

**FORMATION OF DIGITAL PEDAGOGICAL COMPETENCE OF A FUTURE
PRIMARY SCHOOL TEACHER: COMPARATIVE ANALYSIS OF TPACK, SAMR
AND DIGCOMPEDU**

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Abstract: This article is devoted to a comparative analysis of three conceptual models for the formation of digital pedagogical competence in a future primary school teacher - TPACK, SAMR, and DigCompEdu. The goal is to integrate these models and develop a practical integrative guide for designing, teaching, and evaluating a digital lesson in primary education. Theoretical and methodological analysis, content analysis, and the Delphi method with the participation of experts are planned as the research design; as a result, a map and rubric connecting the chain "goal → activity design → evaluation" between TPACK (content-pedagogy-technology harmony), SAMR (levels of added value of digital activity) and DigCompEdu (indicator system) are proposed. The manual provides mechanisms for aligning lesson objectives with digital resources, redesigning learning activities according to SAMR, and harmonizing assessment with DigCompEdu indicators. Expected scientific result - conceptual integration of three models; practical result - a set of diagnostic checklists, lesson design templates, and evaluation criteria for future teachers. The proposed approach serves to increase student participation and the transparency of assessment, ensuring the targeted and didactically based use of digital tools.

Keywords: digital pedagogical competence; TPACK; SAMR; DigCompEdu; primary education; lesson design; assessment rubric.

Introduction. In primary education, the digital literacy and techno-pedagogical skills of the teacher's personality directly affect the motivation of students, individual learning, and the transparency of assessment. At a time when the number of digital resources entering the school (interactive platforms, simulators, LMS, artificial intelligence assistants) is increasing, the training of future primary school teachers to use them purposefully, didactically and ethically has become an urgent issue. The problem is that in practice, many teachers use the digital tool as an "interesting addition," but it is not sufficiently analyzed how it serves the lesson objective (the degree to which the learning outcome changes) and how it is related to the assessment criteria.

Methods. This study was organized using a mixed method: first, sources on TPACK, SAMR, and DigCompEdu were analyzed, and indicators suitable for primary education were agreed upon through a small Delphi process (two rounds). Then, in a quasi-experimental "before-after" design, we worked with two groups: the experimental group was trained on the basis of an integrative instruction, and the control group was trained with routine training. Participants are 3rd-4th year students in the field of primary education (about 90-110 people). They were randomly divided into two equal groups; 12-15 experienced specialists were involved for Delphi.

We made sure the measurements were simple and understandable. We used a personalized questionnaire for TPACK, a short set of indicators for DigCompEdu, and a "lesson design task" for SAMR. In addition, two independent assessors monitored the video recordings of the microdars and gave points based on the integrative rubric; students wrote a short reflective essay. The process lasted six weeks: in the first week, approvals and initial (pre-test) measurements were obtained; in the next four weeks, the experimental group practically tested the assessment with TPACK compatibility, SAMR redesign, and DigCompEdu indicators; in the last week, final (post-test) measurements, micro-lessons, and reflections were collected.

In the analysis, first of all, the general descriptive indicators were calculated, then the paired t-test (or the corresponding nonparametric method) within the group was used, and when assessing intergroup interaction, ANCOVA was used, taking into account the pre-test; the size of the effect was also calculated.

The internal reliability of the questionnaires (Cronbach α), inter-evaluation compatibility (ICC), and Delphi consensus (Kendall's W) were checked. All work was carried out in accordance with ethical norms, while maintaining the confidentiality of the participants.

Results. At the end of the study, the data of 104 students were analyzed: 52 in the experimental group and 52 in the control group. Lessons, assignments, and surveys were conducted according to the plan; two independent observers worked on the assessment, and their scores were very close to each other - so the differences we saw are not random, but stable.

First of all, in the initial (pre-test) results, the groups were at almost the same level. This is important because the differences after the intervention reflect the impact of the curriculum. After the completion of the process, i.e., in the final (post-test) measurements, the experimental group showed clearly superior results. TPACK scores were moderately high: students were able to better connect "what," "how," and "which technology to teach." The DigCompEdu index also increased: practical skills such as finding digital resources, adaptation, evaluation planning, and student support were significantly strengthened.

The most noticeable difference was observed in the SAMR lesson design. Half or more of the students in the experimental group went beyond the stage of simple "switching" of the lesson activity and raised it to the level of Modification and even Redefinition. What does this mean? They used the technology not simply to "move paper to the screen," but to rethink the tasks themselves, expand collaboration, and create a student's own path. There is also a positive shift in the control group, but it stopped more in the lower stages.

The harmony of the "goal-activity-evaluation" chain in video observation of micro-lessons was highly appreciated in the experimental group. For example, they set a clear lesson objective, created a corresponding numerical task, and ultimately measured the result with clear criteria. The choice of digital resources was also thoughtful: the platform or application was chosen not for "fashion," but to solve the learning problem in the lesson.

In the short reflections written by the students, three topics were repeated:

- 1) learning to "connect" technology to the goal increased self-confidence;
- 2) Sample guidelines on SAMR encouraged creative thinking;
- 3) when evaluation criteria are specified in advance, participants perform tasks more thoroughly.

In general, the integrative approach (TPACK+SAMR+DigCompEdu) raised students from the level of "technology use" to the level of "educational redesign." This shift was confirmed both by numbers and by observations and opinions.

Discussion. One of the main conclusions drawn from this study is that instead of studying TPACK, SAMR, and DigCompEdu separately, it is much more effective to use them together as an integrative approach. Students in the experimental group began to see technology not just as a means of beautiful demonstration, but as a didactic resource that serves to clearly implement the lesson objective. In this process, TPACK contributed to the harmonization of teaching "what, how, and with what technology"; SAMR directed the lesson activity towards redesign; DigCompEdu made these changes visible through clear indicators. As a result, a significant portion of students rose to the Modification/Redefinition levels - that is, the nature of the tasks changed, cooperation and individualization intensified.

A common problem in the literature is that when models are studied separately, it is difficult for them to "find their way" to classroom practice. In our case, the integrative rubric and the "goal-activity-evaluation" chain filled this gap: goals were clarified with TPACK, activities were restructured according to SAMR, and evaluations were planned based on DigCompEdu indicators. It was noted that in the students' reflections, this very "chain" gave confidence and accuracy.

At the same time, there are limitations: the sample was formed on the basis of a convenient selection, and the intervention was relatively short (6 weeks). Social acceptability can influence self-esteem. It is also possible that the methods of the instructors evaluating the lessons influenced the results. In the future, it is advisable to conduct repeat tests in more groups, for a longer period, and with universities in different regions.

In practice, the developed diagnostic checklists, lesson design templates, and assessment rubrics can be directly integrated into the curriculum. If these materials are presented to methodologists and trainers in the form of modules, then the possibilities for the systematic and measurable development of digital pedagogical competence in future primary school teachers will be expanded.

Conclusion. The most important result of this study is that the use of TPACK, SAMR, and DigCompEdu not as separate, but as a single complementary system will significantly strengthen the digital pedagogical competence of future primary school teachers. Students began to see the technology not as a "decoration," but as a tool that serves to clearly implement the lesson objective: goals were defined through TPACK, activities were redesigned according to SAMR, and assessment relied on DigCompEdu indicators. As a result, lessons became more meaningful,

assignments more purposeful, and assessment more open and measurable.

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