Case Report

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APPLICATION OF VISUAL DESIGN (OR MULTIMEDIA DESIGN) TECHNOLOGIES IN CONTINUING DESIGN EDUCATION IN UKRAINE

Aplicação de tecnologias de design visual (ou design multimédia) na formação contínua em design na Ucrânia

ABSTRACT

The search for effective innovative approaches to teaching and developing students' creative potential, as well as training qualified professionals who will meet the needs of a rapidly changing society, is a topical and prominent issue today. The purpose of this study was to thoroughly investigate and analyse the role of visual design technologies in the context of design education in Ukraine. The study used methods of analysis, synthesis, and a typological approach. As a result of this study, an in-depth analysis of the role of visual design technologies in the context of design education was performed. The study found that the use of modern visual design technologies creates new opportunities for students, including the ability to experiment with unique design ideas and concepts, interact with virtual objects and receive instant feedback. This approach promotes active learning, stimulates creativity, and the development of critical thinking in students. It was found that design education and multimedia technologies support the development of creative thinking, promote innovation, and interdisciplinary communication. This study confirms the importance of applying visual design technologies in design education and reveals the prospects for the development of this industry in the modern world. The findings of this study can be used to develop updated approaches to teaching in continuing design education.

RESUMO

A procura de abordagens inovadoras e eficazes para ensinar e desenvolver o potencial criativo dos estudantes, bem como para formar profissionais qualificados que satisfaçam as necessidades de uma sociedade em rápida mutação, é uma questão atual e proeminente. O objetivo deste estudo foi investigar e analisar minuciosamente o papel das tecnologias de design visual no contexto da educação em design na Ucrânia. O estudo utilizou métodos de análise, síntese e uma abordagem tipológica. Foi estabelecido que as modernas tecnologias de design visual têm um potencial significativo para melhorar a qualidade e a eficiência do processo educativo no domínio do design. O estudo concluiu que a utilização de tecnologias modernas de design visual cria novas oportunidades para os estudantes, incluindo a capacidade de experimentar ideias e conceitos de design únicos, interagir com objectos virtuais e receber feedback instantâneo. Esta abordagem promove a aprendizagem ativa, estimula a criatividade e o desenvolvimento do pensamento crítico dos alunos. Verificou-se que o ensino do design e as tecnologias multimédia apoiam o desenvolvimento do pensamento criativo, promovem a inovação e a comunicação interdisciplinar. Este estudo confirma a importância da aplicação de tecnologias de design visual no ensino do design e revela as perspectivas de desenvolvimento desta indústria no mundo moderno. As conclusões deste estudo podem ser utilizadas para desenvolver abordagens actualizadas do ensino na formação contínua em design.

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KEYWORDS

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PALAVRAS-CHAVE

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1. INTRODUCTION

Visual design, supported by multimedia technologies, helps engage students in active and hands-on learning, stimulates their creativity and promotes critical thinking. The visual design creates visually appealing compositions. It uses visual elements, principles, and techniques to communicate, evoke emotions, or solve design problems. Visual design is used in graphics, web, UI, branding, advertising, and other fields. The use of such technologies in lifelong design education opens wide opportunities for students to learn and develop design skills, prepare for the challenges of modern design, and build a successful career in this field, and therefore it is necessary to investigate the aspects of their use in more depth. The problem of this study was to identify, analyse, and solve complex issues related to the use of multimedia design technologies in modern continuous design education. The study covers the challenges and obstacles faced by teachers and students when using visual design technologies in design education of a continuous nature.

Multimedia encompasses the amalgamation of a wide range of media types—text, images, audio, video, and interactive components - to impart knowledge, provide entertainment, or transmit messages in an engaging and varied fashion. This technology facilitates the smooth integration of diverse media formats to generate interactive and immersive experiences, including but not limited to lectures, presentations, websites, and video games. As a result, it improves the capacity to communicate concepts, disseminate knowledge, and engross audiences across a multitude of digital platforms and devices.

Averianova & Gook (2021) note that in modern society, design has become more diverse, covering many different areas. New terms such as:

> 1. Design Thinking addresses complex problems and creates innovative solutions using a human-centred, iterative approach and mindset. It emphasises empathy for users or stakeholders, creativity in ideation, and a structured prototyping and testing process. Design Thinking is popular in product, service, business strategy, education, and healthcare.
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> 2. Social Design addresses complex social and societal issues throughmultidisciplinary design. It uses design, social sciences, and community engagement to create innovative solutions that improve people's lives. Social Design prioritises social impact, inclusivity, sustainability, and empowerment of marginalised and underserved populations over traditional design goals.
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> 3. Social Design Strategy Social Design Strategy is a deliberate and systematic use of design thinking and principles to solve complex social and societal issues. It involves using design methods to create innovative and effective solutions to social issues, improve community well-being, and promote positive social change.

Today, design is undergoing a gradual transformation, which is associated with a change in the views and beliefs of young designers regarding the understanding of the essence of contemporary design, its place in the service market and their professional activities.

Meyer & Norman (2020) in their study of design education in the 21st-century point to the

need for changes in continuous design education. Scientists note that the modern design education system does not always provide students with the necessary skills to perform the complex tasks that designers face. In their study, they emphasise the importance of developing creative solutions to complex problems that require an innovative approach. The scholars point to the importance of using visual design technologies and multimedia to improve the design process and develop students' creative skills. The researchers also note that designers can learn from the experience of other professions, such as medicine, law and business, which have successfully integrated technology and learning practices into their educational curriculum. Scientists note that to achieve these goals, conscious efforts are needed to develop the design profession as a community of practitioners and teachers (Meyer & Norman, 2020). It is necessary to investigate this aspect of design education more carefully.

Diachenko (2020) identifies the shortcomings of Ukrainian design education, which include a limited number of specialities and their excessive versatility, lack of connection between education and reality, distortion of the gender component in design education, lack of classrooms and equipment for specialised training, inconsistency with modern professions in the Ukrainian and international markets, as well as the use of outdated methods and mechanisms in the learning process. These shortcomings, according to the scholar, make it impossible to fully adapt Ukrainian design education to the modern requirements and challenges faced by professionals in this field. The scientist emphasises the need for radical and comprehensive changes in the form and system of design education, which would consider innovative approaches to student selection, training, and project evaluation. In the researcher's opinion, it is especially important to make a clear distinction between the design of the object sphere, the design of intangible objects, the design with an artistic bias, and the design with a technological orientation. According to the researcher, changes in the number of hours, mergers and division into departments are ineffective, and therefore it is necessary to rethink approaches to education to ensure the design of education that is more effective and adapted to modern challenges. It is worth exploring the possibilities of reorganising design education based on the use of modern design technologies.

Researchers Chiang et al. (2021) point out the importance of using multimedia design in design education as a way to adapt to modern requirements and develop key skills in students. Scientists note that there is a need to develop an adaptive approach to design education, namely, to adapt programmes and teaching methods to the current needs of students and modern design. According to the researchers, it is also important to use digital tools, software, and technologies to create and execute design projects. Scientists are convinced that the use of multimedia will allow students to expand their creative capabilities, and express their ideas and concepts through various media formats such as graphics, video, and audio. Notably, multimedia design does indeed contribute to the development of important skills in young professionals, such as visual thinking, communication, critical thinking and collaboration, which are key to success in the modern design industry, but it is worth exploring additional aspects of the use of visual design in modern lifelong design education (Chiang et al., 2021).

According to a study by Tymenko & Brovchenko (2022), creative intelligence is manifested in the ability to innovative forming, which includes the development of innovative design concepts, creation of variable design solutions, production of prototypes and exclusive product samples. Scientists point out that the system of national design is still in formation in Ukrainian society. The researchers assert that Ukrainian ethnic designers lack a comprehensive educational system for Ukrainian design, which hinders the growth and advancement of their ethnic design talent. However, the professional practice of designers shows that they have a natural ability to anticipate the energy potential of future forms of the built environment. Scientists note that Ukrainian specialists can embody the experience of former civilisations that had mechanisms of ecological and spiritual self-regulation, specifically, designers are characterised by the Trypillian (culture, which existed in Ukraine during the Neolithic period) worldview "matrix" – a complex system of symbolic forms, ornaments, pictograms that serve as a kind of artistic and figurative "writing" containing information about the

structure of the universe, the principles of its functioning and the place of a person of Ukrainian origin in it. It is worth studying this aspect of Ukrainian design education in greater detail (Tymenko & Brovchenko, 2022).

This comprehensive study of modern technologies, particularly visual design technologies and multimedia, in design education, shows their potential to improve student learning. These technologies encourage active and hands-on learning, creativity, critical thinking, and "Design Thinking" and "Social Design Strategy." Researchers have identified several challenges in continuous design education, including the need for a more adaptive approach, addressing education system flaws, and rethinking design education's structure and focus. Technology and multimedia in design education show promise, but more research and innovation are needed to connect education to real-world needs. The unique cultural and artistic expression potential of Ukrainian design education must also be developed. This study emphasises the need for continuous improvement and innovation in design education to prepare students for the 21st-century's dynamic design industry.

The research aims to investigate the potential of contemporary visual design technologies in offering students novel opportunities, such as the ability to explore original ideas and design concepts, engage with virtual objects, and receive instant feedback. The study seeks to examine the effects of utilising visual design technologies on promoting active learning, fostering creativity, and cultivating critical thinking skills in students. Furthermore, the study aims to reveal the prospects for expansion in the realm of visual design technology in contemporary society.

2. MATERIALS AND METHODS

This paper used the analytical method of scientific research, synthesis, and typological approach. Using the method of analysis, this study examined the role of visual design technologies in design education. The application of the analysis method helped consider various aspects of the use of visual design in education in detail, including the effectiveness of technology, its impact on the quality of learning and student development, and current trends and innovative approaches related to the use of visual design technologies in the educational process. The analysis helped to identify the benefits of using modern visual design technologies and its potential to improve design education, to provide students with practical skills in using various design tools and software, as well as effective communication and collaboration with peers and teachers. Using the analytical method, it was possible to identify the experimental possibilities of visual design technologies with new ideas and concepts in modern education and its role in stimulating students' creativity. Furthermore, the analysis method allowed investigation of the modern views on design education, including more interactive and dynamic approaches to learning, developing critical thinking, and students' creativity, and supporting them in solving real design problems.

This study will examine how visual design technologies affect design education using analysis. The evaluation criteria will include technology efficacy, its impact on learning quality and student development, and current trends and innovative methods for integrating visual design technologies into education. In addition to reviewing scholarly works, the analysis phase will collect empirical data from student and educator surveys or interviews. A comprehensive evaluation of the subject will be achieved through quantitative and qualitative data analysis. Using the method of synthesis, the study combined visual design technologies with modern lifelong education. This method of scientific research allowed the creation of innovative solutions and investigated the relationship between technological capabilities and the educational goals of design education. The synthesis method helped establish the benefits of using visual design technologies in continuing design education, specifically, improving the perception and assimilation of information, and it was found that the use of multimedia elements such as video, images, and animation makes the learning process more dynamic and interesting. The synthesis method will combine visual design technologies and modern lifelong education

in this study. The assessment will focus on how technological capacities relate to design education pedagogy. This research seeks to determine how multimedia—video, images, and animation—enhances education by adding vibrancy and engagement. The synthesis will combine analysis results with educational theories and models. This may inspire new visual design education methods for lifelong design education.

This study used a typological approach to explore the basic terminology. This approach helped systematise and classify various aspects of the research area, which provided a better insight into their nature and interrelationships. Using a typological approach, the main concepts that contributed to the coverage of the subject under study. Based on this approach, the study identified the main aspects of design, including visual perception, functionality, ergonomics, and interactivity. In addition, using a typological approach in this study, it was possible to identify the scope of design education, including the study of design principles, methods and skills, as well as the development of student's creative and analytical abilities, which contributes to the formation of creative thinking, the ability to work with change and solve complex problems, which are important elements of the educational process. Based on the typological approach, the concepts of lifelong design education, namely the idea of continuous learning and development in the field of design throughout life, were studied in this paper. Using this approach, the study identified the main aspects of the concept of lifelong learning, including learning in various formats and contexts, such as formal education, self-education, professional courses, and master classes, which strengthen professional skills and update the knowledge of specialists.

A typological approach will be needed to classify and organise design education aspects in this study. This methodology organises fundamental principles, design aspects, and design instruction. Design education fundamentals will be categorised using this typological method. This taxonomy helps explain design education's complex aspects, including creative and analytical skills, ergonomics, interactivity, visual perception, and functionality. The typological approach will also examine lifelong design education, taking into account formal education, self-directed study, master's programmes, and professional courses that help design professionals improve their skills.

This study endeavours to comprehensively examine the function of visual design technologies in design education, contemplate their pragmatic ramifications, and investigate their theoretical underpinnings in the wider framework of lifelong learning through the application of these distinct methodologies.

3. RESULTS AND DISCUSSION

3.1. Modernity and prospects of design education: Development of creative potential and innovative thinking

In the modern world, it is important to have competent and creative professionals who can work with visual design technologies. These professionals need continuous design education to generate innovative ideas and quickly adapt to the changing needs of society (Ivanenko & Nesen, 2023). They must have imaginative thinking, modelling, and design skills, and apply a creative approach to solving complex professional problems. Design is defined as the process of creating, planning, executing, and evaluating a product or solution that meets a specific need or solves a specific problem. Design is also considered as a combination of aesthetic, functional, technical, and contextual aspects that influence the result (Derevyanko & Zalevska, 2023). It is a creative process that requires imagination, innovative thinking, analytical, and problem-solving skills, focused on creating a favourable user experience and solving particular tasks or problems related to communication, interaction, functionality, and aesthetics of a product or solution. Design also involves the use of various methods, techniques, and tools, such as research, analysis, conceptualisation, prototyping, and iteration, to develop ideas and turn them into real products or solutions (Fleischmann, 2019).

Modern design education is a unique process that combines professional and scientific knowledge to solve problems related to human life and interaction with the environment. It is an artistic and design activity aimed at performing a communicative function, where creative methods and tools are used to implement ideas and communicate with the world around us. Design education is focused on developing students' creative and critical thinking skills, as well as understanding and applying design principles and methods in different contexts. This may include studying design as a separate subject, developing design projects, collaborating with other designers and specialists, and using tools and technologies used in design (Ejsing-Duun & Skovbjerg, 2019). The development of aesthetic taste, creative potential and the ability to think innovatively is one of the outcomes of design education. It supports students in developing skills in working with design ideas, prototypes, project implementation, and evaluating their effectiveness. The main goals of design education are to prepare students for the challenges of the modern world, and to develop their creativity and ability to make positive changes through design.

Design education has a considerable impact on the modern world and is a vital component of the modern educational system. It offers students a unique opportunity to develop creativity, critical thinking, problem-solving, and communication skills. Design education teaches students to analyse, conceptualise, and solve problems using the ability to integrate knowledge from different disciplines. It promotes creativity, innovation, and aesthetic perception. Designers are trained to work with materials, colours, shapes, and space, enabling them to create functional and attractive solutions. Furthermore, design education develops communication and collaboration skills, as many designers work in teams (Diahyleva et al., 2023). It teaches students how to communicate effectively, work on joint projects, and consider different opinions. In today's digital world, design education also includes the use of technology and software to create design (Dzhusubaliyeva et al., 2021; Koshoeva et al., 2023). It teaches students how to use digital tools and understand how they can improve the design process and outcomes. In general, design education is important because it provides students with a set of skills and knowledge needed to develop creativity, solve problems, and create innovative solutions. It also prepares young people for the challenges of the modern world and opens wide opportunities for career growth and personal development (Derevyanko & Zalevska, 2023).

Design education's importance today cannot be overstated. It develops skilled and creative visual design professionals who can quickly adapt to society's changing needs. Design is a dynamic process that requires creative thinking, problem-solving, and a complex blend of aesthetic, functional, technical, and contextual factors. Modern design education combines professional and scientific knowledge to develop students' creative and critical thinking skills, enabling them to solve complex problems in diverse contexts. It develops aesthetic sensibilities, creative thinking, and practical skills needed to complete design projects. Design education also develops communication and collaboration skills, essential in a world of interdisciplinary teamwork. Technology and software skills are integrated to prepare students for the digital age. Design education prepares students to positively impact a rapidly changing world and provides many opportunities for personal and professional growth by teaching them to be creative problem solvers, effective communicators, and innovative problem solvers.

3.2. Lifelong education in the art of design: concept and practice

Lifelong education means the ability to ensure the continuity of the educational process and the preservation of educational standards, despite changes in the format and environment of learning. This type of learning activity requires the adaptation of educational practices to new conditions and learning tools. In such circumstances, students tend to find themselves in need of support, communication, and resources to ensure the continuity of their learning. Furthermore, lifelong education involves active interaction between participants in the educational process and support for students in their learning (Manca & Delfino, 2021). Therefore, adapting educational practices to new challenges, providing support for students and maintaining high standards of education even in situations of crisis or emergency is an important element of the educational process.

The concept of lifelong learning using technology, focusing on the approach to learning, is also known as heutagogy. This concept envisages the active role of independent learning and self-regulation of students in the learning process. Heutagogy is designed to encourage students to self-organise, self-improve, and self-develop, providing them with the skills necessary for lifelong learning. Technology can play a vital role in supporting lifelong learning. It provides students with access to a variety of resources, interactive platforms, collaborative work, and other opportunities for independent learning. Technology also contributes to the flexibility and accessibility of learning, allowing people to study at any time and place convenient for them (Lock et al, 2021; Moore, 2020; Samoylenko et al., 2021). The use of technology is important to support lifelong learning and contributes to the development of a heutagogical approach that promotes active and independent lifelong learning.
The concept of lifelong design education involves the integration of design into all stages of the educational process, from the primary level to higher education and professional development. The main idea of this concept is to create a learning environment in which design is not only a separate subject of study, but an integrated element in various disciplines and areas of knowledge. The concept of lifelong learning can be applied and used in design education in several ways:

1. Integration of design at all levels of education: The concept of lifelong learning allows for the inclusion of design as an integral part of curricula at various levels of education, from primary to higher education. This can include teaching design as a separate subject, as well as integrating design elements into other disciplines and areas of knowledge.

2. Development of creative and innovative skills: The notion of lifelong learning in the field of design fosters the growth of innovative problem-solving skills, creative reasoning, and the capacity to handle intricate challenges. It fosters the growth of design thinking, which is the capacity to conceive of novel concepts and seek out unconventional resolutions.

3. Use of modern technologies: The concept of lifelong learning in design includes the use of modern technologies that help expand the possibilities of design and create new forms of learning. This may include the use of virtual reality, computer-mediated communication, mobile devices, and other tools to help create innovative learning environments.

4. Professional development and self-fulfilment: The notion of lifelong learning in design facilitates the ongoing development and enhancement of the skills and competencies of both students and practising designers. It fosters an environment conducive to ongoing professional development, independent learning, and personal satisfaction within the domain of design.

5. Communication and collaboration: The concept of lifelong learning in design supports collaboration and communication between students, practising designers, teachers, and other professionals. It stimulates teamwork, exchange of experience and mutual learning, which contributes to the development of a professional community and the exchange of ideas.

In conclusion, lifelong learning, especially in design education, emphasises the need for flexibility, support, and rigorous academic standards in a rapidly changing world. Heutagogy, which promotes self-management, self-improvement, and personal growth, allows people to take charge of their educational paths. Technology helps continuous education by providing access to resources and flexible learning opportunities. Lifelong design education promotes collaboration, innovation, creativity, and the use of modern technologies at all levels of

education. Education that meets the changing needs of the design industry develops practical skills that can be used to solve design problems and inspires creativity. In essence, ongoing design education ensures that students and professionals have the skills to succeed in the ever-changing field of design, advancing the field.

3.3. The importance and benefits of using visual and multimedia design in the educational process

The use of visual and multimedia design technologies in continuing design education can provide students with a more active and interactive form of learning (Koshoeva et al., 2023). For instance, multimedia presentations, videos, and graphics can help students better grasp complex concepts and notions and engage them in the learning process through visuals and interest. The use of visual design can also help increase student motivation and reduce study fatigue. Aesthetically pleasing and well-organised materials can stimulate interest in the learning process and contribute to a positive emotional response from students. In addition, the use of visual design technologies can contribute to more effective information transfer and improved communication between the teacher and students. Structured presentations, graphs, diagrams, and other visual elements can help students better understand and remember information, and help the teacher convey complex concepts in a clear and accessible way (Kalashnyk et al., 2020). These technologies in continuing design education can make learning more interesting, effective, and favourable for students, helping them to better understand, remember and apply the information they receive.

The use of visuals, animation, graphics, and other multimedia can help students better understand and perceive design processes and concepts. Positive emotions, such as excitement, enjoyment, and interest, are key factors that encourage students to positively engage with video-based learning material. Furthermore, the interaction with the video (e.g., the ability to comment or share) and the perception of the content also influence student preferences. The quality of teaching, clarity and well-structured presentation also plays an important role in the effectiveness of the learning process (Shoufan, 2019). It is worth emphasising the importance of ensuring quality teaching and structured presentation of content in video format. Design education should pay attention not only to the content itself, but to the way it is presented, the use of visual and audio elements, graphics, animation, and other multimedia that can improve students' perception and motivation. Thus, the use of multimedia design in design education can be an effective means of engaging and motivating students.

The use of visual and multimedia design technologies in lifelong design education is not limited to consumer strategies or product value propositions. Design in this context embodies a holistic sphere that becomes the object and subject of educational activity, design ethos and design aesthetics. This interaction of ethos, aesthetics, and activity shows that the designer plays the role of a director, philosopher, and art critic who creates the integrity of culture through the material mediation of cultural creation. This whole never loses its mythogenic and metaphorogenic features, but instead manifests itself as artistic features that allow regarding design as art. Bringing design into the sphere of artistic culture, we face the task of defining its place and considering the art of 20th-century culture itself as a certain project. Material mediation stratifies and enlarges the dimensions of immanent design when an individual, the world, and the planet become material but with the philosophical connotation of a commodity, coexistence, the market of being, and being for oneself and others. This enables the consideration of design as meta-design and allows observing its reflexive systems as holistic reflexive practices that exist in the field of design (Antonovych, 2011). It is worth paying attention to the main aspects of using multimedia and visual design in design education (Tab. 1). These aspects define the main characteristics and role of each type of design in student learning and development.

No.	Aspects	Multimedia design	Visual design
1	Design objects	Websites, interactive applications, videos, presentations, games, cartoons	Logos, posters, packaging, web design, illustrations
2	Forms of expression	Text, images, sound, animation, video	Graphics, colours, composition, typography
3	Objectives	Creating interactive and multidimensional digital products	Development of aesthetically pleasing and functional visual solutions
4	Skills	Development of multimedia applications, use of software tools, animation, video editing	Proficiency in graphic software, knowledge of colour theory, composition, typography
5	Areas of application	Interactive web design, advertising, media, entertainment industry	Branding, advertising, product packaging, print graphics, web design
6	Key principles	Interactivity, effective communication, user interaction	Aesthetics, perception, functionality, balance
7	Technologies	Development of web applications, graphic editors, animation programs, editing programs	Graphic editors, design systems, colour palettes, typographic tools

Tab. 1
Aspects of multimedia and visual design application in the educational field of design.
(Source: compiled by the authors).

The use of visual and multimedia design technologies in lifelong design education is important because it promotes innovative approaches to learning, providing students with access to innovative tools and technologies that help them develop design skills. Using modern tools, students have the opportunity to learn and experiment with a variety of software tools, computer programs, graphic editors, video and audio tools and other technologies that are essential in modern design. Such an approach empowers students in the creative process, allowing them to freely express their ideas and concepts through digital media.

In conclusion, visual and multimedia design technologies in continuing and lifelong design education offer many ways to improve student learning. These technologies simplify complex concepts and motivate students by creating interactive learning environments. Multimedia design improves information transfer and comprehension and enhances educational materials' aesthetic appeal, eliciting a positive emotional response. Therefore, design education benefits from using visuals, animations, graphics, and multimedia to explain design processes and concepts. It expands design into a cultural and artistic realm where design ethos and aesthetics meet education. Multimedia and visual design technologies allow students to experiment with new tools, preparing them for the ever-changing design world.

3.4. Design education in a global context: Current challenges and prospects for transformation

In modern Germany, some challenges related to design education have become clear. Despite the long and successful history of German design education, prominent scholars note the need to revise it. Researcher D.A. Norman expresses the opinion that traditional design education in Germany has performed its role well and should not be rejected, but it does not meet all modern needs (Norman, 2016). The scholar emphasises that modern design, like other fields, encompasses a variety of disciplines, some of which are new, and require technological, analytical, and cognitive skills that are not covered by traditional curricula. In her study of German lifelong design education, Held (2018) points out that in Germany, design is between two poles in the context of perception by the outside world, as well as in its self-esteem as a profession. On the one hand, as the researcher notes, design is used to develop new products and services, mostly for improvement, although sometimes only on a superficial level or as variations aimed at increasing consumption. On the other hand, design has become a serious discipline, ready to contribute to the formation and, ideally, solution of the urgent problems of the modern world, including the transition to a sustainable society. The scholar notes the diverse roles that design has played throughout its relatively short history, as well as how they are reflected in contemporary design education. Some of these roles include (Held, 2018):

1. The role of the innovator: Design acts as a source of innovation, contributing to the creation of innovative products, services, and solutions. It helps to find new ways to solve problems and meet the needs of society.
2. The role of aesthetics: Design focuses on creating aesthetically pleasing and functional products and environments. It develops the shape, colours, textures, and other elements that contribute to user engagement and satisfaction.
3. The role of the community: Design can serve as a tool to bring people together, create communities, and support social interaction. It promotes the creation of spaces, products, and services that facilitate communication, collaboration, and solidarity.
4. The role of sustainable development: Design can play a key role in developing a sustainable society. It aims to create environmentally friendly and energy-efficient products, promote recycling and reuse of materials, and develop innovative approaches to environmental issues.
5. The role of user interaction: Design puts the needs and expectations of users at the forefront. It focuses on the study of human behaviour and interaction with products and environments to create convenient, intuitive, and enjoyable experiences.

These roles of design are reflected in modern design education and reflect the wide range of tasks and opportunities that it can perform in society. Kawarada et al. (2020) investigated the inception of design education in Japanese elementary schools. Researchers point out that lifelong design education pays special attention to the development of students' creative and innovative skills using design principles and multimedia. In their study, the researchers support the integration of STEAM education, where design is a critical component, into school curricula for primary and secondary school students. STEAM education is an all-encompassing curriculum that integrates the fields of science, technology, engineering, the arts, and mathematics. The objective of STEAM education is to impart a comprehensive and balanced educational experience to students, placing significant emphasis on the practical implementation of knowledge, critical analysis, innovation, and problem-solving. They see the use of multimedia, including programming, as an effective way to promote creativity, problem-solving, and communication skills. This research emphasises the significance of integrating design education into the early stages of education in Japan. Doing so would enable students to cultivate qualities such as innovation, creativity, and teamwork, while also acquiring proficiency in utilising contemporary multimedia technologies (Kawarada et al., 2020).

3.5. Development and transformation of design education in Ukraine: Modern approaches and challenges

Design education in Ukraine emerged in the 1920s and was deeply connected with the development of art education. The Kharkiv School of Art and Industry and other art and industrial schools played a key role in this process. During this period, contemporary educational complexes such as academies, colleges, and institutes proliferated in Ukraine, with the Lviv National Academy of Arts being particularly notable. This has led to a positive trend in their development. Also, in the 20th-century, the speciality "Design" and its various specialisations began to form in various educational institutions, such as The National Academy of Fine Arts and Architecture, Ukrainian National Forestry University, Mykhailo Boichuk Kyiv State Institute of Decorative-Applied Arts and Design. These events contributed to the development of design education in Ukraine and shaped its current state. Between the 1940s and 1960s, higher education institutions were founded in Ukraine to provide education for industrial design professionals. These universities trained the personnel needed for the development of industry. Later, in the 1990s, design departments began to be established based on these higher education institutions. These departments trained and graduated graduate designers in various specialisations at four educational qualification levels (Prusak, 2017). The establishment of design departments during this period was a major step in the development of design education, as they provided proper training for specialists, considering the needs of the labour market and the requirements of the design industry. This development allowed students to choose a specialisation according to their interests and develop in their chosen field of design. Thus, the development of design education in Ukraine has contributed to the development of the country's creative potential and to meet the demand for highly qualified designers in the labour market. Today, design education in Ukraine is recognised as an important and independent component of artistic education that influences the culture of society. The importance of design as a tool of visual communication and its role in shaping the environment for people is also growing.

Brovchenko (2022) notes that for the development of design education in Ukraine, it is necessary to introduce simple functional subsystems. These subsystems include design-technological (aimed at introducing design into primary, pre-profile, profile, professional (vocational) and higher education), design-art (intended for the introduction of design into primary, pre-profile, profile, professional (vocational) and higher education), cultural and artistic ethno-design (aimed at institutions of higher cultural, artistic, and pedagogical education) and industrial and technological ergonomic design (aimed at institutions of higher technological, technical, and economic education). Each of them has its scope of application in educational institutions of various levels. The implementation of these subsystems will help to create a holistic system of design education in Ukraine and ensure the development of design at various levels of education.

In recent years, there has been a growing interest in modern Internet technologies, their rapid development and effective use in information visualisation. This leads to an increase in the number of professional designers specialising in graphic design for websites. The accumulated practices and access to web design resources allow the creation of websites that reflect distinctive styles of graphic design and interact harmoniously with other graphic objects. Questions arise about the adaptation and interaction of the Internet with other information sources, as well as the definition of a web design style, which is the responsibility of practising designers and art historians (Kachala & Chekh, 2023). Rapid technological advances have changed design education by incorporating educational technologies and transforming it into online education. The transition to online education is necessary and requires pedagogical involvement to ensure a successful transition, both temporarily and permanently. Traditional design education has a "resistant" stance towards online education, and this slows down the understanding and use of connecting possibilities in its discourses. The study reveals the pedagogical concept of meta-connectivity, which gives insight into why and how connectivity is becoming a new challenge for online education.

The paper provides a schematic description of meta-connected design education and highlights the new roles and responsibilities of teachers in this context (Dreamson, 2020). Rapid technological advances and the proliferation of digital devices in education have had a substantial impact on lifelong design education (Kulyk, 2023). Specifically, between 1997 and 2016, there was an increase in the use of online technologies, such as virtual learning environments and virtual reality technologies, in the educational process. Digital devices, such as mobile devices and head-mounted display kits (HMDs), provide students with the opportunity to actively engage in learning, enriching their experience of interacting with the design environment. New immersive technologies allow participants to create a sense of presence in the non-physical world, which helps them learn design concepts more effectively and develop their skills (Radianti et al., 2020). Thus, digital technologies, including virtual reality, are contributing to a change in approaches to continuous design education. They enable students to work with the latest tools and materials, communicate with teachers and like-minded people from around the world, and carry out practical exercises in virtual environments. This contributes to their self-development, professional self-improvement, and the possibility of retraining in new areas of design (Kalashnyk et al., 2020). Digital technologies are being introduced into lifelong design education to provide students with ample opportunities to learn, develop creative skills, and adapt to changes in the design industry. They create new pedagogical approaches, allowing students to actively interact with the design environment and fulfil their potential in this area.

Gamification involves adding game-like elements like interactive features, competition, challenges, and rewards to non-game contexts to engage and motivate people. Using game design principles and mechanics improves task enjoyment, engagement, and interactivity. Gamification has been used in customer engagement, education, marketing, employee development, and healthcare. Notably, modern teachers have positive views on the use of gamification in the educational process, as they perceive gamification as an effective tool for engaging students, improving motivation, and increasing interest in learning. Teachers also believe that gamification can contribute to the development of collaboration, communication, and problem-solving skills in modern design education (Hasanov, 2016; Pektaş & Kepceoğlu, 2019). However, it is also worth paying attention to the need for proper design and implementation of gamified elements to achieve maximum pedagogical effect.

In continuing design education today, immense importance is attached to the use of visual design or multimedia design technologies. This becomes especially important at the current stage of development of Ukrainian society, when harmonisation of human relations with the environment, including the natural, material, social and artistic environment, becomes one of the key tasks. The professional activity of young specialists requires the ability to interact with the world of art, to understand and creatively use material and spiritual values, and to master the surrounding reality. They affect the subject-spatial environment, giving it aesthetic expressiveness, which requires proper public attention and pedagogical support in forming aesthetic culture in future professionals.

The use of visual design technologies in continuing design education is of foremost importance for the development of students and their preparation for the requirements of modern design. Here are a few ways that demonstrate the use of visual design technologies in lifelong design education:

1. Computer modelling and visualisation: Using specialised software, students can create computer models and visualisations of their designs. This allows them to experiment with shapes, colours, textures, and spatial interactions, get quick feedback, and improve their designs.

2. Graphic software and editors: Students can use graphics programs and editors such as Adobe Photoshop, Illustrator, or Sketch to create and edit graphic elements. This helps them develop skills in working with fonts, colours, composition, and other aspects of graphic design.

3. Web design and development: Modern design education also covers web design and development. Students can learn programming languages such as HTML, CSS, and JavaScript to create websites and interactive designs. They can also use specialised web design software and platforms.

4. Virtual reality and augmented reality: The use of virtual reality (VR) and augmented reality (AR) allows students to experience their designs in an immersive environment. They can visualise their ideas on a real scale, experiment with spatial aspects, and gain new perspectives on their projects.

5. Online resources and learning platforms: There are many online resources and learning platforms on the internet that offer training materials, video tutorials, exercises, and professional advice on visual design. This allows students to learn new techniques on their own, improve their skills and keep abreast of the latest design trends.

In general, the use of visual design technologies in continuing design education contributes to the development of students' creative and technical skills, gives them the opportunity to experiment with ideas and bring their concepts to life. Such approaches help improve the quality of design education and prepare students for the challenges of the modern world.

4. CONCLUSIONS

Design education is essential for creativity, innovation, and technology skills in today's world. It gives students the skills to face real-world professional challenges and allows for self-expression and professional growth. Design education emphasises continuity. Education becomes a lifelong process of self-improvement and learning, not just academic years. In today's world, where technology is constantly changing, career skills must be adaptable and improved.

Design education lets students study graphic, web, and industrial design. It fosters creativity, observation, analysis, and communication. Students learn to design functional, attractive solutions that meet user needs. Modern multimedia technologies are crucial to design education. Students can experiment, visualise, communicate, and collaborate with other students and professionals from different fields. Computer modelling, graphics software, virtual reality, and other innovative technologies enable interactive projects, virtual prototypes, and creative process. Continuing design education gives students the latest design knowledge and trends. It involves updating curricula, working with professionals, and learning from real cases and projects. This prepares students for real-world challenges by providing practical experience. This emphasises the importance of design education today. Students develop creative and technical skills, as well as personal growth and adaptability. Design education is essential to modern education because it fosters self-expression, innovation, and professional growth. The current terminology, concept, and effectiveness of lifelong design education were examined in this study. The study also highlighted global and Ukrainian design education issues. This study examined visual design technologies in design education. Modern visual design technologies can improve educational quality and efficiency. Current design education opinions were examined in this study, reflecting field trends. Modern design education is expanding beyond traditional teaching methods. The study found that Ukraine is developing secondary and higher design education. Modern education, influenced by European integration, is being developed in this context.

Future researchers should examine how modern technologies affect students' creative, critical, and professional development in design education. Researchers may also analyse innovative teaching methods and find the best ones. A major research area could be how visual design affects student motivation and interest in learning.

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