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A CREATIVIVY APPROACH TO THE DEVELOPMENT OF GRAPHIC COMPETENCE IN HIGHER EDUCATION STUDENTS

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The article substantiates the relevance of the development of graphic competence in the conditions of rapid growth in the volume of digital information and the spread of information and communication technologies. It is noted that the ability to effectively visualize data is becoming an important component of the professionalism of a modern specialist whose activities take place in a digital and multimedia environment. The interdisciplinary nature of graphic competence and its importance for the training of specialists in various specialties are emphasized.

The concept and content structure of the graphic competence of a future specialist are characterized, which consists of four main components: motivational, cognitive, practical and personality. In order to develop the graphic competence in the higher education students, especially those who do not study the technical specialties, it is proposed to actively use extracurricular work. For this purpose, an optional course "Fundamentals of Infographics" has been developed, which has an interdisciplinary nature and combines various forms, methods and means of learning, focused on the active cognitive activity of education seekers. The thematic content of the course is presented. Forms, methods and means of learning that are appropriate to use within the framework of the elective course are proposed. Attention is focused on the project form of learning, which is implemented through the completion of a final creative task. The goal and objectives of the elective course are determined, aimed at developing in students the ability to transform complex information into a structured and aesthetically designed visual form. The course is focused on the development of graphic competence through mastering the theoretical foundations of infographics, acquiring analytical and practical skills for working with data and digital tools, as well as improving the creative, communicative and reflective potential of future specialists in accordance with the requirements of the digital society.

Keywords: *data visualization, graphic competence, higher education students, infographics, project method, professional competence, elective course.*

ТВОРЧИЙ ПІДХІД ЩОДО РОЗВИТКУ ГРАФІЧНОЇ КОМПЕТЕНТНОСТІ ЗДОБУВАЧІВ ВИЩОЇ ОСВІТИ

С. М. Горобець

У статті обґрунтовано актуальність розвитку графічної компетентності в умовах стрімкого зростання обсягів цифрової інформації та поширення інформаційно-комунікаційних технологій. Зазначено, що здатність ефективно візуалізувати дані стає важливою складовою

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професіоналізму сучасного фахівця, діяльність якого відбувається в цифровому та мультимедійному середовищі. Підкреслено міждисциплінарний характер графічної компетентності та її значення для підготовки фахівців різних спеціальностей.

Охарактеризовано поняття та змістову структуру графічної компетентності майбутнього фахівця, яка складається з чотирьох основних компонентів: мотиваційного, когнітивного, практичного та особистісного. З метою розвитку графічної компетентності здобувачів вищої освіти, особливо тих, хто не навчається на технічних спеціальностях, запропоновано активно використовувати позааудиторну роботу. З цією метою розроблений факультативний курс "Основи інфографіки", який має міждисциплінарний характер і поєднує різноманітні форми, методи та засоби навчання, орієнтовані на активну пізнавальну діяльність здобувачів освіти. Представлено тематичний зміст курсу. Запропоновано форми, методи і засоби навчання, які доцільно використовувати у межах факультативу. Акцентовано увагу на проєктній формі навчання, що реалізується через виконання підсумкового творчого завдання. Визначено мету та завдання факультативного курсу, спрямованого на формування в здобувачів освіти здатності трансформувати складну інформацію у структуровану та естетично оформлену візуальну форму. Курс орієнтований на розвиток графічної компетентності через опанування теоретичних основ інфографіки, набуття аналітичних і практичних навичок роботи з даними та цифровими інструментами, а також удосконалення творчого, комунікативного й рефлексивного потенціалу майбутніх фахівців відповідно до вимог цифрового суспільства.

Ключові слова: *візуалізація даних, графічна компетентність, здобувачі вищої освіти, інфографіка, метод проєктів, професійна компетентність, факультативний курс.*

Introduction of the issue. Nowadays, due to the rapid development of information and communication technologies, there is a constant increase in the volume of digital information, which necessitates its effective visual representation. A modern specialist works in an environment where information is increasingly presented in graphic, interactive or multimedia forms, so the ability to visualize the different information qualitatively becomes an indicator of professionalism.

Today, graphic competence is becoming interdisciplinary, since it is necessary not only for representatives of the IT industry, but also for future teachers, engineers, economists, designers, managers, etc. It ensures the effectiveness of presenting research results, creating digital educational resources, developing information products and designing user interfaces. That is why the development of graphic competence is becoming an integral part of the professional training of future specialists and one of the strategic objectives of the higher education system.

However, there is currently a contradiction between the growing requirements for the level of specialists' visual culture and the state of their training in higher education institutions (HEI). On the one hand, students studying in the humanities almost do not study the basic disciplines that lay the foundation for graphic competence (for example, the basics of computer graphics). On the other hand, educational programs for training specialists in technical specialties are often focused on applied and purely technical aspects, while the formation of skills in visual communication, design thinking and effective work with graphic tools is of a fragmented character. As a result, some HEI graduates do not possess the necessary competencies for high-quality presentation of information, while others have instrumental knowledge, but are not always able to creatively apply them to create infographics or data visualization systems.

Current state of the issue. The issues of forming graphic competence in the students of various specialties are the subject of the research of many domestic and foreign scientists. The essence of the concept of "graphic competence" is revealed in the works of P. Buyanov, O. Dzhedzhula, M. Drushlyak, Yu. Kozak, T. Olefirenka and others [1; 5; 8]. A large

number of scientists (N. Volkova, G. Gavrishchak, I. Gevko, R. Horbatyuk, O. Kobylyansky, K. Osadcha, M. Ozhga, O. Pysarchuk, G. Raykovska, A. Urusky, G. Chemerys and others) have devoted their scientific works to identifying pedagogical conditions and didactic features of the effective formation of graphic competence in higher education institutions, as well as to developing models for the formation of such competence [2; 7; 9; 10]. Some authors draw attention to innovative approaches. For example, S. Kyrylashchuk and A. Kolomiets consider the possibilities of using artificial intelligence to form graphic competence of students of technical specialties [6]. I. Goliad and M. Tropina outline the possibilities of forming graphic competence and its components in the context of an innovative educational cluster [3].

The works of the above-mentioned scientists contribute to the development of the theory and practice of the formation of graphic competence and are useful for further research in this sphere. Despite the significant results of recent research, it must be stated that the problem of developing graphic competence in the higher education students in the process of extracurricular work has not been studied sufficiently.

The aim of the research. The purpose of the study is to highlight the possibilities of developing graphic competence in the future specialists in the process of studying the optional course "Fundamentals of Infographics", which involves activating the cognitive activity of students through project, creative and interdisciplinary activities.

Results and discussion. A review of scientific and pedagogical literature allows us to assert that the concept of graphic competence is mostly considered in the context of professional training of future specialists in specific specialties. In particular, this relates to the training of bachelors of art, specialists in the field of computer science, engineers of various profiles, teachers of technological education, civil engineers, etc. Within the framework of such an approach, the content and structure of graphic competence are interpreted in accordance with the specifics of future professional activity and the features of professional training. Therefore, the specified concept acquires a variable nature and reflects, first of all, professionally determined requirements for the level of formation of graphic knowledge, skills and abilities necessary for performing typical tasks of a certain branch of industry. Thus, in most scientific works, graphic competence is interpreted as a component of the professional competence of a specialist, the content of which is determined by the nature of his/her future activity and industry standards of training.

Considering that in the modern world graphic competence is necessary for specialists in a large number of specialties, we consider as appropriate to use a generalized definition of graphic competence, abstracted from a specific type of professional activity, namely: graphic competence is an integrative property of a person, which is based on graphic knowledge, skills and abilities in mastering graphic information technologies, the experience in graphic professionally-oriented activities and is expressed in the readiness to successfully and effectively solve graphic problems [1].

Taking into account the provisions of the competency-based, activity-based and personality-oriented approaches to professional training, it is appropriate to consider the graphic competence of a future specialist as an integrative formation structured according to four interrelated components: motivational, cognitive, practical and personality ones [4: 211-214]. Such structuring allows for a comprehensive description of the content, mechanisms of formation, and criteria for assessing the level of its formation in the process of professional training.

The motivational component encompasses a system of professionally significant needs, motives, interests, value orientations and attitudes that determine the students' positive attitude to graphic activities. It determines the

orientation of the individual to master graphic disciplines, awareness of their significance for future professional activity and the desire for self-improvement in the specified area. Purposeful pedagogical influence on the development of the motivational component ensures the formation of stable internal motivation, readiness to overcome difficulties in the process of performing graphic tasks, as well as orientation to continuous professional growth.

The cognitive component is represented by a system of special knowledge in the field of graphic disciplines, as well as general technical erudition necessary for the effective performance of professionally oriented tasks. It is formed in students in the process of studying in higher education institutions and involves the assimilation of theoretical provisions regarding the rules for constructing images, design principles, norms and standards of graphic design, as well as understanding the patterns of spatial representation of objects. The presence of a solid cognitive base creates the foundation for the conscious and effective application of graphic knowledge in further professional activities.

The practical component reflects the formation of the relevant skills and abilities necessary for the implementation of graphic activities. Its structure includes the ability to perform graphic constructions, use traditional and digital visualization tools, apply regulatory requirements for the design of graphic documentation. Integral elements of this component are developed spatial imagination and spatial thinking, the ability to creatively interpret tasks (creativity), as well as a developed aesthetic taste, which ensures the quality and expressiveness of graphic solutions.

The personality component characterizes the level of development of self-awareness, self-regulation and self-organization of the student as a subject of professional activity. It performs a regulatory function, determining the ability to reflect on one's own achievements, adequate self-assessment and correction of professional actions. Its content includes the skills of planning and organizing one's own activities, responsibility for the results of task performance, as well as developed empathic abilities that contribute to effective interaction in a professional environment. The formation of the personality component is an important condition for both specialist's successful learning and further professional self-realization.

Thus, the graphic competence of a future specialist appears as a multi-component system, within which the motivational, cognitive, practical and personality components are closely interconnected and interdependent. The implementation of targeted pedagogical influence on the development of the outlined four components will contribute to a more effective formation of the graphic competence in a modern specialist. The author has developed forms, methods and means of forming graphic competence in the process of studying graphic disciplines using the example of the educational discipline "Engineering and Computer Graphics" [4: 215-222]. This discipline plays a leading role in the formation of graphic competence in the future specialists and is included in the block of mandatory disciplines for all engineering and technical specialties. However, applicants studying in other specialties (future teachers, economists, lawyers, managers, etc.) are not able to study this discipline in full. At the same time, as noted above, graphic competence is an important component of the professional competence of a modern specialist in any field, as well as a component of the comprehensive development of the personality.

To some extent, this gap can be filled by students' independent work and their extracurricular activities, in particular, attending additional optional classes and studying various courses. In order to develop graphic competence in students, an elective course "Fundamentals of Infographics" has been developed,

intended for students of any specialties and intended for 1 semester. The thematic plan of the optional course "Fundamentals of Infographics" is given in Table. 1.

Table 1

Thematic content of the elective course "Fundamentals of Infographics"

Theme name	Brief summary of the theme	Number of hours
Introduction to the elective	Graphic competence of a modern specialist. Introduction to the program and the main tasks of the elective. Entrance testing for the level of graphic competence. Basic concepts of the course: data types, basic graphic elements, visual channels, infographics, data visualization.	2
Basics of color science and composition	Color wheel. Color combinations. Color scheme of the project. Basic techniques for constructing a composition. Psychology of color and shape perception. The rule of the "golden ratio". Accents in composition. Symbolic and font compositions. Artistic techniques for creating font and symbol compositions.	2
Infographic creation process	Sequence of actions for data visualization. Recommendations for using channels to visualize different types of data. Types of infographics and their features. Types of relationships between data: nominal comparison, distribution, deviation, ratio of part to whole, ranking, evolution over time, correlation, geographic data. Assessment of the effectiveness of visual coding.	2
Infographic creation tools	Graphic editors. Online services. Dashboards. Templates and resources. Using artificial intelligence. Using the cloud environment. Collaborating on projects.	4
Fundamentals of animation and motion design	Principles of classical animation. Animation as a way to maintain attention. Reducing cognitive overload. Visualizing changes over time. Storyboarding. Tools and programs.	4
Animation in infographics	Types of animation in infographics: transformation and morphing; gradual discovery; timeline animation. Principles of building animated infographics: hierarchy and accents; pace and speed; minimalism and informativeness; synchronization of movement and sound. Typical mistakes.	4
Summing up the results of the elective	Presentation and discussion of the results of student projects.	2

The goal of the elective course is to develop the ability to transform complex information into a clear, structured and aesthetically designed visual form, which contributes to the development of graphic competence in students and meets the requirements of professional activity in a digital society.

The main tasks of the elective:

– formation of theoretical knowledge about the basics of infographics, types of data and methods of their visualization, principles of color science, composition and psychology of perception of visual information;

– development of analytical skills, in particular, selection and structuring of data, determination of types of relationships between them and choice of optimal methods of graphical presentation of information;

– formation of practical skills in working with graphic editors and online services, creation of static and animated infographics, use of modern digital tools and cloud technologies;

– development of creative and spatial thinking, formation of aesthetic taste and ability to apply artistic and animation techniques to increase the informativeness and expressiveness of visual material;

– development of communicative and reflective skills, which involves presenting one's own projects, justifying decisions made, and self-assessing the results of activities.

As can be seen from the thematic plan, the optional course "Fundamentals of Infographics" is interdisciplinary in nature and combines elements of computer science, computer graphics, graphic design, databases and data analytics. Its implementation is aimed at developing visual literacy in students, the ability to work with data and the ability to effectively structure information using graphic language. Accordingly, the organization of the educational process involves the use of various forms, methods and teaching aids.

Within the framework of the optional course, it is advisable to combine frontal, group and individual forms of work. The frontal form is used when presenting theoretical material (in the form of mini-lectures). It is also effective for collective analysis of samples of modern infographics, which contributes to the formation of a critical attitude towards the methods of presenting information.

The group form is implemented in the process of analyzing cases and while working in small groups on a joint project. It forms communicative competences, the ability to argue one's own position and reach a collective decision regarding the structure and visual presentation of information.

During the practical tasks, an individual form is implemented, when students independently analyze data and develop their own infographics. This organization of work contributes to the development of creative autonomy, responsibility, and skills in independent design decision-making.

Of particular importance is the project form of learning, which is implemented through the completion of a final creative task – the creation of a static or animated infographic based on real data. At the request of students, the project can be of a group (usually for two performers) or an individual form. Project activity ensures the integration of theoretical knowledge and practical skills and orients students to the final result.

Given the specifics of the course, it is advisable to combine traditional teaching methods (explanatory-illustrative, partially-search) and active ones – the project method, case method, discussion method, etc.

For a systematic presentation of the theoretical foundations of infographics, the explanatory-illustrative method is used, the effectiveness of which is increased by demonstrating real examples, their analytical analysis and collective discussion.

The partially-search method is aimed at involving students in independently choosing methods of presenting data. In the process of completing tasks, they analyze numerical information, determine the optimal type of visualization, and ground their own decisions, which contributes to the development of analytical thinking.

The leading method within the elective is the project method. It involves phased activity (data analysis – concept development – design – presentation), which ensures the formation of complex skills: from the interpretation of statistical indicators to their graphic implementation.

It is also advisable to use the case method. In particular, for the analysis of typical errors in visualization (for example, distortion of scale, excessive use of decorative elements, violation of the logic of presentation, etc.). This approach forms a critical attitude towards information products and prevents the manipulative use of graphics.

The use of the discussion method contributes to the understanding of

various aspects of infographics, in particular the issues of data reliability, objectivity of presentation and the impact of visual aids on the audience's perception. Mutual assessment and self-assessment provide a reflective component of educational activity.

The success of the implementation of the elective course is largely influenced by the rational selection of teaching aids. Technical teaching aids are provided by the available capabilities of the university's material base. During classes, students use classroom computers to work with graphic material. The teacher can conduct lectures using a multimedia projector. If necessary, it is possible to organize online broadcasting using a webcam, audio system and network equipment.

While working on practical tasks, students of the optional course use software tools to create graphic content. In particular, such free universal online services as Canva, Figma, Google Docs Editors (Google Docs, Google Sheets, Google Slides and Google Drawings) are widely used. In some cases, it is possible to use narrowly specialized sites such as Viseme, LiveGapCharts, Miro, Lucidchart.

As information resources and data sources, one can use online directories, open statistical databases, electronic publications. Using popular search engines, one can get acquainted with samples and examples of modern infographics and solutions for animated design of projects.

Conclusions and research perspectives. Thus, a creative approach to the development of graphic competence of higher education students presupposes extracurricular work, in particular, their study of the optional course "Fundamentals of Infographics", which combines various forms, methods and means of learning, focused on active cognitive activity. The combination of frontal, group and individual work with project activities, the use of explanatory and illustrative, search and case methods, as well as the use of modern digital tools has a positive effect on the development of all components of graphic competence.

The use of a creative approach contributes to the preparation of students for effective activity in the information society, since it increases students' motivation to master graphic knowledge and skills, promotes the development of their graphic and professional competence, strengthens the readiness to work in a team and the competitiveness of graduates in the labor market.

The prospect of further research is the development of a separate extended distance learning course based on the created optional course.

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