WAYS OF DEVELOPING THE DIGITAL COMPETENCE OF PRE-SERVICE TEACHERS

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Abstract. This paper examines practical ways of developing the digital competence of pre-service teachers in pedagogical higher education institutions. Drawing on recently defended DSc and PhD dissertations and research articles, it substantiates four directions for developing digital competence: digitalising curricula, practical activity in a digital learning environment, integration with teaching practice, and reflective assessment.

Keywords: digital competence, pre-service teacher, digital learning environment, teaching practice, LMS, reflection, assessment criteria.

The digitalisation of education requires teachers to go beyond basic computer literacy: they must be able to select digital tools that fit pedagogical goals, create learning resources, and organise and assess students' work in online environments. The wide adoption of e-learning platforms and of distance and blended learning under the "Digital Uzbekistan – 2030" strategy has made this requirement even more pressing. Developing pre-service teachers' digital competence purposefully during higher education has therefore become one of the priorities of teacher education.

The concept of digital competence is interpreted in different ways in the research literature. F.I. Muxamadiyeva defines it as an integrative complex of knowledge, skills and practical experience that enables educators to use digital technologies consciously for personalising learning and for pedagogical collaboration, and she proposes assessing its level through motivational-cognitive, practical-activity and reflective-strategic criteria [1]. Z.J. Abilova presents teachers' competence in a digital learning context as an integral system made up of information-media, communicative and technical components [2]. Both approaches confirm that digital

competence should be seen not as a separate technical skill but as an inseparable part of professional pedagogical activity.

Digital competence is not an outcome acquired all at once; it is a professional quality that develops step by step. From this perspective, it is useful to distinguish three levels of a pre-service teacher's digital competence: the *user level* — using ready-made digital tools and resources by following instructions; the *practitioner level* — independently selecting digital tools that match lesson objectives and organising the learning process; and the *creator level* — designing one's own digital learning resources, testing them and sharing them with colleagues. The ways of development described below should move students consistently from the first level to the third.

Based on an analysis of the literature and on teaching experience, the following main ways of developing pre-service teachers' digital competence can be identified.

The first way is digitalising curricula and course syllabi. If digital competence is developed only within informatics or information technology courses, it becomes detached from subject teaching methods. Every course in the degree programme should therefore include tasks that involve digital tools, such as electronic lesson plans, interactive tests, online surveys and multimedia resources. M.M. Tillaboyeva likewise argues that pre-service teachers' digital competence should be developed through a coherent methodological-didactic system rather than through isolated activities [5].

The second way is active practical work in a digital learning environment. Students become competent not by hearing about digital tools but by creating products with them. Regular work in learning management systems (LMS) such as Moodle, interactive content authoring services, online collaboration boards and testing platforms turns a student from a user into an author of learning resources. F.I. Muxamadiyeva reports that applying a methodology based on software integrated with an LMS increased competence indicators by about 15 per cent [1]. H. Raxmatova also

proposes special training sessions and the use of interactive platforms as key solutions for pre-service primary school teachers [4].

The third way is integrating theoretical preparation with teaching practice. In their synthesis of qualitative studies, J. Tondeur and colleagues show that the decisive factors in preparing pre-service teachers to integrate technology are aligning theory with practice, teacher educators acting as role models, students designing their own instructional projects, collaboration, authentic experiences and continuous feedback [6]. Consequently, digital resources created by students should be tested in real classrooms during teaching practice, and the results should be discussed in groups.

The fourth way is organising independent study and reflective assessment on a digital basis. G.K. Raximova's DSc research reports that independent study assignments with creative, reflective and interactive components, together with the use of media technologies, considerably improved pre-service teachers' professional preparation: growth reached 36.4 per cent in the experimental group compared with 11.2 per cent in the control group [3]. In Z.J. Abilova's study, mastery was also higher in the experimental group, where digital technologies were applied systematically, than in the control group (71 % vs 58.33 %) [2]. These results show that students' independent work and analysis of their own activity play an important role in developing digital competence. Electronic portfolios, self-assessment sheets and peer review are appropriate tools for this purpose.

Table 1

Ways of developing pre-service teachers' digital competence

Way	Main tools and forms	Expected outcome
Digitalising curricula	Digital tasks in subject courses, interdisciplinary projects	Digital competence linked to subject teaching methods
Practical work in a digital learning	LMS (Moodle), interactive content services, online testing	The student becomes an author of learning

Way	Main tools and forms	Expected outcome
environment	and collaboration platforms	resources
Integration with teaching practice	Testing digital resources in real classrooms, model lessons, feedback	Theoretical knowledge turned into practical skills
Independent study and reflective assessment	E-portfolio, self-assessment, peer review	Ability to analyse and improve one's own digital practice

It is recommended that these ways be implemented in stages. In the *motivational-preparatory stage* (1st–2nd years), students become familiar with the digital learning environment, core services and digital ethics, and come to understand the professional value of digital technologies. In the *practical-activity stage* (2nd–3rd years), they create electronic resources, interactive tasks and online tests within their subject courses. In the *creative-reflective stage* (4th year, teaching practice), students use the digital materials they have developed in real classrooms, analyse the results and complete their electronic portfolios.

Particular attention should be paid to artificial intelligence tools. Generative AI services are now widely used to draft lesson plans, prepare task and test variants, and provide individual support to learners. Pre-service teachers should learn to use these tools, and they should also learn to evaluate their output critically, check facts, and observe the rules of academic integrity and personal data protection. Otherwise, a digital tool may replace a teacher's pedagogical thinking instead of enriching it.

Implementing these ways requires several pedagogical conditions: teacher educators must themselves have a high level of digital competence; the higher education institution must provide reliable internet access, modern computer labs and LMS infrastructure; diagnostic instruments for determining competence levels (tests,

observation sheets, product analysis) must be developed; and digital ethics, information security and copyright must be included in the learning process.

Conclusion. Pre-service teachers' digital competence develops effectively not within a single course but across the whole process of professional preparation, through the combination of course syllabi, practical work in a digital learning environment, teaching practice and independent study. The experimental results reported in the dissertations and articles analysed confirm that systematic and purposeful use of digital tools considerably increases students' competence. Future research should combine these ways into a unified methodological system and determine its effectiveness through a pedagogical experiment.

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