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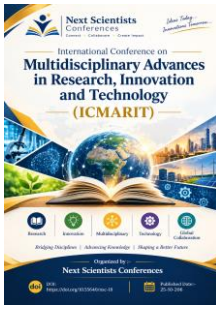
Page No: - 238-242



Principles For Developing Pre-Service Teachers' Digital Creativity In The Era Of Globalisation

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ABSTRACT

This paper provides a theoretical analysis of the development of pre-service teachers' digital creativity in the context of globalisation, drawing on international competence frameworks and academic research. Digital creativity is understood as the ability to identify an educational problem, use digital tools to create a novel and educationally useful solution, and test and improve that solution. The UNESCO ICT Competency Framework for Teachers, DigCompEdu and the TPACK approach are compared to substantiate the principles of pedagogical purpose, integration, project-based activity, cultural relevance, inclusion, information ethics, collaboration and reflection. Suggestions are offered for applying and assessing these principles in higher education for teachers. The paper is theoretical and analytical; it makes no claim to present results from an empirical intervention.

KEYWORDS: Digital creativity, pre-service teachers, globalisation, digital competence, TPACK, DigCompEdu, inclusive education, artificial intelligence, project-based learning.

INTRODUCTION

Globalisation is expanding connections among education systems, scientific knowledge and pedagogical practices. Digital platforms enable pre-service teachers to explore learning materials from different countries, create products collaboratively and share their ideas with a broad audience. At the same time, an open information environment increases the need to select sources, consider cultural context, respect copyright and develop solutions suited to learners' needs. Teacher education must therefore address not only the ability to use digital tools but also the creative and responsible use of those tools.

The UNESCO ICT Competency Framework for Teachers proposes viewing technology in relation to pedagogical practice, curricula and professional development [1]. The European Commission's DigCompEdu framework describes educators' digital activities through 22 competences organised into six areas [2]. Although technical use is important in these approaches, pedagogical decision-making and meaningful use of digital resources also occupy a central place.

The aim of this paper is to develop a set of interrelated principles for fostering digital creativity among pre-service teachers on the basis of academic literature and international competence frameworks, and to suggest ways of applying them in education. The object of study is the process of preparing teachers; its subject is the principles for developing digital creativity within that process.

Research methodology and theoretical foundations.The paper analyses purposively selected international organisational documents, a theoretical model and research reviews relevant to

the topic. The sources were compared in terms of digital competence, pedagogical integration, creative activity and responsible use; practical principles were then synthesised from the analysis. This paper is not presented as a systematic review: a comprehensive database search protocol, selection criteria and source-screening statistics were not employed. The proposed principles constitute the author's synthesis and their effectiveness requires investigation in a separate empirical study.

The TPACK model proposed by Mishra and Koehler explains the interrelationship between a teacher's knowledge of subject content, pedagogy and technology [3]. For example, a student's knowledge of presentation software represents technological knowledge; using the same tool to design a topic in a way that is age-appropriate, understandable and conducive to active learning requires the integration of content, method and technology. TPACK is not a direct instrument for measuring digital creativity, but it can provide one theoretical foundation for designing creative pedagogical solutions.

In a systematic review covering 28 empirical articles published in 2021–2025, Zeng and colleagues identify training, curriculum, psychological and environmental factors, resources, and legal and ethical literacy among the influences on pre-service teachers' digital competence [4]. These findings indicate that digital creativity cannot adequately be explained solely by a student's individual ability: the learning environment and opportunities for practice must also be considered.

Research involving scholars working in Uzbekistan also contributes relevant context. Zakirova and Zakirova analyse the use of digital tools by Uzbek university teachers and discuss technological and human challenges associated with educational digitalisation [6]. In a study of 266 medical teachers at four public institutes in Uzbekistan, Lee, Khabibullaev and Tuychiev identified relatively low self-ratings in areas including creating and adapting digital resources and responsible digital use [7]. These findings relate to medical educators and should not be generalised directly to all pre-service teachers.

In this paper, digital creativity is understood as an integrative ability through which a pre-service teacher uses the opportunities of the digital environment to recognise a specific educational problem, create a solution that is novel or distinctive and useful in that context, assess its outcome and improve it. This working definition does not reduce creativity to decoration or technical complexity. A product's novelty is assessed in relation to its audience and task, and its usefulness in relation to its alignment with the educational objective.

Principles for developing digital creativity

1. Orientation towards pedagogical purpose. Each digital task should start with its intended learning outcome and the needs of its audience. The student first answers the question, "What should the learner know or be able to do?" and then selects a tool. For example, when teaching a topic about nature, an interactive image may support observation, whereas a simple audio story may be better suited to a language-development objective. This principle directs attention to how well a product addresses the educational task rather than to the number of effects it contains [2; 3].

2. Integration of subject content, pedagogy and technology. In creative digital work, the scientific accuracy of the content, the appropriateness of the teaching method and the functionality of the tool are considered together. For instance, if a pre-service preschool teacher designs a digital game for an activity on distinguishing colours, the age-appropriateness of the

tasks, clear presentation of colours, simplicity of instructions and educator feedback should be aligned. This is an applied interpretation of the TPACK model [3].

3. Problem-based design and active experimentation. To develop creativity, students should be given tasks with several possible solutions that require more than reproducing a ready-made template. For example, in response to the problem "How can children be taught about the seasons when internet access is limited?", a student might develop a set of downloadable cards, a short audio recording and a printable activity. The process includes identifying the problem, developing an idea, creating an initial product, testing it and revising it. Analysing shortcomings in the initial version is also part of learning.

4. Alignment of global knowledge with local cultural context. International sources and advanced practices create opportunities for educators, but copying ready-made material without adaptation is not always effective. Students should adapt an idea from a source to the audience by providing explanations in Uzbek, using examples familiar in the local environment and considering the audience's circumstances. This requires avoiding stereotypical depictions of other cultures, checking translation accuracy and acknowledging the original source. In the context of globalisation, creativity is expressed through critical examination and well-founded adaptation of different experiences.

5. Inclusion and accessibility. Digital products should be designed from the outset so that learners with diverse needs can use them. Examples include adding captions to videos, describing images in text, choosing readable fonts and ensuring sufficient colour contrast. An offline or paper-based alternative may also be offered to learners with limited access to the internet or devices. Inclusion is a pedagogical criterion within the design process [1; 2].

6. Information ethics, safety and academic integrity. Students should check authorship and conditions of use for texts, images and music, acknowledge sources and protect personal data. When entering children's names, photographs or developmental information into public services, applicable permissions and institutional rules must be considered. Generative artificial intelligence can help produce ideas or preliminary text, but generated information must be independently verified, errors corrected and responsibility for the final pedagogical decision retained by a human. UNESCO's guidance emphasises a human-centred approach, privacy and age-appropriateness [5].

7. Collaboration and reflective improvement. Digital creativity can develop through individual work and through exchanging ideas in a team. One group of students can prepare a scenario while others develop visual and technical solutions; all participants then discuss the pedagogical purpose and ease of use. Each student should document their contribution, consider reasoned peer feedback and explain changes made in the final version. DigCompEdu also connects professional collaboration and reflective practice with educators' digital development [2].

8. Continuity and adaptability to context. Because technologies continue to change, it is inadvisable to restrict education to a single platform or program. Students should be able to transfer skills learned with one tool—designing, checking, solving problems and revising in response to feedback—to others. To support this, the level of difficulty can be increased gradually: students first analyse an existing resource, then adapt it, subsequently create an independent product and improve it after testing.

Application and assessment of the principles.These principles can be applied in higher education for teachers through an interdisciplinary mini-project. For example, the task may be to develop nature-observation skills in children aged five to six. Students identify the objective and audience; use sources to verify the scientific basis of the topic; propose two or three possible solutions; and create an initial version of a short digital story or interactive activity. They then obtain feedback from peers and the teacher, record difficulties encountered during use and revise the product. If testing involves actual children, institutional rules and any required consent must be observed.

The following formative criteria are proposed for project assessment: alignment with the educational objective; scientific accuracy of content; originality and usefulness in context; suitability for the audience and ease of use; acknowledgement of sources and compliance with ethical standards; and improvement in response to feedback. Predescribed beginning, developing and proficient levels can be created for each criterion. Alongside the final file, assessment considers the scenario, initial and final versions of the product, and a brief reflection. These criteria are recommendations and are not to be interpreted as a standardised diagnostic test.

To investigate the effectiveness of the proposed approach in future, initial and final products from several groups could be assessed using the same rubric, agreement among assessors examined and students' reflections analysed. Where feasible, a comparison group, an adequate sample and predetermined criteria are recommended. These measures can support a more grounded description of change and conclusions about possible effects; no such intervention was conducted in this paper.

Conclusion

Pre-service teachers' digital creativity extends beyond technical operations. It encompasses identifying an educational problem, generating an idea grounded in scientific and pedagogical knowledge, adapting a digital product to its audience, and assessing and improving it. The analysis of international frameworks and research reviews yielded eight interrelated principles: pedagogical purpose, integration, problem-based design, cultural relevance, inclusion, ethics and safety, collaboration, and continuous development. Consistent incorporation of these principles into curricula may help students not only use digital resources but also create and assess them in response to educational needs. Determining the effectiveness of these proposals remains a task for future empirical research.

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