

Enhancing Student Engagement in Graphic Design Education: A Pedagogical Approach to ICT-Mediated Virtual Ideation

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Abstract

Information and communication technology (ICT) integration in graphic design pedagogy lacks sufficient research attention, even though it holds significant potential for educational transformation. This qualitative study analysed how ICT affects teaching methods and student activities in both traditional and virtual design studios across four Ghanaian tertiary institutions using an ICT-mediated activity theory framework. Results showed improved pedagogical strategies that enhanced student-centred learning through virtual ideation, collaborative work, and instructional support in virtual environments. Students exhibited greater creativity, engagement, and analytical thinking skills, while instructors observed better experimentation and concept communication. Virtual studio environments effectively facilitated these improvements, though infrastructure limitations and inconsistent digital skills impacted technology's transformative effectiveness. The study supports systematic ICT implementation within virtual frameworks that align with educational objectives to advance design learning outcomes.

Keywords: ICT integration; Graphic design ideation pedagogy; Learning outcomes; ICT-mediated activity theory framework) etc.

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1. Introduction

The integration of information and communication technology (ICT) in graphic design pedagogy has advanced significantly, creating new learning environments such as virtual studios that influence teaching approaches and student educational experiences. Design studios, which traditionally relied on direct in-person interactions, have now transformed and benefited from specialised ICT platforms that facilitate collaboration, visualisation, and information exchange (Wang et al., 2020). Within virtual environments, ICT provides operational efficiency while also reshaping core processes of concept generation, evaluation, and contemplation (Teo et al., 2019). This impact extends beyond technical competencies, shaping how students develop comprehension, engage with peers, and establish creative problem-solving abilities (Dooly & Sadler, 2016). This study examines this significant evolution within digital environments, especially as academic institutions manage the transition from conventional studio practices. Studies reveal that ICT-enhanced design teaching in virtual contexts encourages inclusivity and active participation, employing resources such as digital dashboards, collaborative design software, and technology-supported visualization to facilitate group idea development (Wong et al., 2021).

For instance, generative software is increasingly utilised in digital studios to support early stages of idea generative activities, offering students multiple visual concept alternatives (Fox, 2025). However, the implementation of this tool encounters a number of obstacles. The success of integrated ICT in pedagogical outcomes in virtual studios often depends on its deliberate integration within pedagogy strategies. When used simply as a practical tool, ICT may become isolated from crucial cognitive and creative processes (Tang & Lau, 2017). Conversely, when thoughtfully aligned with educational goals within a virtual structure, it enhances critical analysis, self-direction, and teamwork, preparing students for changing professional contexts (Dio & La

Scala, 2025). Studies reveal improved student engagement, iterative innovation, and collaborative abilities when ICT systems are systematically integrated into virtual studio practices (Jinghai & Pillai, 2025). However, uneven ICT access, insufficient instructor preparation, and infrastructure limitations can undermine these benefits, creating inequalities in student experiences and outcomes (Appiah & Cronje, 2013; Agbo, 2015). This challenge presents fundamental concerns regarding the best approaches for maintaining fair and effective ICT-supported design pedagogy online. This study seeks to establish ICT integration's influence on design ideation pedagogy, specifically within virtual or online studio settings, through examination of its pedagogical effects and learning outcomes. The study argues that ICT, when strategically integrated into virtual pedagogy frameworks, has the ability to transform graphic design ideation pedagogy into a more interactive, accessible, and progressive system.

2. Literature Review

2.1 *The Potential of Virtual Studios for Pedagogical Alignment*

The integration of ICT into online graphic design studios, especially virtual studios for ideation, has been recognised as a way to enhance creative workflows, improve collaborative efforts, and give students access to industry-standard tools. Studies increasingly show that virtual environments are especially effective at combining digital technologies with pedagogical goals, avoiding the complications often seen in conventional studio settings. Setiawan (2025) highlights this advantage, stating that models like Technological Pedagogical Content Knowledge (TPACK) work more naturally in virtual studios, where technology forms part of the core environment rather than being added as an afterthought. In such contexts, ICT becomes embedded within the fundamental studio structure, creating what Wang et al. (2020) characterise as a “transformative” function for ICT. This integration becomes most apparent when examining specialised virtual learning platforms. Proli (2025) discovered that platforms like Miro or FigJam, when used as the main studio environment, function as dynamic spaces for brainstorming and feedback rather than merely as simple file repositories. This demonstrates the evolution from using ICT merely for organisational purposes to actively supporting creative participation. Wong et al. (2021) similarly contend that virtual design studios can enable a transition from instructor-focused to student-focused approaches, as these environments naturally promote exploration and peer interactions.

This establishes conditions where students develop technical skills while simultaneously using ICT as an authentic cognitive collaborator in ideation processes. Research indicates that this effectiveness comes from the nature of the environment itself, which necessitates digital cooperation. Dooly and Sadler (2016) highlight that virtual studios require and promote instructor development in digital teaching methods, leading to more effective use of ICT's interactive capabilities. With adequate preparation, ICT operates as Vygotsky (1978) envisioned: as a cultural tool for learning. From a technology-mediated activity model (TMAM) perspective (Appiah and Cronje, 2013), the mediating tool (i.e. ICT) successfully reshapes the relationships between participants (i.e. educators and students), tasks (i.e. ideation assignments), and groups (i.e. the virtual studio community), resulting in meaningful change. This research evidence demonstrates the promise of virtual studios: by making technology central to the environment, it can be deliberately aligned with pedagogical goals, functioning as a central enabler of creativity rather than a peripheral tool.

2.2 *Enhancing Ideation in Digital Environments*

Another key advantage of virtual studios lies in their ability to reduce excessive dependence on tools that commonly affect traditional pedagogical environments, while instead promoting genuine ideation. Fox (2025) examines how generative AI functions in virtual idea pedagogy, observing that when employed as a collaborative brainstorming tool within structured digital teaching methods, it can speed up exploration while at the same time preserving originality. Students utilise algorithmic recommendations as launching points for their personal creative investigations, producing work that shows enhanced ideation. The framework of collaborative online platforms also addresses the inclination toward using templates. Boncheva (2025) points out that although Canva is utilised, virtual studios are more likely to see its use questioned and expanded upon by the learning community, progressing beyond standard options. These platforms can reduce entry obstacles while still promoting meaningful engagement, emphasising conceptual exploration rather than just efficiency and visual appeal. The virtual environment also handles cognitive demands differently. Wang et al. (2020) use cognitive load theory to demonstrate that despite software complexity, virtual studios enable structured, supported and timely teaching and learning that minimises unnecessary burden, keeping attention centred on creative processes. The emphasis

moves from mastering interfaces back to addressing conceptual challenges, opening opportunities for repeated creative development. This differs from Appiah and Cronje's (2013) observations in traditional African settings, where technology was limited to production tasks. In virtual studios, the distinction between ideation and ICT disappears; ICT supports the complete cyclical process. These results indicate that virtual studio approaches directly tackle the danger of excessive tool dependence. When students and instructors engage in ICT-enhanced environments built for ideation, tools expand rather than limit creativity. This prevents ICT from controlling the process, ensuring software supports design thinking methods.

3. Methodology

This study employed qualitative methods to explore the effectiveness of an ICT-Mediated activity theory framework to support virtual studio ideation activity in the graphic design pedagogy. Data collection involved observations and unstructured interviews. The Online studio sessions were observed at Takoradi Technical University's Department of Graphic Design Technology, involving students from level 300 and some faculty members. These observations documented ICT's role and effectiveness in mediating instruction, design process, and collaborative activities within virtual environments. The interview component expanded beyond the primary site to encompass the University of Education, Winneba, Ho Technical University, and Bolgatanga Technical University, facilitating cross-institutional comparisons. This analysis concentrates on online studio dynamics and participant perspectives. Student participants were randomly chosen to ensure representational diversity, while educators were deliberately selected based on their virtual teaching expertise. Observational field notes emphasised ICT-Mediated framework's influence on ideation and interpersonal dynamics.

In contrast, interviews explored participants' perspectives on pedagogical transformations and educational outcomes in the virtual studio for ideation in the graphic design process. Thematic analysis following Braun and Clarke (2006) identified key patterns, including ICT's role in driving pedagogical transformation and affecting student performance. Triangulation strengthened the findings' validity, while trustworthiness followed Lincoln and Guba's (1985) criteria.

3.1 Data Presentation and Analysis

The ICT-Mediated Activity Theory framework served as an effective analytical lens for examining how ICT facilitated online interactions, thus virtual ideation. Within the virtual studios at Takoradi Technical University-Ghana, the dynamic relationship between subjects (i.e. students and educators), tools (i.e. digital platforms and design software applications), and objects (i.e. outcomes of ideation activities) showed a fundamental reorganisation of the studio's operational framework. Field observations disclosed that in virtual environments, ICT systems promoted ongoing peer evaluation and collaborative assessment, expanding participation beyond traditional classroom sessions. In this context, ICT operated as an authentic intermediary tool, transforming task distribution by sharing feedback and idea development responsibilities more equally among instructors and learners. Again, the systematic examination of interview data from the institutions corroborated ICT's transformative impact within online studio settings. A primary finding identified ICT as a catalyst for pedagogical innovation, which emerged as educators described shifting from teacher-centred approaches to learner-centred ideation activities facilitated by the virtual studio environment. Educators emphasised that ICT tools allowed them to scaffold student learning in more structured and interactive ways, creating environments where experimentation and iterative development were encouraged. Students supported these observations, explaining how virtual studios increased accessibility to design challenges, improved conceptual visualisation, and built confidence in exploring diverse solutions. Additional findings regarding ICT and student outcomes revealed improvements in motivation, problem-solving, and communication. Students reported that ICT in their online studio sessions enhanced their ability to articulate design ideas clearly and to engage in reflective processes during projects.

Furthermore, the examination of thematic patterns identified both advantages and challenges. Although ICT facilitated positive results, including collaboration and accessibility within virtual environments, tensions emerged within the operational system. In some participants, limited access to infrastructure and uneven levels of virtual literacy constrained outcomes, with students unable to fully exploit the affordances of ICT. Nevertheless, evidence across different settings indicated that deliberate ICT integration within virtual studio structures produced outcomes extending beyond operational efficiency toward genuine pedagogical transformation. This technology modified relationships among subjects, tools, and community, resulting in shifts that supported creativity, collaboration, and enhanced learning experiences. Table 1 summarises the preceding

findings regarding ICT integration and its effects on ideation pedagogy and pedagogical outcomes in virtual studio settings.

Table 1. ICT’s Impact on Pedagogy & Learning Outcomes in Ideation

| Theme | Description | Evidence from Observation & Interviews |
|---|---|---|
| Tools ICT as a catalyst for pedagogical innovation | ICT reshaped teaching from teacher-centered to learner-centered, enhancing collaboration and reflection | Educators across institutions described ICT-enabled scaffolding of design tasks. Online observations showed students engaging in collaborative ideation on dashboard and ongoing peer review and critiqueing |
| Object ICT and student outcomes | ICT improved creativity, motivation, problem-solving, and communication of ideas | Students reported improved visualization, confidence in experimenting with solutions, and clearer articulation of ideas. Educators noted the development of better problem-solving strategies resulting in better solutions as compared to the traditional activity of ideation |
| Division of labour Enhanced Collaborative Studios | Virtual platforms enabled ongoing feedback and shared responsibility in design tasks | Observations of virtual studio revealed dynamic, real-time review and critiqueing sessions and peer-driven inspirations and feedback cycles that extended beyond scheduled class times |
| opportunities and challenges Contradictions in ICT Integration | Benefits were limited by inequities disparities in access and variations in digital literacy | Some students struggled with software complexity or connectivity. Educators noted infrastructural challenges, such as unreliable internet, especially in under-resourced contexts |

Source: Observation & Interview Data (2024)

4. Discussion of Findings

The results of the study reveal the effectiveness of the ICT-Mediated activity theory framework, thus, the integration reshapes pedagogy and learning outcomes when implemented in virtual studios and aligned with ideation objectives. Using the ICT-Mediated framework functioned as a mediating tool that restructured interactions between educators, students and ideation activities in the virtual environment. This results in outcomes such as reflection, collaboration, and experimentation. This finding supports Appiah and Cronje’s (2013) argument that contradictions in activity systems can lead to transformation when the right tools are strategically integrated into a new structure, such as a virtual studio. Similarly, the theme of ICT as a catalyst for pedagogical innovation highlights a shift toward learner-centred education. Observations and interviews revealed that virtual studios enabled scaffolding, peer critique, and iterative learning, confirming Setiawan’s (2015) claim that ICT can enhance higher-order thinking in design pedagogy. Unlike distortions in traditional settings, ICT in virtual practices was embedded in ways that transformed the outcome of the activities, enhanced division of labour -educators moved from sole authority figures to facilitators. At the same time, students assumed more responsibility for idea development. These findings also extend Dooly and Sadler’s (2016) argument that collaborative technologies democratize classroom dynamics. Moreover, the theme of ICT and student outcomes demonstrates clear pedagogical value. Students reported enhanced creativity, motivation, and problem-solving skills, echoing Bratescu (2025), who showed that ICT applications in digital environments promote experimentation and deepen conceptual understanding. From a sociocultural perspective, this suggests that ICT acted as a cultural tool that students internalised, enabling them to externalise more complex design ideas (Vygotsky, 1978). The emergence of enhanced collaborative studios shows that ICT has extended the community dimension of ICT-Mediated virtual ideation. Online platforms enabled continuous inspiration, critique and co-construction of knowledge, aligning with Wang et al. (2020), who emphasised the potential of virtual studios to support ideation. Unlike traditional settings where platforms were limited to administrative use, here, ICT mediated genuine interaction, leading to transformed learning outcomes.

Nevertheless, the theme of contradictions in ICT integration emphasises systemic challenges. Unequal access to infrastructure and disparities in digital literacy constrained the extent of transformation, reflecting Appiah’s (2015) findings on resource gaps in African higher education. From Engeström’s (2001) perspective, these represent unresolved contradictions within the activity system that shape outcomes unevenly across institutions. The preceding findings thus demonstrate that ICT integration, when pedagogically aligned within a virtual studio framework, can catalyse expansive learning and pedagogical innovation in design pedagogy. Theoretically, they

show how ICT can reconfigure relationships within an activity system to support collaboration and ideation. Empirically, they contribute evidence that virtual studios are an effective substitute for traditional ones and that intentional ICT use enhances creativity and learning outcomes in contexts where access and digital literacy challenges are addressed.

5. Conclusion

ICT integration within virtual graphic design studios has the capacity to transform learning by enhancing experimentation, collaboration, and learner-centred pedagogical shifts. When aligned with the ICT-Mediated framework activity, ICT acts as a genuine mediator that transforms studio activities and extends the scope of ideation. The positive outcomes observed in virtual studios stand in direct contrast to distortions in traditional studios, making a compelling case for their adoption as substitutes when in-person settings fail. However, inequities in access and variations in digital literacy create contradictions that temper these benefits, demanding systemic attention. Further studies should adopt longitudinal and cross-institutional designs to examine how sustainable virtual studio practices can enhance creativity and equity in design pedagogy.

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