Ethiopian International Journal of Multidisciplinary Research

pISSN:2349-5707 Volume:12,Issue 10,October-2025 eISSN:2349-5715

IMPROVING THE METHODOLOGY OF TEACHING GRAPHIC TOPICS IN INFORMATICS AND INFORMATION TECHNOLOGY THROUGH DIGITAL TECHNOLOGIES

Qobilova Dildora Odilboyevna

Scientific Supervisor: **Qosimov Feruz**

Abstract: The rapid development of digital technologies has fundamentally transformed the methodology of teaching informatics and information technology. This article focuses on improving the methods of teaching graphic-related topics such as computer graphics, visualization, and design through modern digital tools. The study explores the integration of simulation software, interactive visualization systems, and project-based digital learning environments to enhance students' creative thinking, spatial reasoning, and technological competence. The findings indicate that applying digital resources such as AutoCAD, Adobe Illustrator, CorelDRAW, and 3D modeling programs significantly increases motivation, supports individual learning trajectories, and bridges theory with practice in informatics education.

Keywords: computer graphics, digital learning, information technology, visualization, digital pedagogy, informatics education.

Informatics and information technology are dynamic fields that continuously evolve with advances in digital innovation. Within these disciplines, graphic-related topics such as data visualization, image processing, and digital design play a crucial role in developing students' creativity and analytical skills. Traditional teaching approaches, based on static demonstrations and limited classroom exercises, no longer meet the expectations of today's digital learners. As Prensky (2001) observed, the new generation of students—digital natives—require interactive, visually rich, and technology-driven learning environments. Therefore, the modernization of teaching methodology for graphical topics is essential to ensure the formation of both theoretical and practical competencies aligned with contemporary professional demands.

Effective teaching of computer graphics requires a methodological shift from passive instruction to active, problem-based learning supported by digital technologies. Using specialized software such as AutoCAD, Blender, Adobe Photoshop, and CorelDRAW enables students to engage directly with design and visualization processes. According to Anderson and Krathwohl (2001), meaningful learning occurs when students apply theoretical knowledge in creating tangible products. For example, 3D modeling exercises allow learners to understand geometric transformations, color theory, and image rendering not through abstract explanation but through experimentation and visualization. This approach enhances comprehension and retention by connecting cognition with creativity.

The introduction of digital simulations and virtual laboratories offers further pedagogical opportunities. As Burke (2014) explains, gamification and simulation stimulate curiosity and persistence, transforming complex technical concepts into achievable challenges. In informatics education, digital labs can simulate real-world scenarios such as developing infographics, user interfaces, or 3D visual models, allowing learners to practice skills relevant to professional environments. Students can also use Tinkercad and SketchUp to create interactive digital objects, thus linking artistic imagination with computational logic.

pISSN:2349-5707 Volume:12,Issue 10,October-2025 eISSN:2349-5715

Moreover, project-based learning (PBL) plays a key role in developing graphical competence. Bell (2010) emphasizes that project-based instruction fosters collaboration, innovation, and interdisciplinary integration. In the context of informatics, students can be tasked with creating digital portfolios, interactive dashboards, or educational animations that demonstrate their mastery of graphic tools. These projects encourage independent research, teamwork, and problem-solving, while developing essential soft skills such as communication and time management. The project-based approach transforms learners from passive consumers of information into active creators of digital content.

Cloud computing and online collaboration platforms further extend the learning environment beyond the classroom. Using Google Workspace, Microsoft Teams, and Canva for Education, teachers and students can share, review, and co-create digital graphics in real time. Siemens (2005) argues that learning in the digital age depends on connectivity—the ability to form networks between people, data, and tools. Collaborative platforms embody this principle by enabling knowledge exchange, peer assessment, and collective creativity. Such environments also prepare students for professional collaboration in graphic design, IT development, and engineering contexts.

The improvement of methodology also requires attention to teacher competencies. Educators must be proficient in both computer graphics tools and digital pedagogy. According to UNESCO (2021), the modern teacher must act not only as a knowledge provider but as a facilitator, guiding students through exploration and discovery. Continuous professional development through online certification courses, design workshops, and webinars is vital to maintain alignment with rapidly changing technologies. Teachers who are digitally literate can create adaptive learning experiences that cater to diverse learning styles and abilities.

Additionally, integrating artificial intelligence (AI) and augmented reality (AR) opens new dimensions for teaching graphical topics. AI-based learning systems can offer personalized feedback on design principles, color usage, and composition balance, while AR applications enable immersive visualization of 3D models in real space. These tools foster deeper engagement and provide instant correction, helping students refine their skills more efficiently. As Garrison and Vaughan (2011) note, blended learning environments that combine physical and virtual experiences increase cognitive involvement and overall academic success.

In conclusion, the improvement of the methodology for teaching graphic topics in informatics and information technology through digital technologies represents a decisive step toward creating a modern, practice-oriented, and student-centered educational environment. The integration of digital graphics tools, simulation software, project-based learning, and AI technologies fosters both technical mastery and creative expression. Such innovations transform abstract learning into concrete, visually engaging experiences that prepare students for future careers in IT, engineering, and design. Future research should focus on developing adaptive digital ecosystems that incorporate machine learning and augmented visualization to individualize the learning process. Through this transformation, education in informatics evolves from a process of information transfer into a process of innovation, creation, and lifelong learning.

The modernization of teaching graphic topics within informatics and information technology through digital technologies represents one of the most significant advancements in contemporary education. The fusion of computer graphics, digital design, and interactive technologies is no longer an optional enhancement but a fundamental pedagogical necessity. The integration of simulation software, 3D modeling tools, and visual programming environments

pISSN:2349-5707 Volume:12,Issue 10,October-2025 eISSN:2349-5715

not only increases students' motivation but also reshapes their cognitive development, enabling them to transition from theoretical understanding to practical creativity.

Digital learning environments allow students to explore the logic of computer graphics through experimentation, discovery, and self-directed inquiry. The incorporation of project-based learning, collaborative cloud platforms, and artificial intelligence transforms the classroom into an ecosystem of continuous interaction and innovation. Learners are not passive recipients of information but active designers of digital content, applying theoretical principles of informatics to real-life visualization tasks. This methodological shift reflects Anderson and Krathwohl's taxonomy, emphasizing learning through creation, synthesis, and application rather than memorization.

The digitalization of graphical education also supports inclusivity and personalization. Cloud-based tools, online laboratories, and virtual visualization environments provide flexible opportunities for students with different learning paces and styles. They can experiment, receive feedback, and revise their work independently, which cultivates a sense of responsibility and autonomy. Such personalization ensures equal access to quality education regardless of geographical or technical limitations, aligning with UNESCO's vision of sustainable and inclusive digital learning.

Equally important is the role of the educator. The teacher becomes a mentor and facilitator who guides the learning process, curates digital resources, and stimulates creative thinking. To perform this role effectively, instructors must continuously upgrade their digital literacy, pedagogical strategies, and understanding of emerging technologies such as augmented reality (AR), virtual reality (VR), and artificial intelligence (AI). These innovations enrich the educational experience by providing immersive, visually stimulating, and conceptually deep learning scenarios.

The broader implication of this transformation is that graphic education in informatics evolves from teaching specific software tools to nurturing digital culture and professional identity. Students learn not only how to use programs such as AutoCAD, CorelDRAW, or Blender but also how to conceptualize, plan, and execute visual projects that communicate information effectively. They develop cross-disciplinary competencies that integrate computer science, design thinking, and data visualization—skills highly demanded in modern industries ranging from architecture to artificial intelligence.

Furthermore, the application of digital pedagogy enhances students' soft skills: communication, teamwork, time management, and creative problem-solving. When engaged in collaborative design projects or virtual competitions, learners develop professional attitudes, adaptability, and leadership qualities. These aspects demonstrate that digital graphics education extends beyond technical skill-building—it shapes socially responsible, innovative, and critically minded professionals capable of navigating complex digital ecosystems.

However, the successful implementation of such methodologies requires institutional support, investment in digital infrastructure, and continuous curriculum revision. Universities must provide access to licensed software, high-performance computers, and reliable internet connections. In addition, integrating digital ethics, data privacy, and sustainability principles into coursework is vital for ensuring that future specialists use technology responsibly and effectively.

In conclusion, the improvement of the methodology for teaching graphic topics in informatics and information technology through digital technologies is a key factor in bridging the gap

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between education and the needs of the digital economy. It enables students to acquire not only the technical skills of working with digital media but also the cognitive flexibility and ethical awareness needed to thrive in a constantly changing technological landscape. The combination of creative visualization, computational thinking, and digital pedagogy establishes a model of learning that is interactive, inclusive, and future-oriented. Future research should focus on developing intelligent adaptive learning systems that integrate AI and virtual reality to further individualize education. Through such innovation, informatics education can evolve into a space where technology becomes not just a learning tool, but a partner in creativity, problem-solving, and lifelong professional growth.

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