Jiang, B. et al. (Eds.) (2025). Proceedings of the 33rd International Conference on Computers in Education. Asia-Pacific Society for Computers in Education

Is the Polish school system keeping pace with the digital revolution? Artificial intelligence in the context of the PISA and PIAAC results

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Abstract: The increasingly widespread use of digital tools in teaching and learning is becoming one of the key factors shaping modern education systems. It is therefore particularly interesting to observe how different regions of the world are addressing this issue. The article examines the integration of digital technologies and artificial intelligence in Polish education system. Using a mixed-methods approach, the study combines quantitative analysis of PISA and PIAAC reports with a qualitative review of policy documents, academic literature, and national strategies to identify the current status of Technology-Enhanced Learning in Poland, highlights challenges, factors which help to explain Poland's relatively weak performance in PISA and PIAAC studies, proposes areas for improvement and potential fields for international collaboration.

Keywords: Artificial intelligence, AI implementation, AI-based education, digital competences, digital transformation, Technology-Enhanced Learning.

1. Introduction and Current Study

Contemporary education increasingly relies on technological tools that are transforming the ways in which teaching, learning, and the management of educational processes are conducted. This transformation applies both to teachers, who are enhancing their proficiency in digital learning and integrating technology into their instructional practices (Abdullah et al., 2023), and to students, whose learning experiences now extend beyond the traditional classroom environment (Batita et al., 2025). Technology-Enhanced Learning (TEL) has emerged not only as a response to challenges of digitalization but also as a crucial component in the development of modern educational systems worldwide (Williamson et al., 2023).

In the face of the growing influence of artificial intelligence (AI), machine learning, augmented reality, and remote educational platforms, it is increasingly important to understand how different regions of the world are implementing and adapting these solutions. Asia, as a global leader in technological innovation, is making substantial investments in the development of digital forms of education, efforts that are often reflected in the high performance of students in international comparative assessments such as PISA (OECD/UNICEF, 2021). Europe, by contrast, demonstrates a diverse range of approaches shaped by its rich educational traditions, national policies, and varying levels of technological infrastructure. The aim of this article is to present the current state and key trends in TEL in Poland, with a view to identifying potential areas for international collaboration, both in conducting joint comparative research and in sharing best practices that could contribute to the more effective integration of technology into educational processes in Poland.

Across the globe, the rapid development of AI presents both opportunities and challenges for contemporary education (OECD, 2023a). The findings of the PISA (Programme for International Student Assessment) and PIAAC (Programme for the International Assessment of Adult Competencies) studies provide up-to-date data that allow for an assessment of how well-prepared Polish adolescents and adults are for the integration of AI and modern information technologies into educational contexts. While AI was not the direct focus of either study, the reports include valuable insights into the use of digital tools by both

educators and learners. Our study employed a mixed-methods approach, combining quantitative secondary data analysis of the most recent PISA (OECD, 2023b) and PIAAC (OECD, 2024) reports with a qualitative review of policy documents, expert literature, and national strategies concerning the integration of digital technologies in education. This allowed for both statistical insight and contextual interpretation of key trends in Technology-Enhanced Learning in Poland.

2. The Current Status of Digital Technologies in Polish Schools

Although access to digital infrastructure in education has improved since the onset of the pandemic, the integration of these tools into teaching still needs to be refined. The latest PISA report (Kaźmierczak & Bulkowski, 2024) reveals that Polish teachers continue to use information technology (IT) infrequently and in a limited variety of ways in their teaching. Only 51% of students said that their teachers often use digital technologies in class, putting Poland below the OECD average of 60%. In Polish language and history lessons, digital tools are most often used to present materials, such as slides and educational films. In science and mathematics, they are used to demonstrate simulations and solve problems using specialized software. AI, being a more advanced tool, is not yet widely used, although some teachers are beginning to experiment with chatbots, adaptive quiz creation tools, and real-time student error analysis platforms. The first initiatives are mainly appearing in IT lessons. In language lessons, students use AI to correct their writing or practice their pronunciation with speech-recognition mobile apps. In science subjects, interest is growing in tools that assist with solving equations and simulating physical phenomena.

Despite these positive examples, the PISA report (OECD, 2023b) highlights some serious limitations. Many teachers lack the digital skills and subject-specific support needed to integrate AI into the curriculum. The PISA 2022 survey revealed that, despite improved access to digital infrastructure, there are significant disparities in IT usage between urban and rural schools. The data also shows that students who use ICT more often for learning at school achieve higher average PISA test scores, but only when the use of IT is purposeful and supported by the teacher. Without adequate support, intensive use of technology may not yield positive educational outcomes.

In terms of digital competence, Polish students rated their technology skills as being close to the OECD average. However, they participated much less frequently than students from other countries in projects requiring the advanced use of ICT, such as creating multimedia presentations, analyzing data, and working in teams online. Furthermore, the PISA report indicates that teachers in Poland rarely receive support on how to use ICT effectively, and only a small proportion of schools provide systematic training on modern educational technologies. This restricts the implementation of innovative teaching methods based on AI or blended learning. At the same time, the PIAAC study, in relation to adult competencies, including problem-solving skills in digital environments, indicates a significant decline in Poland’s performance in the 2023 edition compared to 2012. This deterioration has sparked a public debate concerning the effectiveness of the education system and the country's preparedness for operating within an information society (Sitek et al., 2024).

Poland recorded some of the lowest scores among the 31 participating countries in PIAAC 2023. Moreover, the results revealed a growing proportion of individuals with very low proficiency levels. The 2023 PIAAC survey was administered via computer, enabling a comprehensive assessment of ICT competencies. However, Poland reported one of the lowest levels of participant engagement, particularly among individuals with lower levels of education. These respondents frequently failed to complete more complex tasks, which negatively impacted overall results. Low levels of digital competence among adults present a major barrier to human capital development and pose a risk of secondary digital exclusion. The absence of a systemic approach to lifelong learning underlines the urgent need to integrate TEL into national adult education strategies, also with respect to teacher education.

In parallel, the "Digital School 4.0" study conducted by the Digital Poland Association (2024) found that teachers assessed the level of digitalization in schools at 7.6 on a 10-point scale. A substantial majority of educators (60%) rated the digital transformation of their

institutions highly (scores of 8–10). Among those who rated it moderately (5–7), the most frequently cited barriers included outdated technological infrastructure (25%), limited access to computers (17%), and connectivity issues (16%). Both teachers and school principals observed that primary school students generally have better access to digital devices than their peers in secondary schools. At both educational levels, teachers rated their own access to hardware and software more favorably than that of their students. The study also confirmed the widespread use of technology in instructional practice, nearly all teachers reported utilizing interactive whiteboards, projectors, and various multimedia resources in the teaching process.

A significant proportion of respondents expressed the need for support in developing lesson plans that effectively integrate technology, improving the technical infrastructure of schools, and ensuring easier access to digital resources such as online libraries. New initiatives, such as Lesson: Enter, UPSHIFT, digitALL and Eurydice, can help overcome key challenges in ICT adoption in Polish schools. Lesson: Enter develops teachers' digital competencies, while digitALL reduces digital exclusion, particularly in rural areas. UPSHIFT fosters innovation and problem-solving among students, shaping advanced digital skills. Eurydice, in turn, provides comparative data and recommendations that support more effective strategies for digital transformation.

Polish schools are on the threshold of a new era of education, in which artificial intelligence will play an increasingly important role. PISA results show that although digital infrastructure has been significantly expanded, the integration of AI into the teaching process is still in its infancy. Limited professional development leaves teachers unprepared to integrate ICT effectively, while gaps in infrastructure restrict equal access to digital resources. This requires investment in teacher competencies, smart systemic support and a change in approach to modern education. A school's readiness for AI does not only mean having the right tools, it is primarily a readiness to change the culture of teaching.

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