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Article

Pedagogical and Theoretical Foundations for Developing Digital Competence Through Reflective Practice in Higher Education

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Abstract: This article examines how reflective practice can support the development of digital competence among pre-service teachers in higher education. A conceptual review compares digital competence frameworks with theories of professional reflection and experiential learning and considers their implications in light of published teacher education studies. The synthesis identifies four interrelated components: motivational and valuational, cognitive, operational and practical, and reflective and evaluative. Reflective practice connects these components by helping pre-service teachers evaluate how their choices of digital tools affect learning and revise those choices in subsequent tasks. Digital projects, electronic portfolios, reflective journals, and peer feedback provide ways to document this process. The proposed model offers a basis for curriculum design and for further evaluation in teacher education programs.

Keywords: digital competence, reflective practice, pre-service teachers, teacher education, higher education, DigCompEdu

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1. Introduction

Digital technologies are changing what educators need to know and do in higher education. Pre-service teachers need to evaluate digital information, integrate technology into teaching, assess whether it helps learners, and plan their own professional development. A review of higher education research emphasizes that teaching with technology draws on knowledge, skills, and attitudes as well as technical proficiency [1].

DigComp 2.2 organizes citizens' digital competence into information and data literacy, communication and collaboration, digital content creation, safety, and problem solving [2]. In teacher education, these abilities underpin decisions about which resources, tools, and teaching strategies fit a particular group of learners. Falloon's teacher digital competency framework extends this perspective by treating pedagogical, ethical, and professional judgment as integral to competent digital practice [3].

Learning to use a platform can prepare a pre-service teacher to carry out a task, while examining the results of that task can inform decisions about when and how to use the platform again. This article examines the pedagogical foundations of that reflective process and proposes a model for developing digital competence among pre-service teachers in higher education.

2. Materials and Methods

The article uses a narrative literature review and conceptual synthesis. A narrative approach allows frameworks, theoretical works, and empirical studies to be interpreted together when they address different aspects of a research question [4]. The analysis draws on digital competence frameworks for citizens and educators, foundational works on reflective and experiential learning, and published studies of teacher education. Sources were considered for their relevance to competence domains, the role of reflection in professional learning, or approaches to developing and assessing digital competence.

The synthesis first compares how the frameworks describe educators' digital activities. It then examines how reflection and experiential learning can connect those activities to professional development. Finally, it relates the proposed components to evidence from teacher education studies and identifies practical ways to document learning. The analysis is conceptual and draws on published sources.

3. Result

Digital Competence Domains for Educators

DigCompEdu groups educators' digital competence into six areas. Reflective practice belongs to professional engagement, and it can also inform how teachers select resources, design activities, assess learning, and support students [5]. The UNESCO ICT Competency Framework for Teachers similarly connects technology use with pedagogy, assessment, organization, and continuing professional learning [6]. Table 1 translates the DigCompEdu areas into activities that can be practiced in teacher education.

Table 1. DigCompEdu areas and examples of application in teacher education, adapted from [5].

No.	Area	Examples of application
1	Professional Engagement	Exchange ideas with colleagues through digital platforms, use education management systems, and pursue online professional development.
2	Digital Resources	Evaluate online resources, create materials in accordance with copyright, and store and share them securely.
3	Teaching and Learning	Select tools that suit lesson objectives, design in-person and online activities, and facilitate collaboration.
4	Assessment	Create online assessments, analyze evidence of learning, and provide individual feedback.
5	Empowering Learners	Adapt tasks to different learning needs and use assistive technologies to improve access.
6	Facilitating Learners' Digital Competence	Teach information evaluation, safe online participation, digital hygiene, and online etiquette.

Reflective and Experiential Foundations

Schön's distinction between reflection-in-action and reflection-on-action explains two points at which educators can exercise professional judgment. During a lesson, a pre-service teacher may notice that students are struggling to participate on a digital platform and change the way the activity is organized. After the lesson, the teacher can examine student responses, decide whether the difficulty arose from the platform or the task design, and revise the approach [7].

Kolb's experiential learning cycle extends this process from concrete experience through reflective observation and abstract conceptualization to active experimentation [8]. A pre-service teacher can test a tool in a teaching task, review the outcome, formulate

a principle about its use, and apply that principle in another lesson. The technological pedagogical content knowledge framework further explains why these decisions must consider the interaction between technology, pedagogy, and subject matter [9].

A case study by Reisoğlu and Çebi documented how pre-service teachers developed digital competence through activities organized around DigComp and DigCompEdu [10]. Haşlaman and colleagues examined the e-portfolios and reflective reports of 40 pre-service teachers in a 14-week course, illustrating how artifacts and reflective accounts can provide evidence of competence in practice [11]. Research on the use of DigCompEdu with Hungarian teacher educators provides validity evidence for its use as a self-reflection tool in that setting [12]. Taken together, these studies support using self-reflection alongside evidence of what students design, implement, and revise.

4. Discussion

Components of the Proposed Model

The synthesis identifies four interrelated components for higher education programs that prepare future teachers.

1. Motivational and valuational. Fosters in the educator a need to learn digital technologies, acquire new knowledge, strive for professional development within a digital environment, and maintain a critical perspective toward their own professional practice.

2. Cognitive. Entails the acquisition of theoretical knowledge regarding digital technologies, e-learning platforms, digital resources, information security, and digital pedagogy.

3. Operational and practical. Encompasses skills related to utilizing digital tools within the educational process, creating electronic resources, facilitating digital communication, assessing learning outcomes, and resolving problematic situations.

4. Reflective and evaluative. Enables the educator to analyze their own digital activities, evaluate achieved results, identify existing shortcomings, recognize their own capabilities, and determine directions for further professional development.

The reflective and evaluative component connects professional goals, knowledge, and practice. In a digital teaching project, pre-service teachers can explain why they selected a tool, examine evidence of learner participation or understanding, and revise their design after peer feedback. Portfolios can document versions of the artifact, while reflective journals and rubrics can record the reasoning behind revisions. This approach leaves room for professional autonomy and context-sensitive judgment, concerns highlighted in McGarr's analysis of digital competence frameworks [13].

Research on pre-service teachers' digital competence also provides a basis for considering differences in their starting skills when designing learning activities [14]. Everyday familiarity with digital media can therefore serve as a starting point for tasks on source evaluation, attention management, and responsible communication. OECD PISA evidence documents classroom distraction associated with digital devices among school-age students [15]. For teacher education, this evidence gives pre-service teachers a concrete issue to consider when designing activities and evaluating how digital tools affect attention. Testing the proposed model in higher education would require examining changes in teaching artifacts, reflective judgments, and classroom practice across time.

5. Conclusion

Developing digital competence through reflective practice requires pre-service teachers to connect professional motivation, conceptual knowledge, and practical skills with the evaluation of their own teaching. The proposed four-component model places reflection within recurring cycles of design, implementation, feedback, and revision. Digital projects, portfolios, peer assessment, and reflective journals can make these cycles visible and provide evidence of how students' judgments develop. Further research could examine the model across teacher education programs and assess how competence demonstrated in university coursework transfers to teaching practice.

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