
RESEARCH ARTICLE

Activity Theory as a Framework to Analyze e-Portfolios as Mediators in a Communication Design Program

Ralitsa Diana Debrah¹ ✉, Joanne Hardman², Mugendi K. M'Rithaa³, Ismaila Moro⁴, and Adam Rahman⁵

^{1, 4, 5} *Department of Communication Design, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana*

² *School of Education, University of Cape Town, Cape Town (UCT), South Africa*

³ *School of Humanities and Social Sciences, Machakos University (MksU), Machakos, Kenya*

Corresponding Author: Ralitsa Diana Debrah, **E-mail:** rddebrah.art@knust.edu.gh

ABSTRACT

This paper describes Activity Theory (AT) and its use as an analytical lens for examining the integration of electronic Portfolios (e-Portfolios) in a Communication Design program at a Higher Education Institution (HEI). The study draws on first generation AT, which originates from the Vygotskian philosophical tradition. The analysis is based on a pilot study that introduced students to a structured process for developing e-Portfolios for learning and assessment. Students used non-linguistic tools such as Google Sites to create their e-Portfolios and shared them through Edmodo, a virtual classroom platform. The study focuses on mediation as a key phenomenon within the activity system. In this context, e-Portfolios were examined as mediating artefacts through the core principles of AT that relate to human practice and interaction. Activity Theory provided a framework for understanding how students used e-Portfolios as mediators to achieve the intended learning objectives and outcomes within the course. The findings indicate that e-Portfolios have significant potential for supporting student learning within an educational activity system. The study also suggests that AT offers a useful theoretical framework for analyzing the integration and use of e-Portfolios in educational environments.

KEYWORDS

Activity Theory, Communication Design, Design Education, Electronic Portfolio (e-Portfolios), Emerging Technology, Mediating Artefacts

ARTICLE INFORMATION

ACCEPTED: 10 July 2026

PUBLISHED: 31 August 2026

DOI: 10.32996/bjtep.2026.5.9.3

1. Introduction

The concept of activity, in a broad sense, refers to how individuals interact with and make sense of the world around them (Kaptelinin, 2014; Schmidt & Tawfik, 2021). Activity is often described as a “unit of life,” where a material subject exists and acts within the objective world (Peña-Ayala et al., 2014, p. 132; Hajimaghsoodi & Maftoon, 2020, pp. 2-4). Within higher education, educational systems consist of multiple and concurrent activities that take place across different departments or faculties within a university environment (Gedera, Forbes, et al., 2023). This paper examines an activity system for learning that incorporates electronic portfolios (e-Portfolios) within a Communication Design program.

The purpose of the study was to investigate how e-Portfolios function as mediating artefacts in the Communication Design program. Emerging technologies such as Google Sites and Edmodo were used as non-linguistic tools within the activity system to support teaching and learning (Hardman, 2008). Google Sites was used to develop the e-Portfolios, which acted as mediating artefacts for student learning and evaluation. Google Sites is a free web application that allows users to create and customize websites for presenting digital content (Barrett, 2012; Montclair State University [MSU Report], 2018).

In this study, Edmodo supported communication and collaboration among the participants involved in the learning process. Educators commonly use this platform to integrate emerging technologies into teaching and learning in different educational contexts (Dewi, 2014). The instructional context focused on the subjects, the students, and explored how e-Portfolios as mediating artefacts could enhance their learning as objects within the activity system. Two guiding questions framed the discussion in this study using AT as the analytical framework. First, what emerging technologies can serve as tools for students to create e-Portfolios while promoting collaboration and communication? Second, how do e-Portfolios support students' learning processes in a Communication Design course and help them achieve the intended learning outcomes?

Activity Theory (AT) was adopted as the framework to analyze e-Portfolios as mediating artefacts in the Communication Design course (Abidin et al., 2014). The study does not aim to provide a comprehensive overview of AT. Instead, it uses the AT framework as a lens to examine e-Portfolios as mediating artefacts, or tools, within an instructional activity system. As the use of e-Portfolios in education continues to expand, exploring theoretical frameworks that explain how these tools are integrated into educational practice becomes increasingly important (Rhodes et al., 2014).

2. Review of Related Literature

2.1 Activity Theory

Activity Theory is a conceptual framework that emerged from Russian psychology during the 1930s and later developed further in the 1960s (Carvalho et al., 2015). The theory is rooted in the Russian socio-cultural tradition and focuses on understanding human actions within social and cultural contexts (Kaptelinin, 2014). Activity Theory originated from the work of the Soviet psychologist Lev Vygotsky (Hardman, 2008). Vygotsky first introduced the foundations of AT, which later evolved into three generations of theoretical development (Yamagata-Lynch et al., 2013; Schmidt & Tawfik, 2021). His original framework continues to provide the foundation for subsequent developments in the theory. For this reason, Vygotsky's work is often referred to as the first generation of AT (Engeström, 1999a; Hardman, 2008; Rahmati, 2017).

The theory was later expanded by Aleksei N. Leontiev, a former student of Vygotsky, whose work contributed to the development of second-generation AT. The third generation was introduced by Yrjö Engeström and is commonly known as Cultural Historical Activity Theory (CHAT). This version examines how multiple activity systems interact and influence one another to produce change and development (Engeström, 1999b; Karanasios & Allen, 2013; Wilson, 2014). When considering AT, one might question why everyday activities require theoretical explanation. In simple terms, an activity involves understanding who is doing what, why it is being done, and how it leads to the intended outcomes (Hasan & Kazlauskas, 2014).

Harry and Gutierrez (2009, p. 18) explain that "Activity Theory has been sometimes mistakenly read as a fixed theory of impersonal systems and structures. In fact, the object of Activity Theory is to analyze human lives involved in collective activity systems."

Activity Theory should not be understood in the same way as theories in the natural sciences, which often focus on predictive models that rely heavily on data before making conclusions. Instead, AT provides a conceptual framework that helps researchers explore real world situations and identify meaningful evidence within human activity systems (Kaptelinin, 2014; Hajimaghsoodi & Maftoon, 2020). The theory consists of a set of principles that guide the analysis of activities within social contexts. These principles form a conceptual system rather than a strictly predictive model (Kaptelinin & Nardi, 1997; Engeström, 1999a).

Although three generations of AT exist, this study is grounded in Vygotsky's first-generation framework (Figure 1). This perspective was selected because it aligns closely with the context of this study and the phenomenon being investigated. The discussion in this article therefore draws on the principles of Vygotsky's theory as a foundational lens for examining mediation within the learning environment.

2.2 Basic Concepts in First Generation Activity Theory

Vygotsky's perspective on activity systems (Figure 1) is built on three core elements : subjects, tools, and objects (outcomes) (Yamagata-Lynch et al., 2013 ; Queiros et al., 2019). In the context of this study, the activity system operates as follows. The subjects are the students, who use tools such as e-Portfolios to support learning and assessment. The object represents the learning process and tasks that students engage with, while the outcome is the development of improved skills that support professional practice in design education (Hardman, 2005a; Gogus, 2023).

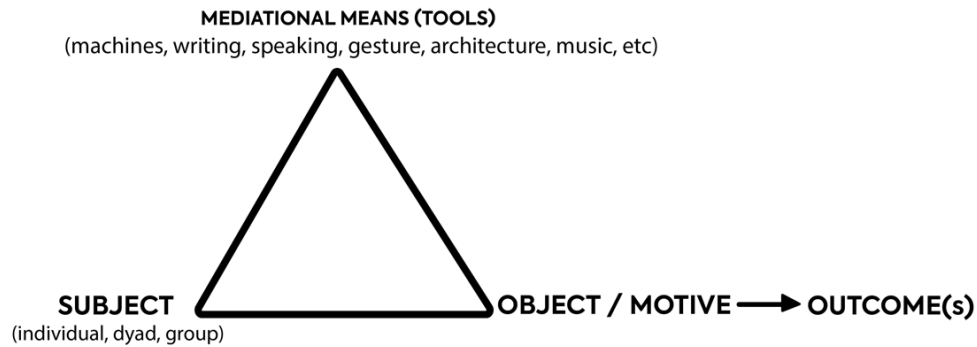


Figure 1: First generation AT based on the Vygotskian philosophy
(Source: Engeström, 1999a, p. 30; Hardman, 2005b: 259)

2.2.1 Subjects

The subjects in an activity system (Figure 1) are the central participants who drive the activity (Collins et al., 2002). The subject refers to the individual responsible for carrying out actions within the activity system (Peña-Ayala et al., 2014). In this study, the subjects were Level 300 (Year 3) communication design students enrolled in a photography course.

2.2.2 Object

Within an activity system (Figure 1), the object refers to the problem space or task that the main actors, such as teachers and students, are working toward. The object can be understood as both conceptual and material in nature. It reflects the motivation that guides the subjects' actions as well as the practical environment in which these actions take place (Hardman, 2008).

2.2.3 Mediation Means or Tools

Mediating artefacts, or tools, are the elements that subjects use to act upon the object within the activity system. These tools may be primary, such as physical tools; secondary, such as lesson plans or instructional materials; or tertiary, which may include relationships and interactions between teachers and students (Hasan & Kazlauskas, 2014). In many cases, these mediating artefacts can also be grouped into linguistic and non-linguistic categories. Teachers and learners situate these tools within their learning environments as resources that support teaching and learning processes. Tools may include language systems, symbolic systems, or psychological resources used to facilitate understanding. Nonlinguistic tools often consist of artefacts placed within the object space of the activity system. This space can include tangible items such as whiteboards, markers, projectors, software, or other emerging technologies that subjects can use in the learning process (Hardman, 2008).

In this study, the focus is on mediation within the instructional environment. For the Communication Design course, the primary mediating artefacts were e-Portfolios. Students used applications such as Google Sites as emerging technological tools to create and develop e-Portfolios as part of their learning activities and for assessment purposes.

2.3 Activity Theory and Mediation

Activity Theory explains that tools mediate both the internal and external activities of human beings. Mediation serves as a fundamental principle that distinguishes human activity from that of animals (Kaptelinin, 2014; Gedera, Forbes, et al., 2023). Within the Vygotskian perspective, psychological tools such as language, signs, and symbols play a central role in mediating human cognitive processes (Karpov & Haywood, 1998). Human interaction with the world rarely occurs directly. Instead, tools, whether material or immaterial, shape these interactions and act as intermediaries between individuals and their environment. In an activity system, tools influence both the mental processes and external actions of individuals and mediate all forms of human activity (Peña-Ayala et al., 2014; Gogus, 2023).

Activity itself also contributes to the creation and transformation of tools. Each tool carries traces of the culture and historical context from which it emerges (Gedera, Forbes, et al., 2023). Over time, the tools used within an activity system accumulate and transmit social knowledge (Kaptelinin & Nardi, 1997). Tools often reflect users' past experiences and the practices developed within that activity system. These tools may be categorized as primary tools such as physical artefacts, secondary tools such as language and symbolic systems, or tertiary tools that relate to broader contexts or environments (Hasan & Kazlauskas, 2014). In this study, e-Portfolios represent digital evidence created by the subjects and function as mediating artefacts within the activity system. The

e-Portfolios serve as mediational tools that demonstrate the knowledge students developed throughout the course while also reflecting their social and cultural learning experiences within the educational environment (Modise, 2025).

2.3.1 Examples of Activity Theory Applications

Researchers across several fields, including education, psychology, healthcare, and design, have applied AT to analyze complex learning and work environments. The theory has proven adaptable to a wide range of contexts. For example, Hardman (2005b) applied AT as a framework to examine teachers' perceptions of computer use at the primary school level in South Africa. Her study showed that AT provides a useful analytical lens for understanding how different tools operate across educational contexts and how they influence pedagogical practices.

Korpela et al. (2000) explored the application of AT within information systems research through case studies conducted in Nigeria and Finland. Their work demonstrated that AT offers a strong theoretical foundation for examining information systems development across different cultural contexts. In the field of design education, Appiah and Cronjé (2013) applied AT to analyze the ideation process within a graphic design course. Their research examined contradictions within the activity system of the graphic design program and found that AT provides a useful framework for identifying tensions and areas for improvement in design education.

Similar work appears in other design related studies. M'Rithaa (2009) applied AT while examining the integration of universal design principles and concluded that the framework offered a valuable lens for understanding activity systems within the research context. Futerman (2015) also used AT to explore participatory design processes and analyze activity systems involved in collaborative design practice. Findings from these studies demonstrate that AT continues to serve as a strong analytical framework. For this reason, AT provides a suitable foundation for examining the integration of e-Portfolios within design education and understanding their role in teaching, learning, and assessment.

2.3.2 E-Portfolios as Mediating Artefacts or Tools for Learning

An e-Portfolio is a collection of an individual's work compiled over a period of time. These portfolios may include physical or digital artefacts that demonstrate the owner's knowledge and professional expertise (Butakor, 2024). The use of e-Portfolios has provided a structured and systematic way to document work across different disciplines, including architecture, nursing, and education (Pallitt et al., 2015; Siqueiros Quintana et al., 2022). Typically, e-Portfolios consist of digital materials such as audio recordings, video files, blogs, and presentations. Individuals often organize these materials within a personal website where the content can be presented in a structured format. Such platforms also support the development of technological skills and contribute to a stronger sense of personal achievement (Lam & Tsang, 2025).

The introduction of e-Portfolios in education allows students to document their achievements and skills through authentic evidence that can serve multiple purposes (Rowley & Bennett, 2016; Zainuddin et al., 2026). The overall design and structure of an e-Portfolio often depend on its intended purpose or target audience (Rowley et al., 2014). Several universities and national education systems have established digital storage platforms where students can host their e-Portfolios. These spaces function as personal learning environments where students can continuously develop their work and track their progress over time (Pallitt et al., 2015; Buente et al., 2015).

E-Portfolios can function both as assessment tools and as instruments that support learning. Their structure allows them to mediate teaching and learning processes in meaningful ways (Davis, 2015). The format also captures an individual's reflections and interpretations of their learning experiences within a course over time (Wuetherick & Dickinson, 2015). Seyferth et al., (2005) explain that e-Portfolios encourage students to reflect actively on their learning while documenting their progress throughout a course. As a visual medium, an e-Portfolio offers a platform where individuals can present and share their competencies with educators, peers, and other audiences inside and outside the academic environment. Within design education, e-Portfolios also provide an alternative method for digitizing and preserving students' creative work.

2.3.3 Instructional Context of the Activity System

This study is situated within the instructional context of design education. The case takes place in a Communication Design Program at the Higher Education Institution (HEI) in Kumasi, Ghana. At present, the research is in its pilot stage and focuses on a photography course as the starting point for implementation. The program offers three main specialization options. Students usually select their preferred option after completing their foundation courses at Level 100 (Year 1). The participating students in this study were enrolled in the Visual Communication, Advertising and Media, and Multimedia (Video and Animation) tracks within the Communication Design program (Debrah et al., 2022). Over time, enrolment in these courses has increased significantly, which has made assessment and the management of learning activities more complex. Educators within the program continue to explore strategies that can strengthen teaching and learning practices, and this study represents one effort to address those challenges.

2.3.4 The Gap in the Activity System

This activity system continues to explore the use of emerging technologies within the research context of a HEI. The study examines how these technologies can enhance teaching and learning in a design program. Studio-based courses present particular challenges, as fully transitioning the program into digital environments remains difficult. Emerging technologies, however, offer opportunities to support and strengthen teaching and learning practices in design education. In this context, e-Portfolios have the potential to function as mediating tools that support learning across several courses within the Communication Design program. A systematic approach is therefore necessary to conceptualize e-Portfolios as mediating artefacts within the activity system. Activity Theory was adopted as the analytical framework to examine the use of e-Portfolios in this instructional context, as it provides a useful foundation for understanding and analyzing activity systems.

2.3.5 The Subjects in the Activity System

In this case study, the subjects refer to the participants, specifically Communication Design students enrolled at Level 300 (Year 3). The students were drawn from all three major options within the Communication Design program. Participants were purposively selected because students at this stage of the program already had some familiarity with emerging technologies used in their coursework. All participants were enrolled in a two-semester photography course offered at Level 300 (Year 3), which served as the main criterion for inclusion in the study. In total, approximately 170 design students participated across the three options within the Communication Design program. Each activity session was supported by two facilitators who assisted the students with the introduction and use of the technologies. This support ensured that students received the necessary guidance while engaging with and experimenting with the emerging digital tools.

3. Methods

The study adopted an Action Design Research approach as the primary methodological framework. Observations, conversations, and visual methods served as the main techniques for collecting relevant data throughout the research process (Keijzer-Broers et al., 2015; Debrah et al., 2022). An incremental approach guided the integration of emerging technologies within the course, ensuring that each step aligned with the research questions and overall goals of the study. The course also introduced e-Portfolios as mediating artefacts for student learning for the first time.

A workshop format was organized using sandpit sessions, which function as playful and interactive learning environments designed to introduce students to new technologies (Susilawati, 2015; Tarling & Ng'ambi, 2016). The learning activities unfolded in three major phases. The process began with a single class from the Advertising and Media option. The second phase developed when students from the initial group shared the concept with their colleagues across other course levels. The second and third phases of the sandpit sessions gradually introduced participants from other courses within the same Communication Design program to the use of these digital tools.

3.1 Design Action and Results

3.1.1 Sandpit Sessions in the Activity System

- *Session One*

As part of the group activity, students were organized into four teams, with each team consisting of approximately nine students. Participants used their own devices during the activities, which made the session easy and straightforward to manage. The first sandpit session introduced students to Edmodo, an application designed to support virtual classroom environments. The platform allowed students to participate in discussions related to course topics within an online learning space. The session included an explanation of the platform's key features and potential benefits, which helped students understand its usefulness for course communication and collaboration (Dewi, 2014). Participants created personal profiles on Edmodo and joined the virtual classroom established for the course. Initial activity within the platform included a small number of postings. Students then began responding to each other's contributions, which supported communication and collaboration within the virtual learning environment (Ruhf, 2015).

- *Session Two*

The second sandpit session focused on introducing Google Sites as a platform for developing e-Portfolios. Students received guidance on how to create their own e-Portfolios using Google Sites as the mediating tool for producing and presenting digital artefacts. The tutorials began during face-to-face class sessions (Barrett, 2012) and later continued within the virtual classroom environment. The e-Portfolio development process started with students collecting images from their photography exercises. These materials were organized using several Google applications, including Google Drive. Students then reflected on their work and arranged the materials into structured and visually coherent formats using Google Sites. Feedback from instructors helped students revise and refine their e-Portfolios for both learning and assessment purposes (Figure 2). The virtual classroom environment also provided a space where students could continue developing their e-Portfolios before submitting them for

evaluation. Interaction within the activity system encouraged students to engage with peers and share ideas within the online learning environment (Pallitt et al., 2015).



Figure 2: Process for developing and using e-Portfolios
(Source: Authors' construct, adapted from Pallitt et al., 2015, p. 3)

- *Session Three*

During the third session, participants submitted their completed e-Portfolios through Edmodo. The platform allowed both instructors and peers to review the submissions and provide feedback for further improvement. Students received comments and suggestions through postings within the platform, which supported revisions and continued development of their work (Figure 2). These activities suggest that students can extend the use of these concepts to other courses within the Communication Design program. Educators within the HEI can also explore ways to integrate these digital tools into their courses through a more systematic and structured approach.

4. Discussion: e-Portfolios in The Activity System

The concept of e-Portfolios as mediators in education continues to evolve. Greater attention is needed to develop accessible frameworks that can help examine how e-Portfolios are integrated into educational practice. In this study, AT provides the framework used to explore the integration of e-Portfolios within a design course. The course included several mediating tools, yet this study focuses mainly on the role of e-Portfolios within the activity system. The discussion begins with a mapping of the key concepts from first generation AT to the instructional context of design education (Table 1).

4.1 Analytical Concepts in the Activity System

First generation AT serves as the analytical framework for this study. The discussion draws on the key concepts within AT to interpret the findings, with particular attention given to the subjects in the activity system. The analysis considers how the subjects responded to the mediating artefacts, namely the e-Portfolios, while working toward their learning objectives and outcomes within the photography course.

Table 1: Mapping Activity Theory to the Instructional Context

Activity Theory Concept	Instructional Context Mapping
Subject	Students: The subjects in this activity system were communication design students. At the beginning of the study, the students had not yet organized their work into portfolios in ways that supported learning or simplified assessment within the course. Introducing the concept of e-Portfolios aimed to help students organize their work more systematically while strengthening their learning experience.
Mediational Means (Tools)	Mediating artefacts and tools: Teaching the e-Portfolio component in the Communication Design course required several mediating tools. These tools were grouped into two categories: linguistic and non-linguistic mediators. The study focused mainly on non-linguistic tools. These included physical classroom tools such as markers, whiteboards, projectors, and screens, as well as emerging digital technologies used within the activity system (Hardman, 2008; Abbaspour et al., 2021). The emphasis remained on digital tools that students could use directly in their work. Emerging technologies: Google Sites and related Google applications served as the main tools for creating e-Portfolios. Edmodo functioned as a secondary platform (learning management system) that supported communication and collaboration among students. Devices: Students created their e-Portfolios using personal digital devices such as Android phones, tablets, laptops, and desktop computers.
Object / Outcomes	The object of the activity system in this instructional context focused on helping students learn how to create and organize e-Portfolios using Google Sites in a systematic way. The e-Portfolios served as collections of students' works from the photography course and functioned as mediating artefacts that supported reflection, learning, and assessment (Barrett, 2012). The expected outcome of this activity system was the improvement of students' design skills while preparing them for professional practice within the field (Seyferth et al., 2005; Pallitt et al., 2015; Gogus, 2023).

4.2 Positioning the Concepts in the Activity System

- **Subject Versus Tools Positioning**

Probing question: *Did the subjects understand the newly introduced tools?*

The subjects in this activity system were the participating communication design students (Figure 3). Observations during the sessions showed that students responded positively to the introduction of the course tools. Most participants used the tools with little difficulty, as they were already familiar with technology and social media platforms as part of their everyday learning environment (Hew & Cheung, 2013).

Students quickly learned how to use Google Sites, particularly for designing their e-Portfolios. The platform's structure made it easy for them to organize and present their work. Conversations with participants also revealed that they recognized the advantages of using Google Sites for the exercise. Some students mentioned other professional tools such as Flash, Adobe Dreamweaver, and additional web design software that could also be used to develop e-Portfolios in more advanced contexts.

Edmodo also received positive responses from the participants as a viable learning management system. Students readily accepted the idea of creating a virtual classroom environment within the course to facilitate interaction (Ruhf, 2015). Several participants noted that the platform felt similar to other social media tools, which made it simple to understand and navigate. Many students described Edmodo (LMS) as a useful backup space where they could store, share, and discuss their work. The platform also encouraged interaction among students and instructors, which strengthened communication and collaboration within the activity system (Dewi, 2014).

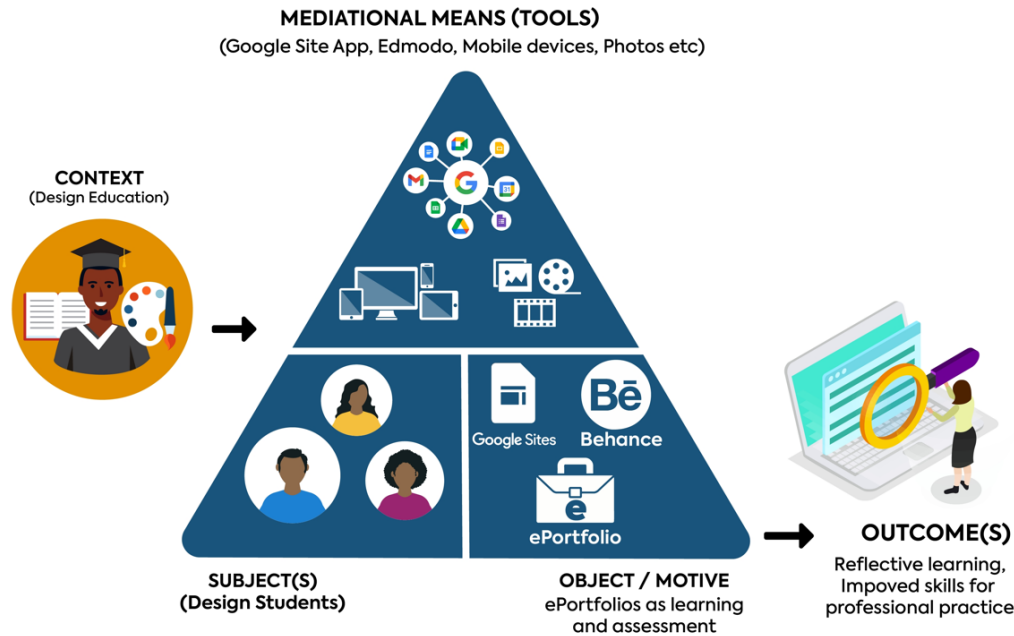


Figure 3: Analytical view of e-Portfolios in the activity system
(Source: Authors' construct, modeled after Engeström, 1999a, p. 30, and Hardman, 2005b, p. 259).

4.3 Subject Versus Object/ Outcome and Positioning in Activity Theory

Probing question: *Were the subjects (students) able to achieve the course goals, and did this progress appear in their learning outcomes?*

Observations during the course indicated that the subjects (students) were able to achieve the learning objective, which focused on creating e-Portfolios for both learning and assessment within the activity system. Students compiled their best work from the semester into structured e-Portfolios. A similar instructional approach appears in the work of Yamagata Lynch et al. (2013), where scaffolding supported students in understanding the concept of e-Portfolios and helped them reach the objectives established for the course.

This strategy helped the subjects (students) meet important semester milestones, including the submission of their first e-Portfolios for mid-semester and end of semester assessments. Feedback received during these assessments strengthened students' confidence in developing their e-Portfolios. The instructional process also aligned with students' Zone of Proximal Development, which helped guide their learning progress and prepare them for continued development throughout the semester and in future years of study (Vygotsky, 1978).

4.4 Subject Versus Tools, Object Versus Outcome, and Positioning in Activity Theory

Probing question: *How did the mediating artefacts (tools) support the subjects (students) in achieving their learning objectives and outcomes ?*

The mediating tools used in the course played an important role in supporting students' learning. The Edmodo platform created opportunities for students to work beyond the traditional face-to-face classroom environment and submit their exercises online (Dewi, 2014). Students posted their work in real time within the virtual classroom, and both instructors and classmates responded promptly with comments and feedback. This environment encouraged peer interaction, allowing students to provide constructive feedback that improved the quality of their work. Instructors also shared learning materials through Edmodo, making course resources easily accessible to all students in the activity system.

The Google Sites application and related online tools also contributed significantly to the learning process. The platform's user-friendly features allowed students to design and organize their e-Portfolios effectively. Several students noted that the same tool could be used to develop websites for potential clients in professional settings. These experiences suggest that e-Portfolios can

support the development of students' cognitive and metacognitive abilities within this context. Students demonstrated their understanding of design principles through the creation of their e-Portfolios, which served as evidence of both their learning and assessment (Figures 3 & 4). The process also encouraged reflection on their activities throughout the course. Such reflection helped students recognize how their work evolved over time while allowing them to compile their projects into a single artefact that could later be presented during internships or professional opportunities (Eynon et al., 2014).

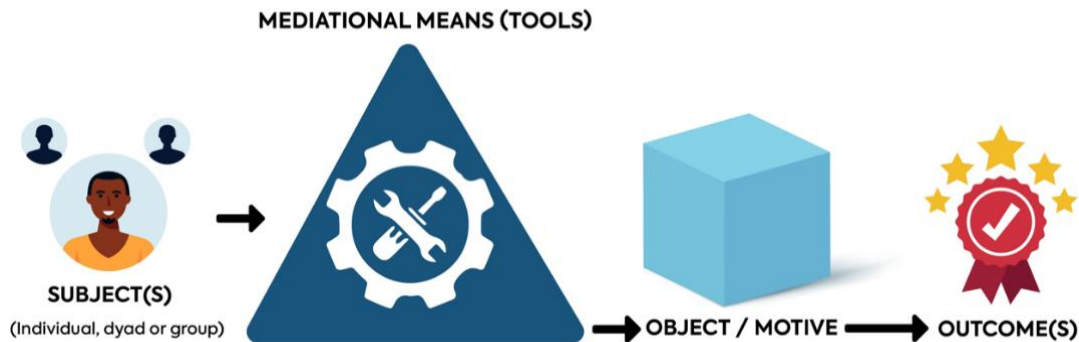


Figure 4: Key concepts in AT aligned with e-Portfolios in the activity system
(Source: Authors' construct, modeled after Engeström, 1999a, p. 30, and Hardman, 2005b, p. 259).

4.5 Lessons Learned from Mediators in the Activity System

Introducing new technologies to a large number of students at the same time can present challenges, especially when the tools are unfamiliar. Working with online technologies for the first time requires careful coordination within the activity system. Organizing students into smaller teams helped manage participation and allowed the group to reach key milestones during the activities. Careful planning of the sessions and the use of sandpit activities supported the management of students in this instructional context.

Integration of these activities into the lesson plan at the beginning of the semester created an opportunity to observe how students responded to the concept of e-Portfolios within the course. The flipped classroom approach also proved helpful, as it encouraged students to take greater responsibility for their own learning. Students could work outside the classroom and prepare before each session, both online and offline.

A gradual pacing of lessons allowed participants to become comfortable with the tools. Use of personal devices during the sessions gave students flexibility and helped reduce the cognitive overload and technological stress sometimes associated with new digital tasks. Group presentations, conducted both online and offline, also strengthened the learning process. Support from co-facilitators played an important role in guiding the sessions and assisting students when needed. Regular reminders and continuous feedback from facilitators encouraged students to refine their e-Portfolios throughout the semester. This ongoing support helped students develop their work to a stage that was suitable for both learning and assessment.

5. Conclusion

This study examined key concepts of first-generation AT and connected them with the use of e-Portfolios as mediating artefacts in a Communication Design program (Figure 4). The findings indicate that AT offers a useful framework for understanding how e-Portfolios function as tools for teaching, learning, and assessment in design education. Future implementation of e-Portfolios within the Communication Design program will require further research to assess their long-term outcomes and overall impact. A longitudinal study could provide deeper insight into how students respond to emerging technologies as part of their learning experience within the program.

Future studies can extend this work through the use of Cultural Historical Activity Theory (CHAT), the third generation of AT. CHAT offers a valuable perspective for examining expansive learning processes in which e-Portfolios operate as mediating artefacts within the design curriculum.

CHAT can also assist researchers in identifying contradictions that may exist within the activity system, which can reveal opportunities for improving the learning environment. Additional research should explore the types of learning experiences that emerging technologies mediate in design education and how these technologies influence student engagement. Collaboration

among educators will remain important in exploring new uses of emerging technologies and strengthening pedagogical practices that integrate e-Portfolios as mediating artefacts within an activity based instructional system.

5.1 Recommendations

In summary, this study recommends integrating concepts from first generation AT together with CHAT in future research to gain a deeper understanding of how learners engage with emerging technologies such as artificial intelligence as learning tools. The use of CHAT as a framework can help educators develop stronger insights into student learning processes and improve their professional practice. This perspective can also support students in the design and development of e-Portfolios while encouraging the thoughtful use of newer technologies such as artificial intelligence that can function as both learning and assessment tools. Higher education institutions may consider adopting this approach across different courses and programs in order to promote more effective, reflective, and meaningful learning experiences.

Funding: No external funding was received for this study.

Conflicts of Interest: The authors declare that they have no conflict of interest related to this study.

¹**ORCID ID:** 0000-0003-0824-7262

²**ORCID ID:** 0000-0002-1592-7357

³**ORCID ID:** 0000-0002-5639-8199

⁴**ORCID ID:** 0000-0002-7643-1152

⁵**ORCID ID:** 0000-0003-4317-1742

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers.

References

- [1] Abbaspour, E., Atai, M. R., & Maftoon, P. (2021). Exploring the impact of scaffolded written corrective feedback on Iranian EFL learners' writing quality: A sociocultural theory study. *Journal of Modern Research in English Language Studies*, 8(4), 53–84. Retrieved from: <https://www.researchgate.net/publication/339285783> [Accessed May 2, 2025].
- [2] Abidin, W. Z., Lorna, U., & Alias, R. A. (2014). E-portfolio development through activity theory in action research. In U. L. et al. (Eds.), *Knowledge management in organizations: KMO 2014* (pp. 311–320). Springer. Retrieved from: https://doi.org/10.1007/978-3-319-08618-7_30 [Accessed April 4, 2025].
- [3] Appiah, E., & Cronjé, J. C. (2013). Exploring information and communication theory in graphic design education with activity theory. *International Journal of Computer Applications*, 84(12), 15–22. Retrieved from: <https://www.ijcaonline.org/archives/volume84/number12/14627-2979/> [Accessed April 14, 2025].
- [4] Barrett, H. (2012). Step-by-Step Model. Retrieved from: <https://sites.google.com/site/mportfolios/processes/step-by-step-model?authuser=0> [Accessed May 13, 2025].
- [5] Buente, W., Winter, J. S., & Kramer, H. (2015). Program based assessment of capstone ePortfolios for a communication BA curriculum. *International Journal of ePortfolio*, 5(2), 169–179. Retrieved from: <https://files.eric.ed.gov/fulltext/EJ1107863.pdf> [Accessed May 13, 2025].
- [6] Butakor, P. K. (2024). The use of e-portfolios as a teaching, learning and assessment tool in higher education: Differing opinions among Ghanaian pre-service teachers and nurses. *European Journal of Education and Pedagogy*, 5(6), 35–45. Retrieved from: <https://doi.org/10.24018/ejedu.2024.5.6.858> [Accessed May 13, 2025].
- [7] Carvalho, M. B., Bellotti, F., Berta, R., De Gloria, A., Sedano, C. I., Hauge, J. B., Hu, J., & Rauterberg, M. (2015). An activity theory-based model for serious games analysis and conceptual design. *Computers & Education*, 87, 166–181. Retrieved from: <https://doi.org/10.1016/j.compedu.2015.03.023> [Accessed February 20, 2025].
- [8] Collins, P., Shukla, S., & Redmiles, D. (2002). Activity theory and system design: A view from the trenches. Retrieved from: <https://www.ics.uci.edu/~redmiles/publications/J008-CSR02.pdf> [Accessed March 22, 2025].
- [9] Davis, V. (2015). 11 essentials for excellent ePortfolios. Edutopia. Retrieved from: <https://www.edutopia.org/blog/11-essentials-for-excellent-eportfolios-vicki-davis> [Accessed February 25, 2025].
- [10] Debrah, R. D., M'Rithaa, M. K., & Ng'ambi, D. (2022). Design courses and the new normal: ePortfolios as a pedagogic innovation in advancing university education. *Machakos University Journal of Science and Technology*, 248–266. Retrieved from: <http://ir.mksu.ac.ke/handle/123456780/12604> [Accessed January 18, 2025].
- [11] Dewi, F. (2014). EDMODO: A social learning platform for blended learning classes in higher education. *Research in Education Technology: Pedagogy and Technology*, 11(2), 1–11. Retrieved from: https://www.academia.edu/20300729/EDMODO_A_Social_Learning_Platform_for_Blended_Learning_Class_in_Higher_Education [Accessed February 25, 2025].
- [12] Engeström, Y. (1999a). Activity theory and individual and social transformation. In Y. Engeström, R. Miettinen, & R-L. Punamäki (Eds.), *Perspectives on activity theory. Learning in Doing: Social, Cognitive and Computational Perspectives*. Cambridge University Press; (pp. 19–38). Retrieved from: <https://doi.org/10.1017/cbo9780511812774.003> [Accessed January 2, 2025].

- [13] Engeström, Y. (1999b). Innovative learning in work teams: Analyzing cycles of knowledge creation in practice. In Y. Engeström, R. Miettinen, & R-L. Punamäki (Eds.), *Perspectives on activity theory*. Learning in Doing: Social, Cognitive and Computational Perspectives. Cambridge University Press; (pp. 377–404). Retrieved from: <http://dx.doi.org/10.1017/CBO9780511812774.025> [Accessed January 2, 2025].
- [14] Eynon, B., Gambino, L. M., & Török, J. (2014). What difference can ePortfolio make? A field report from the Connect to Learning Project. *International Journal of ePortfolio*, 4(1), 95–114. Retrieved from: <https://files.eric.ed.gov/fulltext/EJ1107844.pdf> [Accessed April 20, 2025].
- [15] Futeran, R. G. (2015). *Design for collaboration in South Africa: An activity theory perspective on participatory design* (Doctoral dissertation, Cape Peninsula University of Technology).
- [16] Gedera, D., Forbes, D., Brown, C., Hartnett, M., & Datt, A. (2023). Learning during a pandemic: An activity theory analysis of the challenges experienced by Aotearoa New Zealand university students. *Educational Technology Research and Development*, 71(6), 2271–2295. Retrieved from: <https://doi.org/10.1007/s11423-023-10284-3> [Accessed February 21, 2025].
- [17] Rahmati, T. (2017). *Activity Theory in Education: Research and Practice*, Dilani S. P. Gedera and P. John Williams (eds). Sense Publishers, Rotterdam (2016). xi + 198 pp., ISBN: 978-94- 6300-385-8 (pbk). Retrieved from: <https://www.academia.edu/89592311> [Accessed February 10, 2025].
- [18] Gogus, A. (2023). Adaptation of Activity Theory Framework for Effective Online Learning Experiences: Bringing Cognitive Presence with Teaching and Social Presences in Online Courses. *Online Learning*, 27(2), 265–287. Retrieved from: <https://doi.org/10.24059/olj.v27i2.3073> [Accessed January 13, 2025].
- [19] Hajimaghsoodi, A., & Maftoon, P. (2020). The effect of activity theory-based computer assisted language learning on EFL learners' writing achievement. *Language Teaching Research Quarterly*, 16, 1–21. Retrieved from: <https://doi.org/10.32038/ltrq.2020.16.01> [Accessed January 3, 2026].
- [20] Hardman, J. (2005a). Activity theory as a potential framework for technology research in an unequal terrain. *South African Journal of Education*, 19(2), 378–392. Retrieved from <https://journals.co.za/doi/pdf/10.10520/EJC37127> [Accessed November 3, 2025].
- [21] Hardman, J. (2005b). Activity theory as a framework for understanding teachers' perceptions of computer usage at a primary school level in South Africa. *South African Journal of Education*, 25(4), 258–265. Retrieved from <https://open.uct.ac.za/server/api/core/bitstreams/a148b2b9-8190-46af-97fb-7cefbeff68a8/content> [Accessed November 3, 2025].
- [22] Hardman, J. (2008). Researching pedagogy: An activity theory approach. *Journal of Education*, 1–30. DOI: Retrieved from: <https://doi.org/10.7146/ocps.v9i1.2086> [Accessed November 3, 2025].
- [23] Harry, D., & Gutierrez, K. D. (2009). Learning and expanding with Activity Theory. In A. Sannino (Ed.), Cambridge: Cambridge University Press. Retrieved from: <http://www.cambridge.org/9780521760751>. [Accessed March 2, 2025].
- [24] Hasan, H. & Kazlauskas, A. (2014). Activity Theory: who is doing what, why and how. In H. Hasan (Eds.), *Being Practical with Theory: A Window into Business Research*. Wollongong, Australia: THEORI, 9-14. Retrieved from: <http://eurekaconnection.files.wordpress.com/2014/02/p-09-14-activity-theory-theori-ebook-2014.pdf> [Accessed February 11, 2025].
- [25] Hew, K. F., & Cheung, W. S. (2013). Use of Web 2.0 technologies in K–12 and higher education: The search for evidence-based practice. *Educational Research Review*, 9, 47–64. Retrieved from: <https://doi.org/10.1016/j.edurev.2012.08.001> [Accessed January 7, 2025].
- [26] Kaptelinin, V. (2014). Activity Theory. *IxDF - Interaction Design Foundation*. Retrieved from: <https://ixdf.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/activity-theory> [Accessed April 10, 2025].
- [27] Kaptelinin, V., & Nardi, B.A. (1997). Activity theory: basic concepts and applications. CHI '97 Extended Abstracts on Human Factors in Computing Systems, (158-159). Retrieved from: <https://doi.org/10.1145/1120212.112032> [Accessed January 17, 2025].
- [28] Karanasios, S., & Allen, D. (2013). ICT for development in the context of the closure of Chernobyl nuclear power plant: An activity theory perspective. *Information Systems Journal*, 23(4), 287–306. Retrieved from: <https://onlinelibrary.wiley.com/doi/10.1111/isj.12011> [Accessed March 10, 2025].
- [29] Karpov, Y. V., & Haywood, C. H. (1998). Two ways to elaborate Vygotsky's concept of mediation: Implications for instruction. Retrieved from: https://www.researchgate.net/publication/280757656_Two_Ways_to_Elaborate_Vygotsky's_Concept_of_Mediation_Implications_for_Instruction. [Accessed March 7, 2025].
- [30] Keijzer-Broers, W. J. W., de Reuver, L., Atehortua, L. F., & Guldemond, N. A. (2015). Developing a health and wellbeing platform in a living lab setting: An action design research study. In Donnellan et al. (Eds.), 10th International Conference, DESRIST (pp. 25-32). Dublin. Retrieved from: <http://desrist2015.computing.dcu.ie>. [Accessed January 7, 2025].
- [31] Korpela, M., Soriyan, H. A., & Olufokunbi, K. (2000). Activity analysis as a method for information systems development. *Scandinavian Journal of Information Systems*, 12, 191–210. Retrieved from: <https://aisel.aisnet.org/sjis/vol12/iss1/8> [Accessed May 11, 2025].
- [32] Lam, A. L. K., & Tsang, A. (2025). Paper based versus e-portfolios in FL writing: A mixed methods study of young learners' enjoyment and boredom. *Computer Assisted Language Learning*, 1–26. Retrieved from: <https://doi.org/10.1080/09588221.2025.2486148> [Accessed September 7, 2025].
- [33] M'Rithaa, M. K. (2009). *Mainstreaming universal design in Cape Town: FIFA 2010 World Cup-related activities as catalysts for social change*. Cape Peninsula University of Technology.
- [34] Modise, M. P. (2025). The promise of ePortfolios for student agency in distance education and higher education: A systematic review. In *Digital resilience of ePortfolios during and beyond the COVID 19 pandemic: Lessons for the future* (pp. 711–729). Retrieved from: <https://doi.org/10.5281/zenodo.18421630> [Accessed November 20, 2025].
- [35] Montclair State University. (2018). *Creating an ePortfolio with Google Sites*. Retrieved from: <https://www.montclair.edu/information-technology/wp-content/uploads/sites/168/2018/05/Google-Sites-Guide.pdf> [Accessed August 11, 2025].
- [36] Pallitt, N., Strydom, S., & Eunice, I. (2015). Introduction to ePortfolios: Definition and characteristics. University of Cape Town. Retrieved from: <https://open.uct.ac.za/items/6fbc5901-1ed9-4149-9ced-c048133135b7> [Accessed September 17, 2025].
- [37] Peña-Ayala, A., Sossa, H., & Méndez, I. (2014). Activity theory as a framework for building adaptive e-learning systems: A case to provide empirical evidence. *Computers in Human Behavior*, 30, 131–145. Retrieved from: DOI: 10.1016/j.chb.2013.07.057 [Accessed July 17, 2025].

- [38] Queiros, L. M., Silva, C. J. P., Gomes, A. S., & Moreira, F. (2019). Context analysis of teachers' learning design practice through Activity Theory, distributed cognition, and situated cognition. *Communications in Computer and Information Science* (Vol. 1011). Springer International Publishing. Retrieved from: https://doi.org/10.1007/978-3-030-20798-4_22. [Accessed August 3, 2025].
- [39] Rhodes, T., Chen, H. L., Watson, C. E., & Garrison, W. (2014). Editorial: A call for more rigorous ePortfolio research. *International Journal of ePortfolio*, 4(1), 1–5. Retrieved from: https://dgm81phhvh63.cloudfront.net/content/user-photos/IJEP/Article-PDFs/Vol-4-1/IJEP_4-1_1-5.pdf [Accessed February 13, 2025].
- [40] Rowley, J., Bennett, D., Blom, D., & Dunbar-Hall, P. (2014). Exploring the pedagogy and impact of technology on ePortfolio creation for arts students in Australian tertiary study. *UAE Journal of Educational Technology and eLearning*, (December), 36-45. Retrieved from: http://ejournal.hct.ac.ae/wp-content/uploads/2014_Article4_Rowley.pdf. [Accessed February 13, 2025].
- [41] Rowley, J., & Bennett, D. (2016). ePortfolios in Australian higher education arts: Differences and differentiations. *International Journal of Education & the Arts*, 17(19). Retrieved from: <http://www.ijea.org/v17n19/v17n19.pdf> [Accessed February 15, 2025].
- [42] Ruhf, T. (2015). Civic engagement, historical dialogue, and the development of personal learning networks through microblogging on EDMODO. Moravian College. Retrieved from: <http://home.moravian.edu/public/educ/eddept/mEd/2015/Thesis/Ruhf.pdf>. [Accessed January 20, 2025].
- [43] Schmidt, M., & Tawfik, A. (2021). Activity theory as a lens for developing and applying personas and scenarios in learning experience design. *Journal of Applied Instructional Design*, 11(1). Retrieved from: <https://doi.org/10.59668/354.5904> [Accessed August 3, 2025].
- [44] Seyferth, T., Ritzhaupt, A. D., Singh, O. B., & Dedrick, R. (2005). Student response to an ePortfolio initiative: A grounded theory analysis. In M. Simonson (Ed.), *On the practice of educational communications and technology* (pp. 299-305). Anaheim. Retrieved from: <http://files.eric.ed.gov/fulltext/ED499896.pdf#page=310>. [Accessed April 23, 2025].
- [45] Siqueiros Quintana, M. G., Mungarro Robles, G., & Robles Tarazón, H. S. (2022). The e-portfolio as a learning evaluation tool: Main benefits and challenges. In S. Hosseini, D. H. Peluffo, J. Nganji, & A. Arrona Palacios (Eds.), *Technology enabled innovations in education* (Transactions on Computer Systems and Networks). Springer. Retrieved from: https://doi.org/10.1007/978-981-19-3383-7_15 [Accessed January 23, 2025].
- [46] Susilawati, C. (2015). Blended learning extension in a global collaborative learning environment. *International Journal of Information and Education Technology*, 5(4), 18-21. Retrieved from: <https://eprints.qut.edu.au/83857/3/83857.pdf> [Accessed January 23, 2025].
- [47] Tarling, I., & Ng'ambi, D. (2016). Teachers' pedagogical change framework: A diagnostic tool for changing teachers' uses of emerging technologies. *British Journal of Educational Technology*, 47(3), 554–572. Retrieved from: <https://doi.org/10.1111/bjet.12454> [Accessed January 23, 2025].
- [48] Wuetherick, B., & Dickinson, J. (2015). Why ePortfolios? Student perceptions of ePortfolio use in continuing education learning environments. *International Journal of ePortfolio*, 5(1), 39–53. Retrieved from: <https://files.eric.ed.gov/fulltext/EJ1107862.pdf> [Accessed March 10, 2025].
- [49] Yamagata-Lynch, L. C., Click, A., & Smaldino, S. E. (2013). Activity systems as a framework for scaffolding participant reflections about distance education in an online instructional technology course. *Reflective Practice*, 14(4), 536–555. Retrieved from: <https://doi.org/10.1080/14623943.2013.809336> [Accessed June 14, 2025].
- [50] Zainuddin, Z., Churiyah, M., Rahayu, W. P., et al. (2026). E-portfolios as authentic assessment in pre-service teacher education: Enhancing reflection, professional identity, and digital preparedness. *Education and Information Technologies*. Retrieved from: <https://doi.org/10.1007/s10639-025-13869-y> [Accessed February 24, 2026].