

**TECHNOLOGICAL RESEARCH AND DIGITAL COMPETENCIES IN
COMPUTER SCIENCE PEDAGOGY**

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Annotation. *Studies indicate that, for technology integration to take place, educators must have access to suitable equipment and receive support in the workplace. They also need a positive outlook on technology and the ability to integrate and use it for educational purposes. This requires a combination of general skills, both personal and professional. Specific pedagogical abilities are also required. This is called the professional digital competence of future computer science teachers. Teachers have two responsibilities in this regard: they must be proficient at using technology in their teaching and contribute to the development of digital competence in other educators.*

Keywords: *pedagogical education, technology, digital competence, teachers, efficiency.*

In the intricate field of teacher education, where the training of educators occurs both in universities and schools, the issue of how technology is integrated in each of these settings becomes particularly significant. How is technological proficiency incorporated into teacher training?

There is a growing need for innovative learning approaches that foster the development of students' abilities, including their capacity to employ technology to enhance critical thinking, problem-solving, and communication skills. Many educational institutions have ample access to computers and the necessary technological infrastructure, yet despite this access, the implementation of educational technologies varies in the field of computer and information literacy, as measured by the International Computer and Information Literacy Study (ICILS). The results of this study indicate that students' computer and information literacy significantly surpasses the global average level of computer and information literacy.. Nevertheless, while students engage with computers on a daily basis, 75% of them use them at home, and 8% use them at school on a daily basis. Therefore, despite the substantial efforts and investments made by our government to enhance the integration of technology in education, there remains a discrepancy between the availability of technology in classrooms and its utilization for educational purposes. This discrepancy is evident in the findings of researchers worldwide, including those in Switzerland.

The experience of using technology that teachers acquire during teacher education before starting work, both through their own use and through observing the use by other

teachers, is crucial for their development of digital competence. Therefore, the extent to which teachers choose to use technology in their teaching practices can directly affect their students' attitudes towards integrating technology into their classrooms. Additionally, an analysis of teacher education curricula shows that digital competence and technology use are not effectively integrated into either the specific subject curricula or the general curriculum.. The successful integration of technology into education has been a topic of interest for researchers and educators since technology became available for educational purposes. Most research has focused on primary and secondary education, rather than higher education. However, this study allowed us to identify several reasons why technology is not well integrated into higher education activities. First, we can explain the lack of integration by examining the nature of how technology is conceptualized and supported in educational settings. Some argue that current methods of integrating technology are technocentric, placing too much emphasis on technological skills while ignoring the complex relationships between technology, pedagogical content, and changing contextual realities.

Others, like Ertmer, suggest that the lack of technology integration may be explained by barriers that affect teachers' use of technology in the classroom. Ertmer distinguishes between first- and second-order barriers to change. First-order barriers are external to the teacher and include areas such as access to resources, learning and support. Second-order barriers, on the other hand, are internal to teachers and include their confidence (beliefs about the value of technology). A similar distinction is made in Drent and Meelis's (2008) work, where they distinguish between non-manipulable and manipulable school and teacher factors. Non-manipulate factors are those that a school can't directly control, such as teachers' age, teaching experience, government support and external support for schools.. On the other hand, manipulative factors include, for example, teachers' attitudes towards technology, their skills, the use of pedagogical technologies, or the availability of technological support and commitment to technology implementation in schools. The research literature usually identifies five barriers to technology integration: lack of access to technology; teachers' vision of technology; beliefs in the usefulness of technology; time required; and lack of professional development related to the use of technology in classrooms. Similarly, the WILL, SKILL, TOOL (WST) model was developed to explain the reality of technology integration in education.. The model identifies three key elements for a high level of technology integration: the teacher's desire to use technology in the classroom, their attitude to technology and their skills in using it, digital competence, and satisfactory access to technology as a tool. Based on previous studies using this model, Knezek and Christensen (2008) argued that differences in the level of integration of technology in classrooms can be explained by these variables. The model also includes academic performance of students, suggesting that the attitudes of teachers towards computer technology skills and access to it have an impact on integration, which in turn influences academic performance.

Christensen and Knezek (2008) argue that a positive attitude towards computers may be due to increased computer usage. Thus, factors related to the concept of will are related to teachers' attitudes towards technology, etc., which refers to beliefs or internal barriers. Teachers may have many beliefs about using technology, their self-efficacy as teacher educators, and their students, both positive and negative. Ultimately, their attitude towards integrating technology is based on a shared assessment of these beliefs. Teacher effectiveness is defined as "faith in one's ability to have a positive impact on student learning." The attitudes of teachers towards technology can also be seen in relation to their perception of the usefulness of technology. However, as noted above, a positive attitude does not necessarily lead to changes in behavior in terms of increased integration of technology into the classroom. From this point of view, teachers may have a positive attitude towards technology, but they may not use it in the classroom at the same time. This highlights the fact that the ratio is related to a number of other variables that need to be taken into account. According to the self-efficacy theory, substitutive experience or modeling is one of the four main sources (mastery experience, physiological and emotional states, substitutive experiences, and social persuasion) that change beliefs about effectiveness through the transfer of competences and comparison with others' achievements. In the context of teacher effectiveness, substitutive learning refers to observing how another person teaches. For example, a teacher observes a mentor teacher using technology to teach before starting work. The closer an observer identifies with a model, the more likely they are to influence effectiveness.

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