

EMERGING TRENDS IN INFORMATION AND COMMUNICATION TECHNOLOGY FOR QUALITY TEACHING OF GRAPHICS EDUCATION AT THE TERTIARY EDUCATION LEVEL

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Abstract

The rapid advancement of Information and Communication Technology (ICT) has significantly transformed teaching and learning processes in higher education. In graphics education, ICT tools and digital platforms have enhanced instructional quality, creativity, and collaboration among students and educators. This paper examines emerging ICT trends that support the effective teaching of graphics education at the tertiary level. The study adopts a non-empirical approach, based on a review of relevant literature. Key areas discussed include digital design software, online learning platforms, artificial intelligence, virtual and augmented reality, multimedia learning environments, cloud-based collaboration, and mobile learning technologies. The paper also highlights the pedagogical implications of ICT integration in graphics education, as well as the challenges associated with technology adoption in developing countries. The study concludes that the effective integration of ICT tools promotes interactive learning, enhances visual communication skills, and prepares students for the demands of the contemporary creative industry.

Keywords: ICT, Graphics Education, Digital Technology, Higher Education, Design software, E-learning.

Introduction

Information and Communication Technology (ICT) has become an essential component of modern education systems. In recent decades, the integration of digital technologies into teaching and learning processes has transformed the methods through which knowledge is delivered and acquired in higher institutions. Graphics education, which focuses on visual communication, design principles, and digital creativity, has particularly benefited from ICT innovations because of its strong reliance on visual and technological tools (Maier, 2025).

Traditionally, graphics education relied heavily on manual drawing techniques, studio demonstrations, and physical materials such as drafting tools, paints, and printing equipment. While these traditional approaches remain important in building foundational artistic skills, contemporary graphics education has increasingly shifted toward digital platforms and computer-based design systems. According to Isiyaku, Kanu and Mella (2025), emergence of modern digital design tools, multimedia resources, and online learning environments has created new opportunities for improving the quality of graphics instruction in tertiary institutions. ICT tools such as digital illustration software, multimedia presentation tools, cloud-based collaboration platforms, and virtual learning environments enable educators to present visual concepts more effectively and provide students with practical experience that reflects contemporary industry practices. These technologies enhance students' ability to create, modify, and distribute visual content efficiently. According to research on digital design education, technological innovations have significantly influenced teaching strategies and learning outcomes by enabling interactive and multimedia-rich learning experiences (Wardhanie & Rahmawati, 2022).

Furthermore, the increasing demand for skilled graphic designers in the digital economy has made it necessary for tertiary institutions to adopt modern technologies that reflect the realities of the creative industry. Modern design industries depend heavily on digital platforms, artificial intelligence tools, and collaborative design environments. Therefore, integrating emerging ICT technologies into graphics education is essential for preparing students with the competencies required in contemporary professional practice (Soeteja, Kurnia, & Setiawan, 2024). This paper explores emerging trends in ICT that support quality teaching of graphics education at the tertiary education level. The discussion focuses on technological innovations, pedagogical strategies, and digital learning environments that enhance teaching effectiveness and student learning outcomes.

Theoretical Framework

This study is anchored on three theoretical perspectives: Constructivist Learning Theory, Technology Acceptance Model (TAM), and Technological Pedagogical Content Knowledge (TPACK) Framework

i. Constructivist Learning Theory

The **Constructivist Learning Theory**, largely associated with scholars such as Jean Piaget and Lev Vygotsky, posits that learners actively construct knowledge through interaction, exploration, and experience (Satish, 2024).

In the context of graphics education, constructivism supports the use of digital technologies such as computer-aided design software, animation tools, virtual studios, and interactive learning platforms. These technologies enable students to experiment with design processes, manipulate visual elements, and engage in collaborative problem-solving activities. Applying constructivism to tertiary graphics education suggests that ICT tools transform the learning environment from a teacher-centered approach to a learner-centered one. Tangney (2013) explains that students can develop visual communication skills through practice, experimentation, and feedback supported by digital platforms. Thus, emerging ICT tools serve as cognitive and creative tools that facilitate a deeper understanding of graphic principles, design thinking, and visual problem solving.

ii. Technology Acceptance Model (TAM)

The **Technology Acceptance Model (TAM)**, developed by Fred Davis, explains how users come to accept and use technology (Marikyan & Papagiannidis, 2025). The model emphasizes two key determinants: **perceived usefulness** and **perceived ease of use**. Within the context of tertiary graphics education, TAM helps explain how lecturers and students adopt emerging ICT tools such as digital illustration software, 3D modeling platforms, virtual learning environments, and multimedia presentation technologies. If educators perceive ICT tools as useful for improving instructional delivery and enhancing students' graphic design competence, they are more likely to integrate them into teaching. Similarly, students are more inclined to utilize digital design tools if they find them easy to operate and beneficial for developing professional skills (Tangney, 2013). Therefore, TAM provides insight into the behavioral and technological factors influencing the successful integration of ICT in graphics education.

iii. Technological Pedagogical Content Knowledge (TPACK) Framework

The **Technological Pedagogical Content Knowledge (TPACK) Framework**, developed by Punya Mishra and Matthew J. Koehler, provides a comprehensive model for understanding the knowledge teachers need to effectively integrate technology into teaching (Koehler, Kereluik, Shin, & Graham, 2014). The framework highlights the intersection of three essential forms of knowledge: **content knowledge**, **pedagogical knowledge**, and **technological knowledge**. In tertiary graphics education, content knowledge involves understanding design principles, typography, visual communication, and digital graphics techniques. Pedagogical knowledge relates to effective teaching strategies such as studio-based learning, critique sessions, and project-based instruction. Technological knowledge includes proficiency in graphic design software, digital drawing tablets, animation tools, and online collaboration platforms (Mena-Guacas, López-Catalán, Bernal-Bravo, & Ballesteros-Regaña, 2025). The TPACK framework suggests that effective graphics instruction occurs when lecturers integrate these three knowledge domains. By combining appropriate pedagogical strategies with relevant technologies, educators can enhance creativity, improve technical competence, and promote a deeper understanding of graphic design concepts among students.

The application of **Constructivist Learning Theory**, **Technology Acceptance Model**, and the **TPACK Framework** provides a comprehensive theoretical foundation for examining emerging ICT trends in graphics education. Constructivism explains how technology supports experiential and interactive learning in graphic design. TAM highlights the factors influencing lecturers' and students' adoption of ICT tools. TPACK emphasizes the competencies required for effective technology integration in teaching. Together, these theories explain how ICT can transform the teaching and learning of graphics at the tertiary level by improving instructional strategies, fostering creative engagement, and enhancing professional skill development. The framework, therefore, supports the argument that the effective integration of emerging ICT tools is essential for achieving quality teaching and learning outcomes in contemporary graphics education.

Concept of Graphics Education in Tertiary Institutions

Graphics education refers to the study and practice of visual communication through images, symbols, typography, and layout. It involves the development of creative and technical skills required for designing visual materials such as posters, advertisements, illustrations, digital media content, and information graphics. At the tertiary level, graphics education aims to equip students with both conceptual understanding and practical skills necessary for professional design practice.

The discipline combines artistic creativity with technological competence. Students are trained in areas such as visual composition, typography, digital imaging, illustration, branding, and multimedia design. The integration of ICT tools into graphics education has expanded the scope of learning by enabling students to work with digital tools that replicate professional industry environments. Contemporary graphics education also emphasizes problem-solving, innovation, and communication skills (Langat, 2025). Students are encouraged to develop visual solutions that effectively communicate information to specific audiences. With the rapid growth of digital media, the role of graphics education has expanded beyond traditional print design to include web design, animation, user interface design, and interactive media.

In tertiary institutions, graphics education is often delivered through studio-based learning, project-based assignments, and collaborative design activities. The integration of ICT tools supports these instructional approaches by providing students with access to advanced design software, digital resources, and collaborative platforms (Rabah, 2015).

Concept of Information and Communication Technology in Education

Information and Communication Technology refers to the collection of digital tools, technologies, and communication systems used for storing, processing, transmitting, and sharing information. In educational contexts, ICT includes computers, software applications, digital networks, multimedia technologies, and internet-based platforms that support teaching and learning activities. ICT has transformed the educational landscape by enabling more flexible and interactive learning environments. Wardhanie & Rahmawati (2022) explain that digital technologies allow educators to present information through multiple formats such as text, images, videos, animations, and interactive simulations. This multimodal approach enhances students' understanding of complex concepts and supports diverse learning styles. Langat (2025) clarifies that multimodal learning environments combine visual, auditory, and interactive elements to improve comprehension and engagement. Educational research indicates that multimodal learning encourages students to use various forms of communication, including images, audio, video, and text, thereby improving learning outcomes and creativity. ICT also facilitates communication between teachers and students through digital platforms such as learning management systems, virtual classrooms, and collaborative software. These technologies enable real-time feedback, online discussions, and remote learning opportunities.

Emerging ICT Trends in Graphics Education

The rapid advancement of Information and Communication Technology (ICT) has significantly transformed the landscape of education across various disciplines, including graphics education. According to Isiyaku, Kanu and Mella (2025), in contemporary tertiary institutions, the integration of emerging digital technologies has reshaped traditional methods of teaching and learning graphics, enabling more interactive, innovative, and industry-relevant instructional approaches. Rabah (2015) also explains that graphics education, which traditionally relied on manual drawing techniques and physical studio practices, is increasingly benefiting from digital tools such as computer-aided design (CAD), digital illustration software, virtual learning platforms, and interactive multimedia resources. These technological developments have expanded the possibilities for creativity, experimentation, and collaboration among students and educators.

Abid, Mohd, Mohd and Rajiv (2022) also observe that emerging ICT trends have enhanced the efficiency and quality of graphics instruction by facilitating access to a wide range of digital resources and global knowledge networks. With the use of online learning environments, cloud-based design platforms, and virtual simulation tools, students are able to acquire practical skills that align more closely with the demands of modern creative industries. These technologies not only improve visualization and design capabilities but also encourage independent learning, problem-solving, and innovation among learners in tertiary education settings.

Consequently, the growing influence of ICT in graphics education calls for a critical examination of the emerging technological trends that are shaping teaching and learning practices. Understanding these developments is essential for educators, curriculum planners, and institutions seeking to enhance the quality of graphics education and ensure that graduates possess the relevant digital competencies required in the twenty-first-century creative economy.

i. Digital Design Software and Creative Tools

One of the most significant ICT developments in graphics education is the widespread use of digital design software. Modern graphics instruction relies heavily on professional design tools that enable students to create digital illustrations, edit images, design layouts, and produce multimedia content.

Examples of commonly used tools include image editing software, vector illustration software, and animation applications. According to Mayer (2009), digital platforms such as Adobe Creative Cloud and other graphic design tools enable students to create visual materials such as posters, info graphics, and multimedia presentations. These tools simplify the design process by providing templates, typography options, and advanced editing features that support creative experimentation. Through these technologies, students can develop practical skills that align with the expectations of the contemporary design industry.

ii. Online Learning Platforms and E-Learning Systems

Another emerging trend in graphics education is the adoption of online learning platforms and virtual classrooms. Learning management systems allow educators to upload course materials, conduct virtual lectures, and provide assignments and feedback through digital platforms. E-learning technologies enable flexible learning environments where students can access instructional materials anytime and anywhere. Online platforms support

multimedia learning through video tutorials, interactive demonstrations, and digital project submissions (Simon, Jiang, Fryer, King, & Frondoza, 2024).

These systems are particularly useful for graphics education because they allow instructors to demonstrate digital design processes through screen recordings, live demonstrations, and digital critique sessions.

iii. Artificial Intelligence in Graphic Design Education

Artificial Intelligence (AI) has become an emerging technological trend in graphics education. AI-powered design tools can assist students in generating design ideas, improving layouts, and automating repetitive tasks. Adeleye (2024) observes that these technologies help students focus more on creativity and conceptual thinking rather than technical processes.

AI systems can also analyze design patterns and provide suggestions for improving visual composition and user engagement. In educational settings, AI-driven platforms support personalized learning by adapting instructional materials according to students' learning pace and preferences. As AI technologies continue to evolve, they are expected to play a more significant role in supporting creative experimentation and innovation in graphics education.

iv. Virtual Reality and Augmented Reality in Design Education

Virtual Reality (VR) and Augmented Reality (AR) are emerging technologies that create immersive learning environments (Yang, 2023). According to the source, these technologies allow students to interact with digital objects in three-dimensional spaces, providing new opportunities for visual exploration and design experimentation. In graphics education, VR and AR can be used to simulate design studios, interactive exhibitions, and virtual galleries where students can display and evaluate their work. These immersive technologies also help students understand spatial relationships and visual composition in ways that traditional teaching methods cannot provide.

v. Cloud-Based Collaboration and Digital Workspaces

Cloud computing has transformed collaborative learning in graphics education. Cloud-based platforms allow students and instructors to store, edit, and share design projects online. These systems enable real-time collaboration where multiple users can work on the same design project simultaneously. According to Oni and Ngongpah (2025), collaborative digital workspaces promote teamwork and peer learning. Students can exchange ideas, critique each other's work, and collectively develop creative solutions to design problems. Cloud-based platforms also facilitate remote learning by allowing students to access their projects from different locations and devices.

vi. Mobile Learning and Portable Design Technologies

Mobile technology has introduced new possibilities for graphics education. Smartphones and tablets now support powerful design applications that allow students to sketch, edit images, and create digital content outside traditional studio environments (Sookkaew, Chaikaew, & Chaikaew, 2025). Mobile learning platforms enable students to access educational resources, participate in online discussions, and submit assignments through mobile devices. This flexibility encourages continuous learning and creativity beyond classroom settings. Mobile learning environments also support interactive educational systems where students can actively participate in knowledge creation and collaborative learning activities.

vii. Multimedia and Interactive Teaching Approaches

Multimedia technologies are increasingly used to enhance graphics instruction. Staneviciene and Žekien(2025) explain that multimedia tools combine text, images, audio, and video to create engaging learning materials that improve students' understanding of design concepts. Interactive multimedia presentations allow educators to demonstrate complex design processes step by step. Students can observe digital workflows, experiment with design elements, and receive immediate feedback on their work. These technologies also support project-based learning, where students develop visual communication projects using digital tools and multimedia resources.

Pedagogical Implications of ICT Integration in Graphics Education

The integration of ICT into graphics education has significant pedagogical implications. Digital technologies support learner-centered teaching approaches where students actively participate in the learning process rather than passively receiving information. ICT tools encourage experimentation and creativity by allowing students to explore various design possibilities without the limitations of traditional materials. Digital design software enables students to quickly modify and refine their work, thereby enhancing their problem-solving skills. Furthermore, ICT integration promotes collaborative learning through online discussion forums, group design projects, and digital critique sessions. These activities help students develop communication and teamwork skills that are essential in professional design practice.

Challenges of ICT Integration in Graphics Education

Despite its numerous advantages, the integration of ICT into graphics education presents several challenges. One major challenge is the high cost of acquiring modern computer hardware, design software, and multimedia

equipment. Many tertiary institutions in developing countries face financial constraints that limit their ability to implement advanced digital technologies. Another challenge is the lack of adequate technical skills among educators. Some instructors may not have sufficient training in using digital design tools or online teaching platforms. This situation can reduce the effectiveness of ICT integration in the classroom. In addition, issues such as unreliable internet connectivity, limited technical support, and insufficient digital infrastructure can hinder the effective use of ICT in graphics education.

Conclusion

The integration of emerging ICT technologies has significantly transformed the teaching and learning of graphics education in tertiary institutions. Digital design software, online learning platforms, artificial intelligence tools, virtual reality environments, cloud-based collaboration systems, and multimedia technologies have enhanced the quality of graphics instruction and improved student learning outcomes. These technologies enable educators to create interactive learning environments that foster creativity, experimentation, and collaborative learning. By integrating ICT tools into graphics education, tertiary institutions can equip students with the digital competencies required in the contemporary creative industry.

However, the successful implementation of ICT in graphics education requires adequate infrastructure, professional development for educators, and strong institutional support. Addressing these challenges is essential to ensure that ICT continues to enhance the quality, relevance, and effectiveness of graphics education in the digital age.

Recommendations

Based on the discussion on emerging trends in Information and Communication Technology (ICT) for quality teaching of graphics education at the tertiary level, the following recommendations are proposed:

- i. Tertiary institutions should invest in modern ICT infrastructure such as high-performance computers, graphic tablets, interactive boards, digital printers, and updated graphic design software. Adequate technological resources will enable students to develop practical digital design skills that align with contemporary industry standards.
- ii. Lecturers in graphics education should be provided with regular training, workshops, and seminars on emerging digital tools and instructional technologies. Capacity-building programs will help educators remain current with technological innovations and improve their ability to integrate ICT effectively into graphics instruction.
- iii. The curriculum for graphics education at the tertiary level should be periodically reviewed to incorporate emerging digital design technologies such as computer-aided design, animation, digital illustration, multimedia design, and virtual learning environments. This will ensure that the curriculum remains relevant to the demands of the modern creative industry.
- iv. Institutions should encourage the use of blended learning approaches that combine traditional studio practice with online instructional platforms, digital tutorials, and collaborative design tools. Such learning models enhance flexibility, creativity, and student engagement in graphics education.
- v. Universities and colleges should establish stronger partnerships with creative industries, advertising agencies, publishing firms, and digital media organizations. These collaborations can facilitate internships, workshops, and industry-based training that expose students to real-world applications of digital graphics technologies.
- vi. Government and institutional authorities should allocate sufficient funding for the development and maintenance of ICT facilities in graphics departments. Sustainable funding is essential for acquiring updated technology, maintaining equipment, and supporting digital innovation in art education.
- vii. Students should be encouraged to explore emerging digital platforms, experiment with new graphic technologies, and participate in digital art competitions and exhibitions. This will promote innovation, enhance creative thinking, and prepare students for opportunities in the global digital creative economy.
- viii. Reliable internet connectivity should be provided in tertiary institutions to support access to online design resources, digital libraries, tutorials, and collaborative platforms. Strong digital access will facilitate research, learning, and creative experimentation in graphics education.

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