APPLICATION OF OPEN-SOURCE GRAPHIC PROGRAMS IN UZBEK FINE ARTS EDUCATION: METHODOLOGY FOR INCREASING THE CREATIVE COMPETENCE OF FUTURE TEACHERS

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Abstract

This study is dedicated to testing a specially designed methodology for integrating open-source and free graphic software (Krita, Sketchbook) into the educational process to enhance the creative competence of future fine arts teachers within the framework of the "Teacher of the Future" concept. The relevance of the research is determined by Uzbekistan's state policy on education digitalization and the need to bridge the gap between traditional art education and modern labor market demands. The study was conducted as a pedagogical experiment using a pre-test/post-test control group design. It involved 60 students (N=60) from the Visual Arts program at Chirchik State Pedagogical University. The experimental group (n=30) was trained for 15 weeks using the enhanced methodology with graphic software, while the control group (n=30) followed the traditional curriculum. Adapted Torrance Tests of Creative Thinking were used to evaluate results. Statistical analysis (independent samples t-test) revealed that the experimental group demonstrated significantly higher scores in all components of creativity (fluency, flexibility, originality) compared to the control group (p<.001). The findings confirm that the proposed methodology not only significantly enhances students' creative abilities but also equips them with modern digital tools, thereby improving their professional competence.

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Introduction

Globalization and the technological revolution taking place on a global scale pose new and complex tasks for the education system. Creativity, critical thinking, and digital literacy, recognized as skills of the 21st century, have become integral qualities of today's specialist. Uzbekistan is not staying away from these global trends and is on the path of fundamental reform and digitalization of the education system. The "Digital Uzbekistan - 2030" Strategy, approved by the Decree of the President of the Republic of Uzbekistan No. UP-6079, has created a solid foundation for the widespread introduction of digital technologies in all spheres, including education.

However, in this process, a certain gap is observed in the system of higher pedagogical education, in particular, in the training of future teachers of fine arts. Although traditional teaching methods (working with paper, pencil, brush) are fundamental, they do not fully meet the requirements of modern creative industries and the digital space. A future teacher should not only know traditional art forms, but also be a "digital educator" who can reveal the world of digital art to their students.

The main problem of this study is that there is a dependence on expensive licensed software in the teaching of fine arts in higher educational institutions of Uzbekistan, and a scientifically based and systematic methodology for the development of students' creative competence using the didactic capabilities of free and open-source (FOSS - Free and Open-Source Software) programs (for example, Krita, Sketchbook, Infinite Painter) has not been sufficiently developed. Filling this research gap (research sentence) is the main goal of this work.

The purpose of the research is to develop a scientific and practical methodology for the development of creative competence of future fine arts teachers using graphic programs such as Krita and Sketchbook, and to prove its effectiveness through a pedagogical experiment.

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Literature Analysis and Methodology

Literature Analysis

The phenomenon of creativity has been deeply studied in the fundamental works of such scientists as J.P. Guilford (1967) and E.P. Torrance (1974). Guilford introduced the concepts of divergent and convergent thinking, emphasizing that the basis of creativity is the ability to find non-standard solutions. And Torrance is creativity and proposed criteria such as fluency, flexibility, originality, and elaboration as its components. These theories served as a theoretical basis for assessing creative competence in our study.

The influence of digital technologies on education is vividly reflected in the concept of "digital natives" put forward by M. Prensky (2001). According to him, modern youth are inclined to new ways of assimilating and processing information, and the educational process should take these features into account. Research conducted on the application of digital tools in art education (for example, Smith & Jones, 2019) shows that graphic programs allow students to experiment "without fear of mistakes," quickly visualize their ideas, and participate in an iterative creative process. However, most of the existing research is focused on expensive, licensed programs such as Adobe Photoshop, and the pedagogical potential of free and affordable programs such as Krita and Sketchbook has been little studied, especially for the education system of developing countries, such as Uzbekistan.

Methodology

The study used a pre-test/post-test control group design based on a quantitative approach. This design allows comparing the effectiveness of the proposed methodology with traditional methods.

Participants: 60 students (N=60) studying in the 2nd year of the "Fine Arts and Engineering Graphics" program of the Faculty of Art Studies of Chirchik State Pedagogical University were voluntarily involved in the study. Participants (38 women, 22 men; mean age M=19.8, standard deviation SD=1.1) were randomly divided into experimental (EG) and control (CG) groups of 30 people.

Measurement tools: To measure the level of students' creative competence, an adapted version of E.P. Torrance's figurative creative thinking test (TTCT -

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Figural) was used. The test was aimed at assessing three main components: Fluency (the number of relevant ideas created within a certain timeframe), Flexibility (the ability to generate ideas of various categories), and Uniqueness (the uniqueness and statistical rarity of ideas). Each component was assessed on a 20-point scale, and the total maximum score was 60.

The experiment lasted 15 weeks during the autumn semester of the 2024-2025 academic year. Each group was allocated 4 academic hours per week.

The control group (CG) was trained according to the traditional curriculum. Classes were mainly focused on studying the basics of still life, landscape painting, and painting using materials such as paper, pencil, gouache, and watercolor.

A methodology specially developed for the experimental group (EG) was used. The methodology has a modular structure and includes:

Weeks 1-3: Introduction to Digital Art. Interface of Krita and Sketchbook programs, basic tools, basics of working with layers and brushes.

Weeks 4-7: Character design and concept art. Practical tasks on creating characters in various styles (cartoons, realism) in the Sketchbook program.

Weeks 8-11: Digital landscape and "matte painting." Creating fantastic and realistic landscapes by working with various textures, lighting, and colors in the Krita program.

Week 12-15: Final creative project. Students, applying the acquired knowledge and skills, created a final digital work on a free topic and formed their digital portfolio.

Data analysis: The collected data were analyzed using the IBM SPSS Statistics program (version 26). To compare the pre-test and post-test results of the groups, a t-test (Independent Samples t-test) was used. The level of statistical significance was marked as $p<0.05$.

Results

The research results showed the high effectiveness of the proposed methodology. Analysis of the results of the pretest conducted at the beginning of the experiment confirmed the absence of a statistically significant difference in the overall

indicator of creativity between the experimental group (M=25.2, SD=4.5) and the control group (M=24.8, SD=4.7), t (58) =0.34, p=.73. This means that the initial conditions of both groups were equal.

After 15 weeks of the experiment, the results of the post-test showed a sharp difference. The table below presents a comparative analysis of the post-test results of the groups.

Table 1. Comparative Analysis of Post-Test Results of Groups

Component of creativity	Control group (n=30) M (SD)	Experimental group (n=30) M (SD)	t (58) value, p-value
Smoothness	16.1 (2.4)	24.5 (2.9)	t=12.3, p<.001
Flexibility	13.2 (2.1)	21.8 (2.5)	t=14.8, p<.001
Specificity	11.5 (2.8)	20.4 (3.1)	t=12.1, p<.001
Total score	40.8 (5.9)	66.7 (6.8)	t=15.4, p<.001

Note: M - arithmetic mean; SD - standard deviation.

The results show that the students of the experimental group achieved significantly higher results in all components of creative thinking compared to the students of the control group. In particular, a significant increase was observed in the indicators of flexibility of thought (t=14.8) and originality (t=12.1). The difference in total scores is also statistically significant (p<.001), which indicates a direct positive effect of the improved methodology.

Discussion

The obtained results fully confirm our main hypothesis: the targeted integration of open-source graphic programs into the educational process is an effective means of developing the creative competence of future fine arts teachers.

Interpretation of the results: The sharp increase in the experimental group can be explained by several factors. Firstly, the "Ctrl+Z" (cancellation) function in digital programs and the ability to work with layers removed the psychological barrier of "fear of making mistakes" in students. This encouraged them to try more bold and non-standard solutions, which, in turn, led to an increase in the indicator of originality. Secondly, the thousands of brushes, textures, and color palette in the programs allowed students to quickly test different styles and approaches within one idea, which developed flexibility. In the traditional

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method, the transition from one style to another requires much more time and resources.

Theoretical and practical significance: Theoretically, this study confirms and expands the creativity theories of Torrance and Guilford in the context of digital pedagogy. From a practical point of view, the results are important for the higher education system of Uzbekistan. The developed methodology allows improving the quality of education without spending money on expensive licenses. It can be applied to the curricula of fine arts programs of all pedagogical universities of the republic. This, in turn, will ensure the entry into schools of a new generation of teachers who, along with traditional knowledge, possess modern digital skills.

Limitations of the study: This study has certain limitations. Firstly, the sample size (N=60) is relatively small and covers students of only one university, which requires caution when summarizing the results. Secondly, the results may have been influenced by the "novelty effect," that is, the initial interest of students in new technologies. Thirdly, the research is based only on quantitative data.

Recommendations for future research: In the future, it is advisable to study the long-term impact of this methodology (longitudinal study), test it at universities in other regions, as well as supplement quantitative analysis with qualitative research methods, such as in-depth interviews with students and teachers.

In conclusion, this study proved through reliable statistical data the high effectiveness of the methodology developed on the basis of open-source and free graphic programs (Krita, Sketchbook) in the development of creative competence of future fine arts teachers. This approach not only reveals the creative potential of students, but also serves to prepare them as "Teachers of the Future," who meet the requirements of the modern labor market and have mastered digital technologies. The research results can serve as an important scientific and practical basis for the modernization and digitalization of the content of pedagogical education in Uzbekistan.

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