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Technologies For Developing The Digital Creativity Of Pre-Service Teachers In The Era Of Globalization

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ABSTRACT

Globalization and the expansion of digital learning environments require pre-service teachers to create educational resources that respond to diverse learners and contexts. This conceptual paper examines technologies and pedagogical approaches that can support the development of digital creativity in teacher education. Drawing on international competence frameworks and peer-reviewed research, it proposes an iterative model combining problem identification, digital design, collaborative feedback, classroom testing and reflection. The discussion considers multimedia production, interactive learning tools, collaborative platforms and generative artificial intelligence, with attention to accessibility, copyright, privacy and human oversight. A performance-based assessment rubric is proposed to complement self-assessment. The model is a practical proposal derived from the literature; its effectiveness requires empirical evaluation.

Keywords: Digital creativity; pre-service teachers; teacher education; globalization; educational technology; digital competence; generative artificial intelligence.

INTRODUCTION

Globalization connects educational communities across borders and expands access to ideas, teaching resources and opportunities for collaboration. At the same time, teachers must adapt materials to local languages, cultures and learners' needs. In this context, digital creativity can be understood as the purposeful generation, adaptation and evaluation of original and educationally useful ideas or products using digital tools. This working definition treats technical skill as a foundation, while emphasizing pedagogical value, contextual relevance and responsible use.

International frameworks provide a foundation for this work. UNESCO's ICT Competency Framework for Teachers identifies knowledge creation as an advanced approach to integrating technology into education [1]. The European DigCompEdu framework similarly describes educators' digital competences, including selecting, creating and modifying digital resources and supporting learners' active engagement [2]. These frameworks guide professional development, but neither automatically establishes that a particular technology will improve creativity in every setting.

Aim and approach.The aim is to identify practical ways to develop pre-service teachers' digital creativity and propose a model for their use in teacher education. This is a conceptual literature-informed paper based on selected international frameworks, a peer-reviewed theoretical model, a systematic literature review and UNESCO guidance [1–5]. It is not a systematic review or a report of an original intervention; the proposed outcomes therefore remain to be tested.

Conceptual foundations.The technological pedagogical content knowledge framework (TPACK) explains that effective technology integration depends on the interaction of knowledge of subject content, pedagogy and technology [3]. For a pre-service teacher, this means that choosing an animation tool is insufficient on its own: the teacher must also decide which concept it clarifies, which learners it serves and how it supports a learning objective. An original product gains educational value when its design is linked to these decisions.

A systematic review by Shokeen and Kaur [4] identifies attitudes and self-efficacy, skills and knowledge, practical experience and access to technology as factors associated with pre-service teachers' digital competence. These findings support designing training that combines guided practice with accessible resources and opportunities to experiment. Digital competence and creativity overlap, but they are not identical: a technically competent user may reproduce a template without developing an original pedagogical solution.

Research in Uzbekistan offers useful context for institutional planning. Zakirova and Zakirova [6] examine digital tools used by university teachers and discuss technological and human challenges in educational digitalisation. A separate study of 266 medical teachers at four public institutions found comparatively lower self-ratings in creating and adapting digital resources and responsible digital use [7]. The findings concern practising medical educators and self-reported competence; they cannot be assumed to describe pre-service teachers or their creative performance. Nevertheless, they suggest questions that teacher education programmes can investigate in their own settings.

Creativity develops within a learning environment as well as through individual effort. A review of 28 empirical studies identifies curriculum and training, psychological and environmental support, resources, legal and ethical literacy, and individual characteristics as influences on pre-service teachers' digital competence [8]. These findings support an integrated approach in which trainees have time to explore, access to guidance, and opportunities to receive constructive feedback. The relationship between these conditions and digital creativity specifically still requires further study.

A proposed technology-supported model.The proposed model consists of five connected stages. First, trainees identify a real learning problem, specify an audience and define a measurable learning objective. Second, they generate several possible solutions and select appropriate digital tools. Third, they create

a prototype, such as a short subtitled video, interactive quiz, digital story or visual explanation. Fourth, peers and, where feasible, intended learners provide feedback on clarity, originality, accessibility and pedagogical fit. Finally, trainees revise the product, document design decisions and reflect on what they would change in a future lesson. This sequence is a pedagogical proposal, not an empirically validated intervention.

Multimedia authoring tools can support the combination of text, sound, images and animation. For example, a trainee preparing a science lesson can design a short visual explanation of a difficult process and add captions and an accessible text alternative. Interactive quiz and branching-story tools can help trainees build feedback and decision points into learning tasks. The creative challenge lies in adapting these features to a specific objective rather than adding digital effects for their own sake.

Collaborative documents, shared whiteboards and video-conferencing platforms can connect trainees with peers in other institutions or countries. A shared task might ask teams to develop two versions of the same learning resource for different linguistic or cultural contexts, explain their choices and revise the materials after feedback. Such collaboration requires suitable connectivity, equitable participation and clear rules for attribution and consent.

Generative artificial intelligence can be used as a supervised aid for brainstorming lesson scenarios, drafting questions or suggesting alternative explanations. Trainees should verify generated statements against reliable sources, check for bias and inappropriate content, and disclose use where institutional or journal rules require it. UNESCO recommends a human-centred approach that considers privacy, age appropriateness and educational validation [5]. The teacher remains responsible for the accuracy, originality and appropriateness of the final resource.

An example for preschool teacher education is a digital story about seasonal change for children aged five to six. Trainees first state a learning objective, such as identifying two visible signs of autumn. They then plan a short sequence of locally familiar pictures and questions, verify the scientific content, and produce an accessible version with clear audio and captions. Peers review whether the story invites children to observe and speak, and the trainee revises the resource. An offline picture sequence can serve the same objective where internet access is limited. This example illustrates the proposed approach and does not report observed outcomes.

Teacher educators can support the process through graduated tasks: analyse an existing resource, adapt it for a new group, create an original prototype and justify revisions. Short design notes can record why a tool was chosen, how source permissions were checked and how feedback changed the final product. Such documentation makes the reasoning behind a product visible and allows the assessment to consider the process as well as its appearance.

Assessment and implementation.A practical assessment can combine a digital portfolio, a short design rationale, peer feedback and a teacher educator's evaluation. A proposed rubric can score five criteria from 1 to 4: originality of the idea, alignment with the learning objective, quality and usability of the digital product, accessibility and contextual relevance, and responsible use of sources and technology. The total ranges from 5 to 20 points. These scores are formative indicators, not established diagnostic norms; institutions should pilot the rubric, define level descriptors and examine agreement between evaluators before using it for high-stakes decisions.

Implementation requires access to devices and affordable connectivity, preparation of teacher educators, time for iterative work and alternatives for students with limited digital access. Low-bandwidth or offline resources can be used where possible. Training should also include copyright, open licensing, protection of personal data and consideration of learners with disabilities. These conditions support participation and help ensure that creativity serves educational purposes.

Conclusion

Developing digital creativity in pre-service teacher education requires more than introducing new applications. The proposed model connects pedagogical problem solving, digital production, collaboration and reflection, grounded in established frameworks [1–3]. Future research should test the model in specific teacher education contexts using a comparison design where feasible, clearly described assessment criteria and evidence from both portfolios and classroom practice. Such work can determine which approaches are effective, for whom and under what conditions.

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