).

A prerequisite for the use of modern technologies, including in the design field, is the reform of the education system, and the development of new didactic and methodological principles of education (Nan et al., 2018).

The use of SMART technologies for organizing the educational process considers the following approaches to learning:

- interactive learning is a special form of organizing cognitive activity aimed at creating comfortable learning conditions in which every student should feel successful;
- personality-oriented learning is a form of a learning organization that ensures the development of the potential and abilities of each student, creates the necessary conditions for their self-improvement;
- the modular learning system is the organization of the learning process through a program consisting of many modules and sequential tasks;
- modular block technology is a combination of different types and forms of education into a single complex (Prandi et al., 2019; Kuppusamy, 2020; Bian & Ji, 2021).

Given the specific types of SMART technologies, the basis of the modular-block organization of learning is the division of educational material into modules and the independent processing of educational material. The theory of problem-based learning is based on the organization of the learning process, which involves the creation of a problem situation and active independent work to solve it. This leads to a thorough mastery of scientific concepts and develops

the creative thinking and the ability to work independently. The basis of the artistic development of the educational system is the introduction of interactive teaching methods designed to provide thorough knowledge, professional skills, and high competence of specialists in the field of art and design (Fang, 2018).

While SMART is still a relatively new technology, it is being used and implemented in several countries around the world. Some countries where SMART technology is currently being used include: United States, China, Japan, South Korea, United Kingdom, Australia, Singapore, Germany, France, and Canada. Also SMART technologies are being increasingly used in higher education institutions around the world. There are some examples of individual institutions and the tools and useful cases for implementation and adoption of experience of SMART technologies:

- 1) University of Michigan: The University of Michigan has implemented SMART technologies in their OT and PT programs, allowing students to practice a variety of therapeutic interventions in a virtual environment.
- 2) University of Central Florida: The University of Central Florida uses SMART technologies to create virtual environments for students to practice clinical decision-making in a variety of healthcare scenarios.
- 3) University of British Columbia: The University of British Columbia has used SMART technologies to develop virtual reality simulations for medical students, allowing them to practice various surgical procedures and techniques.
- 4) Stanford University: Stanford University's Virtual Human Interaction Lab uses SMART technologies to study the effects of virtual reality on social behavior and empathy.
- 5) University of Illinois at Chicago: The University of Illinois at Chicago has implemented SMART technologies in their special education program, allowing students to practice teaching strategies and interventions in a virtual classroom environment.

The study of the experience of using SMART technologies in design education allows us to establish that the most optimal is the combination of classical teaching technologies and the latest innovative technologies. Such a combination allows us to integrate processes that are incompatible within the framework of classical learning and traditional education. It is also necessary to introduce innovative information methods and means of organizing the educational process (Kong, 2019).

The positive aspects of studying innovative methods of SMART technologies are the faster solution of methodological problems compared to traditional teaching methods, and the increase, as well as expansion of practical problems of color science and composition (Liu, 2022).

Scientific research on the use of SMART technologies in the field of design education has shown that the use of this type of tool significantly expands the palette of color combinations for future specialists. In addition, their use increases the comfort of working with palettes presented by modern art programs. At the same time, there is a noticeable change in the technical capabilities of color work, the range of tasks is expanding, and the way they are performed in the electronic environment is changing (Liu, 2018; Maher et al., 2019).

3. Aims

The study aims to determine the position of students and teachers of design-related specialties on the peculiarities of using SMART technologies in design education in HEIs of technical and humanitarian fields.

4. Materials and Methods

A practical study of current trends in the use of SMART technologies in design education was conducted by interviewing 253 practicing teachers of higher education institutions. What is more, 311 students from 14 HEIs in Vinnytsia, Cherkasy, Sumy, and Kyiv oblasts of Ukraine were interviewed. The study was conducted using the Google Forms service.

5. Results

First, the survey revealed the types of pedagogical technologies that today, in the context of globalization and informatization of the educational system, most need to apply SMART approaches to their optimization in the field of design (Figure 1).

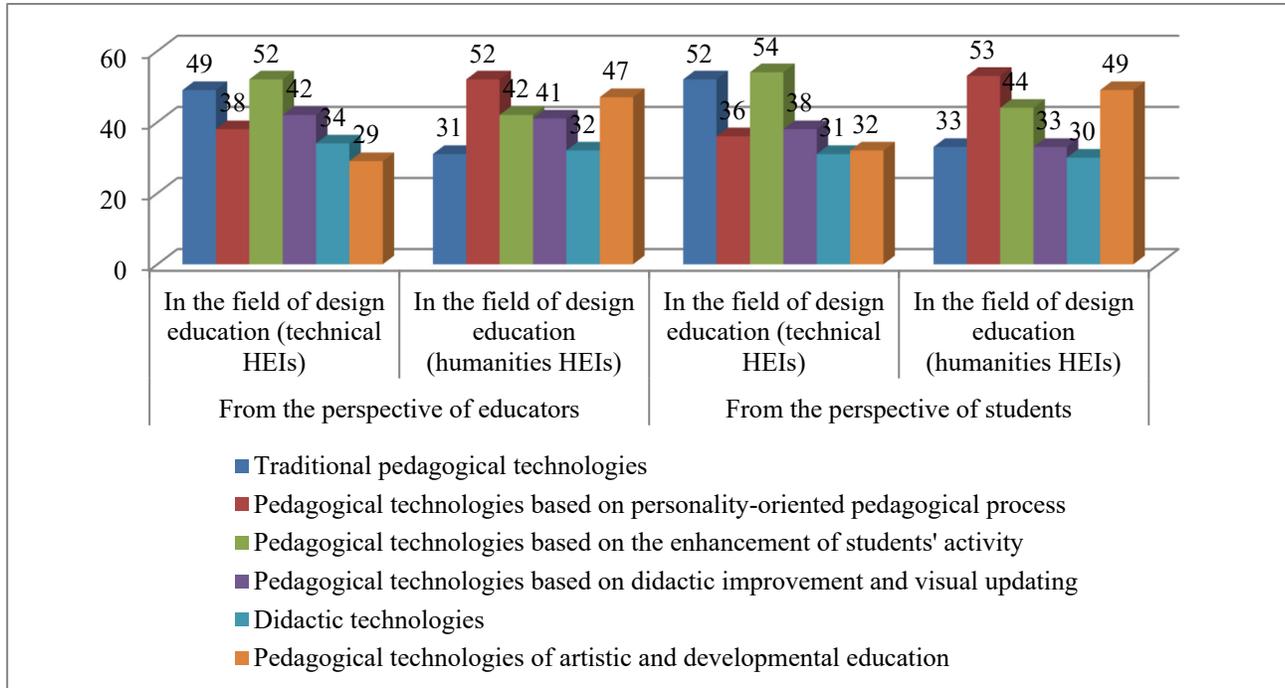


Figure 1. Types of Pedagogical Technologies That Most Require the Use of SMART Approach to Their Optimization in the Field of Design, %

Source: built by the authors.

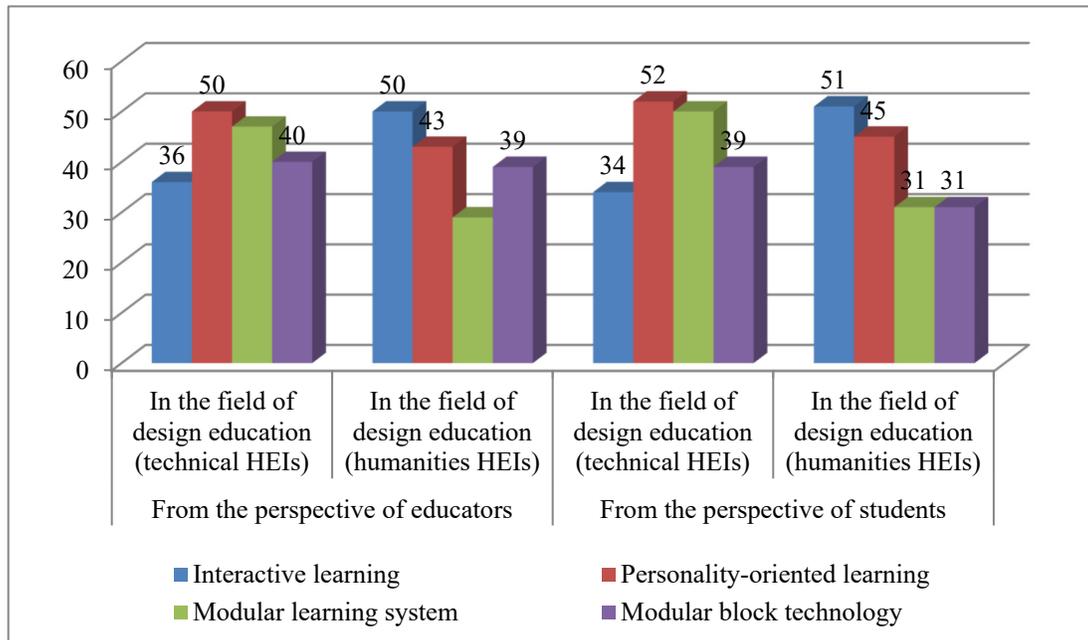


Figure 2. Approaches in Design Education That Are Most Often and Most Successfully Subject to the Application of SMART Technologies, %

Source: built by the authors.

According to the survey participants, the following types of technologies, in the opinion of both students and teachers, are used in humanities education: pedagogical technologies based on a personality-oriented pedagogical process and

pedagogical technologies for artistic and developmental learning. In the field of design education of technical specialties, these are traditional pedagogical technologies, pedagogical technologies based on the enhancement of student activities, and pedagogical technologies based on didactic improvement and visual updating.

During the survey, respondents identified the following educational approaches that are most often and most successfully subject to optimization in design education today, namely the use of SMART technologies concerning them (Figure 2).

As can be seen from Figure 2, these approaches are personality-based learning and modular learning.

Important aspects that were found during the survey were the types of competencies, the improvement of which is the primary goal in the introduction of SMART technologies in design education (Figure 3).

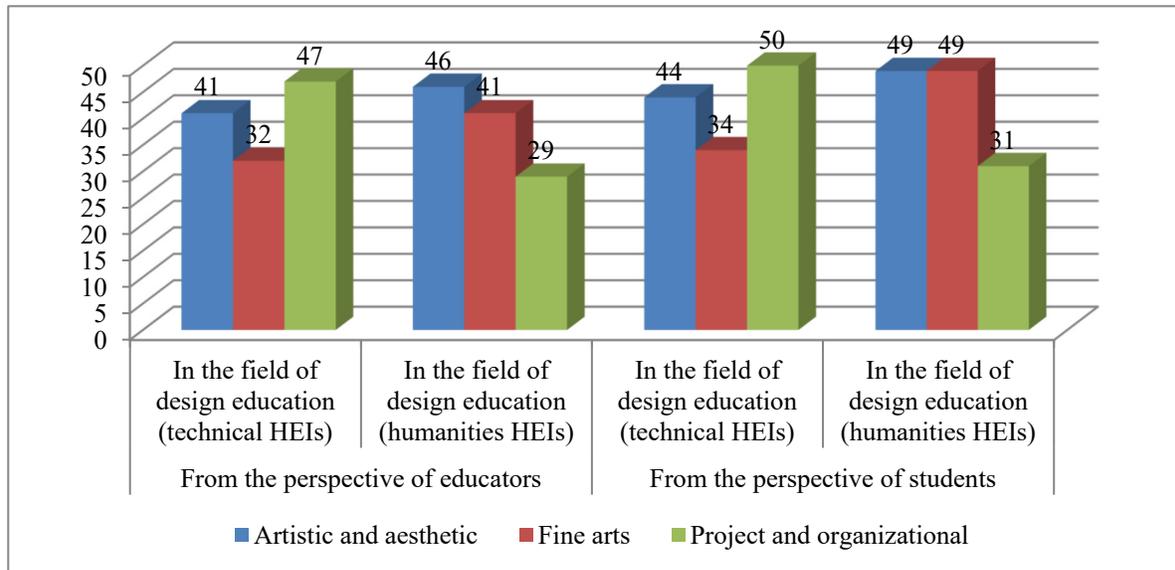


Figure 3. The Main Types of Competencies, the Improvement of Which Is the Primary Goal in the Implementation of SMART Technologies in Design Education, %

Source: built by the authors.

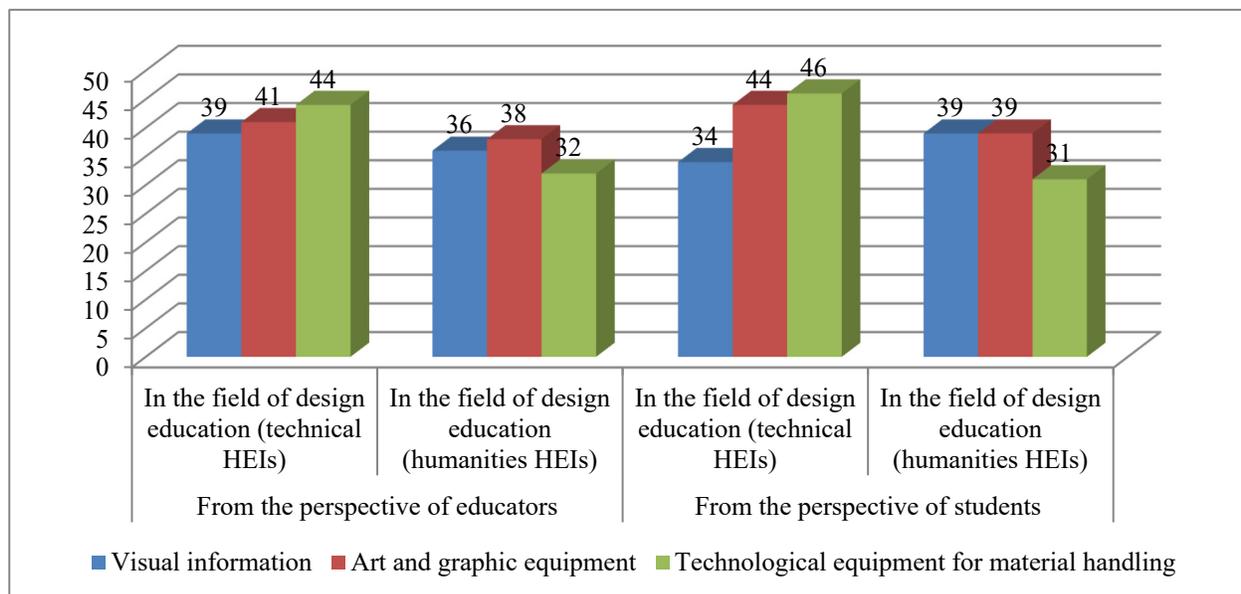


Figure 4. Most Effective Teaching Tools Which Are in Demand in the Practical Implementation of SMART Technologies in Design Education, %

According to the survey, when selecting SMART technologies, one should consider their potential impact on artistic and aesthetic, design, and organizational competencies.

In the course of the study, respondents were asked to name the teaching tools that are most effective and in demand in the practical implementation of SMART technologies in design education. These tools are (Figure 4):

- artistic and graphic equipment;
- technological equipment for working with materials.

Regarding the most important skills, which, according to the survey participants, are being developed especially significantly due to the introduction of the latest SMART technologies and will be especially in demand in the future, the respondents named (Figure 5):

Source: built by the authors.

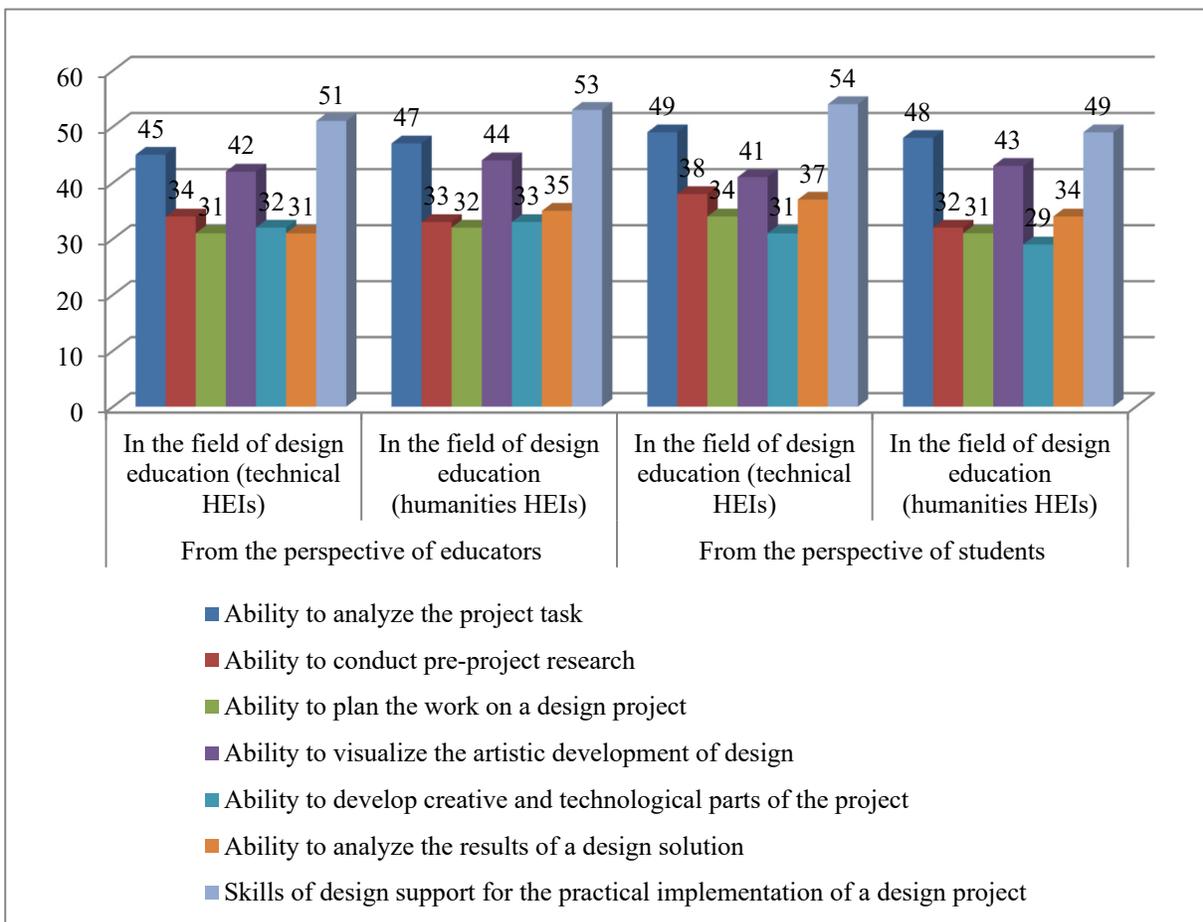


Figure 5. Skills That Are Especially Significantly Developed Through the Introduction of the Latest SMART Technologies in Design Education, %

Source: built by the authors.

- ability to analyze the project task;
- skills in design support for the practical implementation of a design project.

Modern education is impossible to imagine without multimedia technologies, which include a set of computer technologies and information tools. The survey revealed the respondents' point of view on multimedia, which is the object of the most widespread use of SMART technologies in design education (Figure 6).

As can be seen from Figure 6, these multimedia tools include video technologies, graphics, and communication technology solutions.

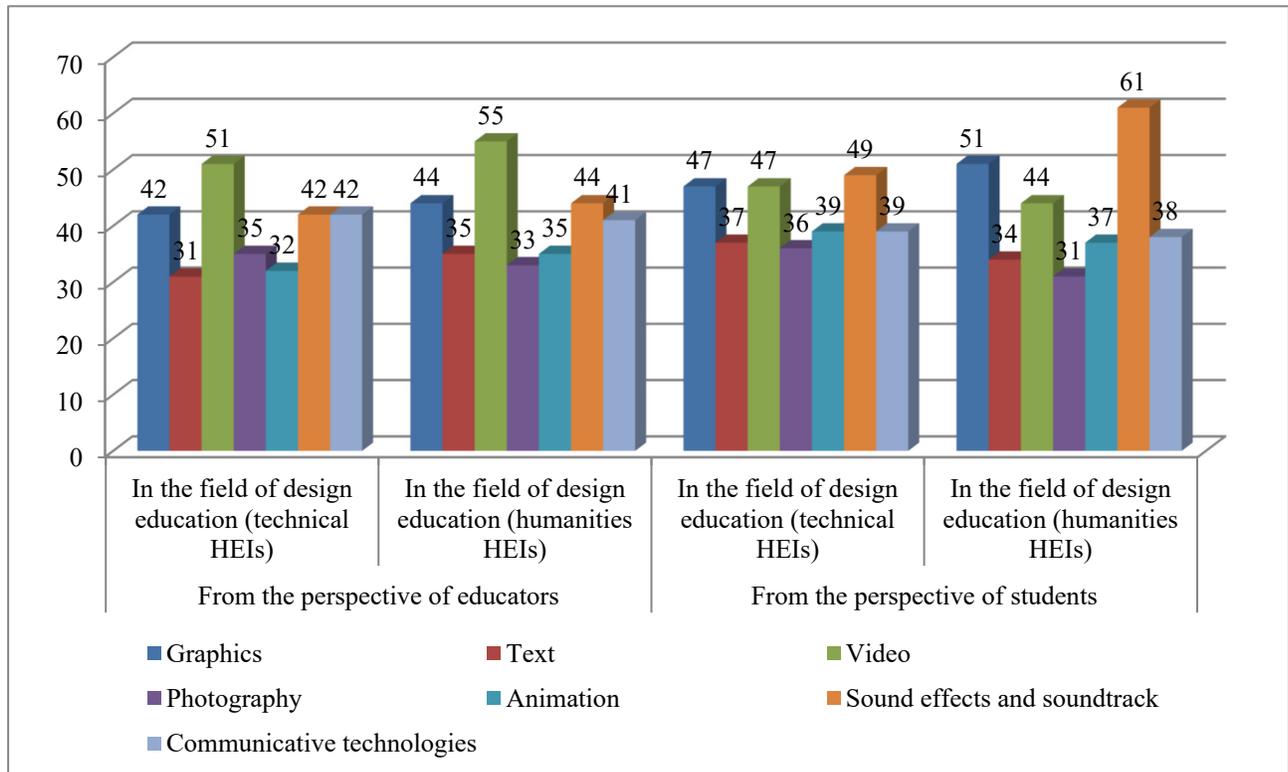


Figure 6. Multimedia, Which Is the Object of the Widest Application of SMART Technologies in Design Education, %

Source: built by the authors.

6. Discussion

The art of design and graphic activity is closely related to the latest digital technologies at the present stage. Therefore, at this stage of development of the educational system, a necessary prerequisite for effective design education is a combination of classical methods of design education and innovative computer technologies (Maher et al., 2018; Zhang, Hu, & Yang, 2021).

Modern education is constantly being updated and is in search of new forms and methods of teaching that are in line with technological and social development and allow for better formation of the professional competence of future designers and professional activities following international standards, as required by the modern demanding labor market. Therefore, designers need an integrated education that combines not only classical education but also universal approaches:

- 1) **Design thinking:** Design thinking is a human-centered approach to problem-solving that involves empathy, experimentation, and iteration. It involves understanding the needs and perspectives of users and stakeholders, and using this information to generate creative solutions that meet their needs.
- 2) **Collaboration:** Designers often work in teams, so an education that emphasizes collaboration and teamwork can help designers to develop strong communication and interpersonal skills. This can include learning how to work effectively with people from diverse backgrounds and disciplines.
- 3) **Critical thinking:** Critical thinking skills are essential for designers, who need to be able to analyze problems, evaluate different solutions, and make informed decisions. An integrated education that emphasizes critical thinking can help designers to develop a strong analytical and problem-solving mindset.
- 4) **Communication:** Communication skills are vital for designers, who need to be able to articulate their ideas and designs clearly and effectively to clients, stakeholders, and team members. An integrated education can help designers to develop strong written and verbal communication skills, as well as skills in visual communication and presentation.
- 5) **Technology:** Technology is a key component of modern design, so designers need to have a strong foundation

in the latest software and tools. An integrated education that includes training in software and technology can help designers to stay up-to-date with the latest trends and techniques in the field.

These approaches ensure their competitiveness and adaptability, provide for continuous professional development, and the ability to identify and reach specific achievable goals (Pivo, 2019; Zhan, 2022).

For a long time in the history of design, this type of activity focused on the creation of physical objects and relied on the rich traditions of artistry. Today, the functions of design have expanded, and it has entered the sphere of solving social problems in various forms and a variety of contexts. In many countries, professional organizations are being created to address the problems of design education, and relevant events (congresses, conferences, forums, seminars) are being held to discuss the most pressing issues in this area. Some events become international platforms for solving problems of the design world, which are similar in different countries, but each country solves them based on its circumstances, conditions, and opportunities (Venkatraman, Alazab, & Vinayakumar, 2019; Zhu et al., 2020).

The problems of implementing SMART technologies in design education are often associated with a lack of understanding of the prospects and capabilities of smart technology products. The solution to this problem may be the creation of a state strategy for the development of smart technologies aimed at cooperation with leading companies in this sphere (Wall & Hall, 2019).

In the training of future designers, the scientific community emphasizes the existence of certain contradictions, the resolution of which will intensify the process of their training and ensure guaranteed positive dynamics in the assimilation of educational material and practical skills. It is advisable to identify these contradictions, among which the most significant are the following: the saturation of the educational process with practical tasks, the need for intensive (productive) activity of graduates, and the inability of students to organize their own time for professional development. This also includes the quality of practical tasks, multitasking of individual disciplines or tasks and inability to apply time management principles, lack of experience in setting specific learning goals and determining the actual time to complete them, the need to formulate a clear goal within a specific task or discipline and insufficient experience in such activities (Wang, 2021).

Modern society is in the midst of a technological paradigm shift. Information technologies that defined the image and essence of the twentieth century are giving way to intellectual technologies that open a new path for the development of world powers. The modern educational system of most countries is characterized by fundamental changes in its content, namely the level of flexibility, adaptability, quality of research, and innovations that meet the needs of smart education (Wu & Li, 2020; Sinfield & Cochrane, 2018).

7. Conclusions

Thus, according to the analysis of scientific literature on the research topic and the results of the survey, the use of the SMART method in the educational process of future designers will resolve several contradictions. This will contribute to the qualitative dynamics of the learning outcomes and the educational level of their professional competence. This approach improves the quality of education and the competitiveness of future designers, bringing the quality of their work closer to international standards. Furthermore, the integration of the SMART method into the educational process of future designers has the potential to offer a more flexible and adaptive learning experience. By providing personalized and adaptive feedback, SMART technologies can help students to identify their strengths and weaknesses, and focus their efforts on areas that need improvement. This approach can help to reduce the gap between theory and practice, as SMART technologies allow for the simulation of real-world design scenarios and the testing of design solutions in a safe and controlled environment. In summary, the integration of the SMART method into the educational process for future designers has the potential to offer numerous benefits, including improved learning outcomes, enhanced professional competence, increased competitiveness, greater flexibility, and more dynamic and interactive learning experiences.

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