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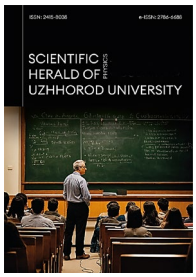

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Development of continuous design education using the STEAM approach

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Abstract

Relevance. The relevance of this study lies in the growing interest of specialists in the reorientation and reconstruction of Ukrainian design education following the Science, Technology, Engineering, the Arts, and Mathematics (STEAM) approach.

Purpose. The purpose of this study was to investigate the features of the STEAM approach and its application in the context of continuous design education.

Methodology. The study employed theoretical research methods, including analysis and synthesis, induction and deduction, comparison, systematisation, classification, and generalisation.

Results. The study employed theoretical research methods, including analysis and synthesis, induction and deduction, comparison, systematisation, classification, and generalisation. The main results highlighted the regulatory documentation on the development of a modern design system. The study found the of the New Ukrainian School (NUS) in the development of continuous design education and the need to study natural, mathematical, and humanitarian disciplines for effective design education. The educational, methodological, and software framework for secondary and higher design education in Ukraine were considered.

Conclusions. The correct organisation of continuous education contributes to the development of students' motivation in studying design disciplines that meet the requirements of STEAM education. A vital stage of the STEAM system is the design of an integrated curriculum platform in the context of interdisciplinary learning, the application of the dynamics

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of mathematical, engineering, modelling, creative, and other design processes. A high-quality STEAM approach in design education will help to develop students' critical thinking and creative approach to problems.

Keywords: thinking; integration; creative abilities; learning environment; art; project activity.

Introduction

Today, there is a rapid growth of innovations in the scientific field, manufacturing, and modern design. The need for their application in design activities has contributed to the urgent need for the development of continuous design education at various educational levels to ensure the development of a highly qualified level of design professionals according to foreign practices. Modern educational researchers are actively promoting the introduction of the Science, Technology, Engineering, the Arts, and Mathematics (STEAM) approach as an effective way to develop students' design and other creative skills. A specialist designer, a teacher of design should be professionally trained and knowledgeable to work with students following the requirements of STEAM education, which requires appropriate conditions for the development of creative personal qualities of the student and will be effective in forming a satisfactory level of competence. The interest of the educational space in STEAM-learning towards continuous design education and the development of pedagogical and design competencies, the lack of a methodological framework and theoretical coverage of this issue necessitates a detailed investigation of the specific features of the development of modern design education as factors in the theoretical and practical training of students, techniques for the formation of systemic continuous design education based on innovative STEAM approaches.

Scientists today are carefully studying various factors in the development of students' design abilities. V.P. Tymenko and A.I. Brovchenko [1], who investigated the design and creative talent of students in the context of the Ukrainian design education system, concluded that pedagogical creativity, as an essential element of the quality of student education, is also the solution of pedagogical tasks in the educational process, as a result of which the student's personal qualities are formed under the influence of the teacher. Scientists consider the system-forming factors, including the development of a creative pedagogical personality, creative potential, and creative activity of the teacher as key aspects of design education. In their study, the researchers not sufficiently covered the specific features of design pedagogical activity in the context of professional training, the development of which is impossible without regular improvement of creative potential.

According to A.I. Brovchenko [2], who aimed to analyse the national system of continuous design education, the key requirement for the development of student competencies to implement specialised training is in-depth practice in specialised disciplines. The researcher means that a teacher should have the skills and knowledge of the theoretical basis of the modules that underlie specialised education in technology, master design methods, specifically in the field of design, and improve the level of personal competence in design education. The researcher does not pay due attention to the problem of the substantial difference between qualifications and competencies of a designer, which is that qualifications should still be confirmed by a higher education diploma, while competencies are developed through gaining appropriate practical experience and it is crucial to investigate these concepts independently of each other in terms of continuous design education.

Following V.F. Prusak [3], organisational and pedagogical requirements for the development of design specialist competencies play the role of complex pedagogically oriented interdisciplinary tasks, an incentive for the development of students' project thinking, and the activation of their design activities. In their study on the phenomenon of design education in the context of the development of modern design and professional training of students, O. Fursa [4] noted that at the stage of subject design education, it is worth focusing on the development of graphic skills, which require knowledge of geometry, skills of quantitative and spatial relationships, and their correct application in practical classes. In the results of the empirical part of the study, the researcher did not emphasise that in the context of studying graphics, images, and measurements, students face many problems in working with quantitative and spatial concepts of ratios.

Studying Ukrainian and foreign design education, H. Kashyna [5], in the study aimed at analysing the transformation of pedagogical design models in the system of continuing education, identified appropriate teaching conditions that contribute to the quality of design thinking of students. The author notes that the regulation of the motivational strategy, the development of professional skills in project and image transformation, the activation of project approach tools, and the creation of an innovative educational environment are relevant at the stage of organising practical training. In their study, the author touched upon the concept of innovative education in the context of the STEAM approach but did not fully cover its essence and indicate the prospects for the implementation of the STEAM system.

The purpose of the study was to investigate the STEAM approach and its derivatives to enhance the development of students' design skills.

Materials and Methods

To fulfil the purpose of this study, a set of theoretical methods of scientific research was employed, including analysis and synthesis, induction and deduction, comparison, systematisation, classification, and generalisation. A comprehensive and promising analysis of pedagogical, methodological, and philosophical literature on this and related topics was conducted to investigate in the conceptual provisions, definitions, and features of the categories of continuous design education and the STEAM approach in greater detail. Through the method of critical analysis of methodological manuals and recommendations, the state of modern design education was found and the specific features of implementing STEAM education in design specialisation and the competencies of participants in the educational process were identified. By analysing theories, approaches, and

methods, the means of modernising continuous design education were identified.

The synthesis method contributed to a superficial review of the role of STEAM education in design education and the identification of aspects of the essence of the definition of continuous design education. Using the synthetic research method, the purpose of the study was formulated, namely, to investigate the stage of activating the development of students' design skills, to identify aspects of influence on the development of continuous design education following innovative STEAM education.

In the study, the method of induction was applied, which helped to investigate the issues facing design education in greater detail and identify the reasons for the need to introduce an innovative educational approach. Using this method, a general conclusion was made about the benefits of teaching future designers in the STEAM approach. The method of induction was also used to obtain formal results of scientific work and proved the need to intensify STEAM learning.

The method of deduction was used to form the final features of the structure of design competences and formalise their development in the context of the STEAM educational environment. The method of comparison helped to identify common and distinctive features of the development following the specific features of Ukrainian and foreign practices in this area. The method of systematisation was used to identify the main functions, tasks, and general structure of continuous design education, competences of future designers and competences of teachers, and to combine recommendations for improving modern design education into a single system. Using the method of systematisation, the study revealed the relationship between the studied components and the features and nature of their construction. The study considered a set of pedagogical and philosophical objects of influence as a single system at the stage of forming the personality of a future designer, in which additional reasons for learning in a STEAM environment were identified.

The materials of this study are based on the legislative and regulatory framework for the development of the Ukrainian educational environment, including The Law of Ukraine "On approval of the concept for the development of science and mathematics education (STEM education)" [6], the Law of Ukraine "On Education" [7], Methodological recommendations for the development of STEM education in institutions of general secondary and extracurricular education for the academic year 2023/2024 [8]. The integrated use of these methods and materials has made it possible to formulate a range of scientific proposals for the overall development of continuous design education following the STEAM approach in Ukraine.

Results

Today, many countries are implementing STEAM education as an innovative approach to curriculum development, establishing STEAM centres, organising international targeted events, scientific conferences and STEAM practices. Despite some uncertainty about the STEAM methodology, Ukraine's modern educational system is actively involved in the development of STEAM education, combining project-based and interdisciplinary aspects, developing natural, mathematical, technological, engineering, and artistic sciences. Many studies emphasise that such scientific areas are often used in various fields of knowledge, in the study of various disciplines, which contributes to increasing motivation and interest in acquiring creative skills [9]. STEM is a natural and mathematical educational system that includes an artistic component. The STEAM approach to education aims to develop a curriculum in cases where the study of technical, mathematical, natural, and artistic sciences as independent disciplines is reduced. Today, new educational requirements are emerging, including STEAM education, which requires the increased introduction of technological disciplines into the educational space. Technologies should be considered broader than the concept of information and communication technologies, which, like engineering, are becoming mechanisms for solving problems of introducing innovations into modernised education [10].

Today, continuous education is being popularised, especially in the field of design, the main function of which is to effectively develop the skills of modern students in non-verbal communication and thinking, and to develop innate skills in non-standard conditions. The newest model of the New Ukrainian School's curriculum includes the disciplines Design and Technology for primary school and Technology for basic secondary school. The main purpose of introducing these subjects is to find talents, shape students' abilities, and develop their competencies, which are essential for the implementation of ideas by means of design and decorative applied arts. The New Ukrainian School has introduced interdisciplinary STEAM elective courses aimed at developing project activities. All this together contributes to the development of a dynamic continuous design education.

Furthermore, as noted earlier, modern design education has a strong connection with the natural and mathematical sciences, but there is no such connection in the content of complete secondary education. The development of design specialisation in the educational environment plays a key role at the stage of applying innovations in the STEAM learning system [11]. In both Ukrainian and foreign practices, design education is often interpreted in relation to the educational areas of technology and art, aesthetic culture. A minority of experts focus on the importance of science in the design education environment, on the interaction with STEAM disciplines, which include natural, mathematical, and language areas. Nevertheless, the key aspects of design are the balance of scientific, technical, and artistic creativity, and therefore artistic and technical creativity in the absence of science cannot fully contribute to the development of continuous design education in Ukraine [12].

STEAM learning is sometimes interpreted as "education in reverse", as learning is conducted in the form of project activities or games, and theoretical or practical classes are reversed, i.e., first in the form of a game, and then – mastering the theory and acquiring practical skills. The study of technological disciplines in the development of design specialisation is a form for the integration of technology, science, mathematics, i.e., STEAM-direction and the development of mathematical skills. However, the benefits of technology in STEAM education today are insufficiently substantiated for society. US scientists argue

that promoting the intensification of learning in the scientific field in the absence of the introduction of artistic subjects will lead to the fact that modern youth will not acquire the competencies of creativity. Project activities in technology or design education are widely used in various fields of knowledge, in the study of any discipline, and are known for increasing educational motivation and interest, and developing artistic abilities. The role of both the STEAM approach and the concept of design thinking in the development of continuing education and project activities is relevant [13]. Design thinking is a methodology that aims to solve complex problems of varying complexity that are currently uncertain. The solution is the realisation of the problematic nature of real conditions in relation to human needs, the creation of a great number of ideas by the so-called brainstorming method and an active approach to testing and prototyping. The elements of design thinking according to the STEAM approach are structuring, component analysis, and modelling [14].

Understanding and applying design thinking in the context of continuous design education is a key aspect of successfully following innovations and implementing the latest educational programmes. This is a good reason to understand the so-called 5-stage model created by the Stanford Design Institute (Table 1).

Table 1. Models of design thinking development

No.	Design thinking stage	Content of design thinking
1	Empathy	Empathetic perception of the problem through consultation with specialists to gain skills in a particular area, observation, empathy for others to understand their motivation, environment, and detailed understanding of the problem. Empathy is an essential factor in personal design thinking, which allows diverting from personal perceptions at the stage of forming an understanding of others and their needs.
2	Definition	The information is put into a single structure, analysed, observed, and summarised to identify the key components of the problem. The designer solves problems like a user. The definition affects the number of ideas offered for implementing problem-solving tools and minimising complexity.
3	Generation	Understanding of user demand, readiness to offer ideas, and the development of a personal focus on the task at hand. In such conditions, the group can think outside the box, promote novel ways of solving problems, and look at the problem from all sides. The brainstorming technique is used to encourage free thinking and expand the scope of the problematic.
4	Prototyping	The design team can produce reduced, cheaper versions of the final product to test the solutions. Prototypes are investigated within the group or departments outside the development team. This is the stage of the experiment to identify the most effective solution over all three previous stages. Such decisions are formed into a prototype, approved or not, considering feedback. As a result, the design team is better aware of the limitations and behaviour of people in contact with products.
5	Testing	Designers control the resulting products based on the best prototypes. The result is used to define one or more problems, to obtain details about users, conditions of use, behaviour when contacting the prototype. At this stage, refinements are made to help resolve potential problems and gain an understanding of product quality and user demand.

Source: [15].

These stages are separate stages that affect the project not only as a primitive sequence of actions. The 5-stages design thinking model identifies and structures the general stages of a design project. Design thinking should be interpreted as an inflexible, unique approach to design. The purpose of the stages is to obtain information and apply it to the creation of a specific project, expand the boundaries at the problem-solving stage, and find the most effective solution, while you can change the order of use of the stage, use them simultaneously, and repeat them. An essential advantage of the 5-stage model is that the skills acquired in the later stages are feedback to the questions asked in the earlier stages.

The development of design and art in general in the structure of STEAM education and its successful implementation is to consider the types of art and creative thinking in the context of reality. Creativity is the identification and formation of creative ideas for solutions that should be considered in a given situation, the integration of principles and the awareness of information. In today's environment, the concept of creativity is crucial for doing business, including in the field of design. Promotion of creative ideas in the context of creating a new product is a crucial factor in the growth of its developer. In addition, in times of active spread of information and communication technologies, specialised applications for design, engineering, construction, and the use of 3D printers in various fields, the skills of general ability to artfully modernise the surrounding space, developed creative vision and creative imagination are essential for a future designer or design education teacher [16].

When investigating the features of continuous design education following the STEAM approach, it is necessary to identify the positive and negative factors of effective foreign design education systems to apply innovations that will contribute to the effective development of continuous design education in Ukraine. It is also important to realise that contemporary design cannot be fully perceived outside

of the economic, political, social, technological, and cultural factors that have a direct impact on strategic problem solving. The state's awareness of the need to introduce continuous design education affects its application in educational institutions from primary school to higher education. Ukraine recognises the significance of design education in economic and social growth, but the complex problem of developing a system of continuous design education is still unresolved. Teaching natural, mathematical and social sciences and humanities does not directly interact with the concept of design education.

Many prominent higher education institutions in Ukraine have successfully created a methodological framework for design activities in the educational space. Despite the difficulties of the country's development, some areas of design are quite effective, such as graphic design, art design, landscape design, web design, environmental design. They have taken a place in the international market among the developed countries, which is the result of a successful partnership with business. Furthermore, the synthesis of professional and scientific abilities and knowledge is important for professional design education. This occurs when there are difficulties in the personal perception of a person and their behaviour in society, in the marketing environment, in the technological activities of business, in the professional development of a specialist, their experimental base, scientific observations, study of risks and market demand [17].

Given the continuous approach, design education can be considered as a gradually formed multi-level principle at the following stages: design in the system of general core and non-core education; in the system of professional education; in higher education institutions of various accreditations; postgraduate design education; second design education and training courses for designers and design amateurs. The strategy of continuity in education is a principle of its professional development, which helps to ensure the provision of education at various levels and, at the same time, the multidimensional path of a person in the learning environment. An inherent feature of the implementation of the principle of continuous learning in the context of improving the national structure of designers' training is the creation of multi-species secondary, vocational, and higher education institutions that holistically form a multi-level system of professional training [18].

Comprehensive modelling in the context of modern design requires the development and argumentation of a component system of continuous design education. Ukraine has developed a programme and educational and methodological framework for technologies and design for general, vocational, pre-university, and higher design education institutions. Such a national system of continuous design education can effectively function in such areas as technological design, artistic design, ergodesign, ethnodesign, the key requirements of which are continuity, consistency, and theoretical substantiation. In the primary, specialised, vocational, and pre-university education systems, subsystems of technological and artistic design are being implemented, while higher education institutions of art, pedagogical and cultural education are characterised by cultural, artistic, and production and technological subsystems [19].

Today, Ukrainian society understands the concept of design as an innovative activity. That is why the professional training of future designers is of great importance. The significance of design education and its history should become known to the pupil or student at the stage of choosing the trajectory of their future professional path. Awareness of aesthetics and appreciation of the environment interact with the object environment, and therefore it is an artistic component of the designer. That is why it is methodologically necessary to understand the strategy of sequencing skills and knowledge in the field of design education.

The strategy of continuing education following the STEAM approach creates new opportunities for promoting design culture and ideas for students' project activities. A key pedagogical and organisational condition for the growth of the Art Institutes is the formation of partnerships with creative centres of prominent Ukrainian and foreign designers and design organisations. This helps future design professionals to effectively consolidate their skills and professional knowledge, and most importantly, to find employment in leading institutions and design studios and set up their own business.

Discussion

The results of the research show that the implementation of the STEAM approach becomes impossible in the absence of a detailed study of the conditions of the environment and analysis of its features that contribute to the development of future designers' search skills, critical and design thinking, and a new vision of things. The development of cognitive activity and curiosity, independent work, building an algorithm for solving problems, critical evaluation are factors in the development of a design style of thought. Knowledge of aesthetics and space appreciation interact with the built environment and therefore form the designer's artistic view, which contributes to a better understanding of the continuity strategy. The strategy of continuing education in line with the STEAM approach creates a range of new opportunities to promote culture and design ideas for students.

Today, experts often discuss the problem of forming a system of educational training for future designers. The difficulties lie in the rather dynamic nature of this field, which is rapidly changing and spreading in modern production and in the requirements of society for design professionals. A.D.M. Hawari and A.I.M. Noor [20], who investigated the project activity of pedagogical design in STEAM art education, argue that the philosophy of the design industry is a method of design strategy to create a system of thinking about the general formation of the surrounding space and the life of society in nature, which is aimed at developing logical abilities in mathematics, natural and other sciences, and at exploring the artistic meaning of the visual arts.

According to scientists, the definition of the essence of design is interpreted through various approaches to design practices and the results obtained, which contribute to the promotion of trends in the field of design education, coverage of the content, directions of practical training of a new generation of designers. It is worth agreeing with this opinion, as the findings of the study suggest that the concept of design education contributes to the

development of a well-founded understanding of the phenomenon of design as a phenomenon and confirms the aesthetic, artistic, and economic determinism of the practical training of a future designer.

M.W. Meyer and D. Norman [21], whose work was to analyse the changes in design education in the 21st century, believe that modern design education needs a detailed modernisation at the stage of training a future specialist, finding new ways of growth in a highly competitive environment, and improving the level of qualification of a future specialist in the field of design education. At the same time, a design teacher in a variable modular approach should develop the aesthetic nature of the student's thinking, promote the comprehensive development of personal qualities. The proper professional training of a future designer or design teacher is on a par with the quality education of specialists in other technological fields, and therefore it is a primary goal in the context of the formation of art education.

The statements coincide with the findings obtained, since the study determined that without receiving artistic practical training for students of technological and pedagogical specialities, design training should be supported methodologically and theoretically, as well as be systematic. At the stage of organising the practical training of a design educator, it is vital to ensure continuity of training. The theoretical framework of the sequence of the system of continuous design education of future specialists is manifested in the interaction of educational content with specialised subjects throughout the entire training. The problem of inadequate quality and lack of competencies of future designers depends heavily on the strategy and the chosen means and methods of teaching.

S. Gregor et al. [22], who investigated the prospects of design education and the anatomy of design principles, believe that the ideologues of the latest specialisations contribute to the establishment of the design industry as a culture of design thinking, the elements of which include architecture, the creation of tools, vehicles, household equipment, arts and crafts. In this context, the similarities of different areas of activity were outlined, for instance, the commonality of aesthetics and functionality, but the specificity of each area and its tasks was denied. The authors examine different positions on the role of design and its place in society. This statement is expedient and complements the above design features and confirms that in the context of design education, modelling, engineering, and design have a strong connection with the artistic and aesthetic development of design and artistic professionals. The study of design should be introduced in primary school.

L. Forsetlund et al. [23], who investigated the essence of continuous learning, somewhat equate the concepts of continuous and lifelong learning. The results the study deny a full-fledged commonality of concepts, as this contributes to an incorrect understanding of the problems of vocational training in the educational sector. Notably, lifelong learning is a system of personal education, the development of personal qualities through educational institutions and opportunities for improvement. The concept of continuity is aimed at motivating individuals to develop themselves and grow professionally, and to improve their competence in the latest areas. At the same time, an inherent feature of continuous education in the context of improving the structure of designers' training is the development of different types of secondary, vocational, and higher education institutions that integrally form a multi-level system of professional training.

S.S. Belbase et al. [24], who investigated the priorities, prospects, problems, and processes of STEAM education, consider the modern STEAM approach to the training of qualified design professionals to be insufficiently modernised to the challenges of reality. The authors argue that STEAM education is the creation of an environment for interdisciplinary artistic discussion, which is not limited to the study of natural or exact disciplines, but also considers the problems of sustainability of social progress, the form of social relations, their ethics. The authors emphasise the principle of pluralism of forms of relations between the individual and the environment, the multiplicity of which denies the confrontation between the artistic and the scientific. Researchers are also promoting transdisciplinarity as a strategic concept of the STEAM system. The authors' conclusions coincide with the findings obtained in the present study, since it was found that this principle contributes to a balanced scientific and creative search because the essence of art lies in the possibility of its awareness and assimilation. In this context, a STEAM system is perceived as a variant approach to the curriculum that aims to integrate, synthesise, and interact subjects to gain a transdisciplinary educational experience.

N. Romanenko [25], who investigated design education in the context of aesthetic development of the spatial and subject environment, identified among the shortcomings of Ukrainian design education the insignificant availability of specialisations and their excessive universality, lack of interaction of national education with realities, modification of the gender aspect in design education, insufficient equipment and classrooms that meet the requirements for specialised education, insufficient application of foreign trends, and the use of outdated tools. The author's opinions somewhat coincide with the findings obtained, but it is worth noting that many modern design education institutions primarily claim that there is a lack of a sufficient number of qualified design teachers. This may be the result of the novelty of the educational system in line with the requirements of STEAM education, which has been actively implemented in recent years. This is based on the understanding that the essence of design specialisation is characterised by features that are distinctive and different from other areas, such as art and engineering. Furthermore, the material and methodological support for teaching highly specialised subjects is insufficient. The need for future designers to study diverse disciplines such as engineering, art and design, the practical component of which should be provided with suitable equipment and classrooms, is neglected by those responsible for the development of design education programmes.

Thus, in today's conditions, the development of an effective Ukrainian design education in the context of an innovative STEAM approach requires optimising the resources of highly specialised subjects with the latest technologies, expanding the number of specialised educational institutions and qualified personnel with the

appropriate potential in design, art, graphics, engineering. It is vital to involve future design professionals in direct participation in project activities, building strong relationships between design subjects and other disciplines that will help shape design thinking and business skills. It is necessary to develop partnerships between national design centres and art schools with prominent art educational institutions.

Conclusions

Thus, there is a pressing issue of developing a high-quality system of continuous design education in Ukraine. When creating a system of continuous design education according to the STEAM approach, it is essential to consider the foreign practices of developed countries in solving this problem. The existing system of design education in Ukraine already has a range of quality developments at different levels of education. There is a need to develop a methodological and theoretical framework for Ukrainian continuing design education similar to the trends of leading countries.

Ukraine's modern educational system actively promotes the STEAM approach, combining interdisciplinarity and project-based learning in science, mathematics, technology, engineering, and the arts. It is essential to integrate the STEAM approach and develop design thinking at the stage of developing the continuous education. STEM science and mathematics education that includes the arts is called STEAM. The STEAM approach is a process of historical acquaintance with modern design trends, mastering techniques, acquiring skills in the use of information sources, and developing STEAM competencies in design education. A key stage of this system is the integration of the curriculum system into interdisciplinary learning, using a balance of mathematical, engineering, modelling, creative, and other design processes. The qualitative development of the STEAM approach in design education will contribute to the development of students' critical thinking and creative perception of problems.

Design thinking is a methodology, the main purpose of which is to solve complex problems of varying complexity that are still uncertain. The solution is to understand the problem of the real requirements of the individual, create a large number of tasks by brainstorming and an active approach to testing and prototyping. The components of design thinking according to the STEAM approach are structuring, component analysis, and modelling. Understanding the concept of design thinking and its application in continuous design education is essential to effectively follow innovations and the latest educational programmes. This reveals the need to understand the 5-stage model developed by the Stanford Institute of Design. The components of the model are empathy, definition, generation, prototyping, and testing. The 5-stage design thinking model defines and systematises the main stages of a design project. The objective of each stage is to obtain and use information to create projects, expand the boundaries of problem solving, and find effective solutions. The advantage of the 5-stage model is that the skills acquired in the later stages are feedback to the questions asked in the earlier stages.

The prospect of the research is to substantiate certain aspects of the complexity of continuous design education in Ukraine and to use the results by scientific experts to publish recommendations in the field of design and pedagogy. Further areas include the investigation of the STEAM approach and its impact on the development of professional competence of students and future design teachers, the fulfilment of their needs for self-development to improve the ability to compete in the context of multicultural educational globalisation.

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Conflict of Interest

None.

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Розвиток безперервної дизайн-освіти з використанням підходу STEAM

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Анотація

Актуальність. Актуальність цього дослідження зумовлена зростаючим інтересом фахівців до переорієнтації та реконструкції української дизайн-освіти відповідно до підходу Science, Technology, Engineering, Arts, and Mathematics (STEAM).

Мета. Метою цього дослідження було вивчення особливостей STEAM-підходу та його застосування в контексті неперервної дизайн-освіти.

Методологія. У дослідженні використовувалися теоретичні методи дослідження, зокрема аналіз і синтез, індукція та дедукція, порівняння, систематизація, класифікація та узагальнення.

Результати. У дослідженні використано теоретичні методи дослідження, зокрема аналіз і синтез, індукцію та дедукцію, порівняння, систематизацію, класифікацію та узагальнення. Основні результати висвітлили нормативну документацію щодо розвитку сучасної системи дизайну. Дослідження виявило роль Нової української школи (НУШ) у розвитку неперервної дизайн-освіти та необхідність вивчення природничо-математичних і гуманітарних дисциплін для ефективної дизайн-освіти. Розглянуто навчально-методичне та програмне забезпечення середньої та вищої дизайн-освіти в Україні.

Висновки. Правильна організація безперервної освіти сприяє розвитку мотивації студентів до вивчення дизайнерських дисциплін, які відповідають вимогам STEAM-освіти. Важливим етапом системи STEAM є розробка інтегрованої навчальної платформи в контексті міждисциплінарного навчання, застосування динаміки математичних, інженерних, моделюючих, творчих та інших процесів проектування. Якісний STEAM-підхід у дизайн-освіті допоможе розвинути у студентів критичне мислення та творчий підхід до вирішення проблем.

Ключові слова: мислення; інтеграція; творчі здібності; навчальне середовище; мистецтво; проектна діяльність.