Title: Enhancing Professional Communicative Competencies through AI: Pedagogical and Psychological Impacts on Students in the Classroom

Iskandarova Sharifa Madaliyevna, Fergana State University, Doctor of Philological Sciences. Uzbekistan, prof.iskandarova@mail.ru

Ganieva Dilafruz PhD student of Kokand Pedagogical Institute. Uzbekistan dilyaganieva17@gmail.com

Abstract

Artificial intelligence (AI) is increasingly penetrating the educational environment, opening new opportunities to improve professional communication competencies among students. Considering this, it is important to investigate the pedagogical and psychological effects of AI on students in the classroom. This study aims to investigate the impact of AI on learning, specifically on the development of students' communication skills. We will examine how AI can help improve these skills and discuss possible problems and challenges. In addition, we will discuss pedagogical strategies and approaches that can help optimize the use of AI in the classroom. Our goal is to provide educators and researchers with valuable insights and recommendations for using AI to improve students' professional communication competencies.

Keywords: Artificial Intelligence (AI), education, learning, pedagogy, personalized learning, student engagement

Introduction

In the modern educational landscape, artificial intelligence can potentially revolutionize the classroom experience for students. AI can significantly

enhance pedagogical and psychological impacts on students by offering personalized learning experiences, adaptive tutorials, and effective feedback. By utilizing AI technologies, educators can tailor instruction to meet individual student needs, allowing for a more engaging and effective learning environment (Colchester et al., 2016). AI also has the potential to alleviate the burdens on teachers, allowing them to focus more on teaching by automating certain tasks and providing valuable insights into student progress. As AI continues to be integrated into education, teachers need to upgrade and retrain themselves in order to leverage the benefits of AI in the classroom fully. Additionally, integrating AI in education calls for participatory design methodologies, ensuring that the development of AI in Education technologies considers the needs and perspectives of teachers, parents, and students. This collaborative approach will empower educators and contribute to the successful implementation of AI in the classroom (Kizilcec, 2023), ultimately leading to improved student outcomes.

Furthermore, the emergence of AI in education presents an opportunity for the reconceptualization of schooling and the role of teachers. As AI technologies continue to advance, there is a need for critical initiatives to address ethical considerations and privacy concerns. Interdisciplinary collaborations and large-scale research efforts are essential to ensure the responsible and ethical application of AI in education (Gillani et al., 2022). In addition, it is important to carefully consider the potential drawbacks and challenges of integrating AI into education. AI technologies have the potential to transform the traditional role of teachers in the classroom. As AI-driven personalized learning experiences and adaptive tutorials become more prevalent, the role of educators may shift to that of facilitators and mentors rather than traditional lecturers. This shift in perspective calls for a reconceptualization of schooling, focusing on the collaborative partnership between AI technologies and educators to create an enriched learning environment that fosters critical thinking, problem-solving, and creativity (Ouyang & Jiao, 2021).

Methodology

This study employs a narrative literature review to explore AI's impact on students' communication skills in the classroom. We follow these steps:

Identifying Relevant Literature: We search academic databases for articles on AI in education and communication skills using keywords like «AI in education», «communication skills», and «pedagogical impact».

Inclusion and Exclusion Criteria: We select peer-reviewed articles that focus on AI's influence on students' communication competencies and exclude unrelated studies.

Data Collection: We gather information from selected literature, including findings, methods, and key insights, categorizing it by themes.

Synthesis and Analysis: We synthesize data, identify common trends, and analyze strengths, weaknesses, and research gaps.

Discussion and Recommendations: We discuss AI's pedagogical and psychological impacts, addressing challenges and providing recommendations for educators and researchers.

Conclusion: This narrative review offers insights into AI's role in enhancing communication skills. Understanding AI's effects is crucial for educators and education stakeholders as it transforms communication skill development in the classroom.

Results

AI and ML's Transformational Impact on 21st Century Educational Pedagogy

In the 21st century, artificial intelligence (AI) and machine learning (ML) have emerged as transformative tools in global education, shifting traditional teaching methods to technology-enhanced learning (Poquet et al., 2021; Ahmad et al., 2021). They have revolutionized learning from a one-dimensional approach to a multifaceted digital experience (Hsu et al., 2021), significantly elevating educational pedagogy (Borko, 1985; Gordon & Debus, 2002).

The term "artificial intelligence" was first coined in 1956 by John McCarthy and has been prominent in various technical fields, but its integration

into education pedagogy has been slower (Zawacki-Richter et al., 2019; Kabudi et al., 2020). Recent advancements have seen AI and ML being applied in educational settings, supported by initiatives like OpenAI and the development of education technology (EDTECH) tools such as humanoid robots (Webb et al., 2020).

Machine learning, a subset of AI, enhances the functionality of intelligent devices, offering real-time responses and is pivotal in creating smart tutoring environments in classrooms (Hamal et al., 2022; Chen et al., 2020). These technologies not only mimic human cognitive abilities but also provide comprehensive teaching and learning support through various programming languages and internal components (Tedre et al., 2021).
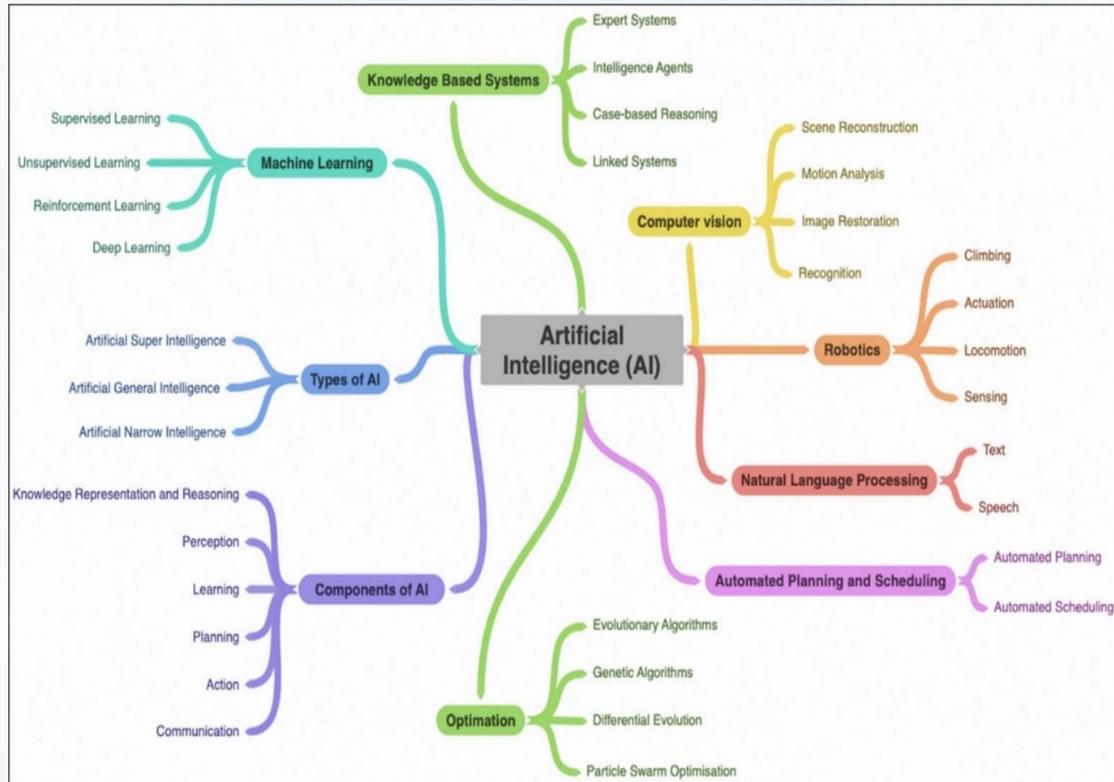
In education, AI and ML offer a range of applications from speech recognition to learning analytics, significantly contributing to interactive teaching and feedback mechanisms, digital curriculum development, and student progress tracking (Ouyang & Jiao, 2021; Baker & Ga, 2021; Cox, 2021).

Understanding education pedagogy as the art and science of teaching, it's clear that AI and ML have a significant role in evolving teaching methods and impacting student learning behaviors (Klitmøller & Klitmøller, 2017; Lavelle et al., 2020). AI and ML are crucial in providing personalized feedback, enhancing communication, and supporting inclusive education, particularly in STEM fields (Lee & Lee, 2021; Pandey & Gelin, 2017; Popenici & Kerr, 2017).

Figure 1 presents a detailed structure of the components, types, and subfields of artificial intelligence, as outlined by Regona et al. (2022). This figure serves as a comprehensive visual representation that categorizes the various aspects of AI. It includes an in-depth breakdown of the primary components that constitute AI, the different types of AI systems, and the diverse range of subfields that fall under the broader umbrella of AI. This structured depiction is instrumental in understanding the complexity and multifaceted nature of artificial intelligence, as it highlights the interconnectedness of its components, types, and subfields.

Figure 1. Components, types, and subfields of AI based on Regona et al (2022).

AI and Education

AI enhances education by personalizing learning, offering instant feedback, and streamlining assessments. It can tailor online learning platforms to individual student needs, with learning management systems delivering custom recommendations and progress tracking. Virtual reality and social media can foster collaboration and connection among students and teachers. Interactive tutorials and virtual assistants can address student queries, offer explanations, and guide learning, allowing for self-paced, supported education (Mahendra 2023).

The COVID-19 pandemic has significantly shifted towards online and blended teaching and learning. Educators have been striving to incorporate new technologies into their classrooms during this period, as highlighted in studies by Ng et al. (2020), Sartika et al. (2021), and Whalley et al. (2021). Artificial

Intelligence in Education (AIED) has gained popularity among these technologies, especially during the pandemic. Several studies have initiated discussions on how AI reshapes education by reducing teachers' workloads by automating non-teaching tasks, improving data analysis, and optimizing online teaching (Kexin et al., 2020). Luckin et al. (2016) argue that AI can enable a new form of education that is more learner-centered, adaptive, collaborative, and creative. The authors propose a vision for how AI can support the development of 21st-century skills and competencies include critical thinking, problem-solving, communication, and collaboration. It emphasizes the importance of involving learners, educators, and society in designing and evaluating AI systems for education.

Personalized learning

The integration of artificial intelligence (AI) in education, particularly in personalized learning, has significantly transformed student learning experiences (Rana et al., 2022). Personalized learning tailors education to individual student needs, leveraging AI to adapt instruction and pace (Zarei et al., 2022). AI's machine learning algorithms analyze student data to customize learning experiences, offering resources and adjustments in learning tasks specific to each student's requirements (Samad, 2022; Samudrala et al., 2022). This approach supports diverse learning needs, assisting struggling students and challenging advanced learners, thereby enhancing engagement, academic performance, and retention rates (Gningue et al., 2022; Al-Abboodi et al., 2021).

AI-based platforms facilitate this by analyzing past performance, adapting to learning paces, and providing customized feedback (Ibrahim et al., 2022; Alarabi & Wardat, 2021; Mohammed Al-Bahrani et al., 2020). Examples include Carnegie Learning's math software and Duolingo's language platform, which have shown significant improvements in student outcomes (Al-Bahrani et al., 2022). However, challenges such as the need for accurate data and teacher training in AI tools remain (Wu et al., 2022; Zahmatkesh et al., 2022). Despite these challenges, AI-driven personalized learning offers substantial benefits in

various educational settings, promising a transformative impact on student learning (Jarrah et al., 2022; Balamurugan et al., 2022; Anjan Kumar et al., 2022).

The Rise of Chatbots

Chatbots, computer programs simulating human conversation, have become increasingly prevalent in education, offering personalized student support and automating administrative tasks (Sreenivasu et al., 2023; Yeruva, Choudhari, et al., 2022). As virtual tutors, they provide instant feedback, answer queries, and guide students, enhancing the learning experience with personalized recommendations and progress tracking (Sridhar et al., 2022). Additionally, chatbots efficiently handle routine tasks like scheduling and grading, freeing educators to focus on teaching (Mohammed Al-Bahrani, Bouaissi, & Cree, 2022; Gningue et al., 2022).

Moreover, chatbots create engaging, interactive learning environments, potentially gamifying education to boost motivation and participation (Patil et al., 2022; Stoica & Wardat, 2022). However, challenges include designing chatbots to be student-centered, accessible, accurate, and unbiased (Abbas et al., 2022; Al-Abboodi et al., 2022). Institutions like Georgia State University and the University of Adelaide have successfully integrated chatbots, named "Pounce" and "MyUni" respectively, for student support in academic and administrative areas (Mohammed Al-Bahrani, 2019; Yeruva, Durga, et al., 2022). Duolingo's language learning chatbot also exemplifies this technology's potential in enhancing language education (Gningue et al., 2022).

AI in Grading and Assessment

AI's role in automating grading and assessments allows for quick feedback and reduces educators' workload (AlAli, Wardat, & Al-Qahtani, 2023). Using algorithms, AI evaluates student work against set criteria, offering prompt performance feedback (M Al-Bahrani et al., 2018; Li et al., 2022). Automated essay grading systems, employing natural language processing and machine learning, exemplify this, providing immediate essay evaluations (Stoica &

Wardat, 2021). AI in education enhances personalized learning, streamlines processes, boosts student engagement, and improves data analysis, though it also presents challenges that must be carefully managed.

In Table 1, we have conducted a comprehensive analysis of the various benefits associated with the use of artificial intelligence (AI) in the field of education. This analysis delves into the multiple ways in which AI technology can enhance educational practices, improve learning outcomes, and foster a more efficient and effective educational environment. We have explored the potential of AI to personalize learning experiences, streamline administrative tasks, and provide insights through data analysis. Additionally, the table examines the impact of AI on teacher support and student engagement, as well as its role in creating innovative educational tools and methodologies. This thorough investigation aims to provide a detailed understanding of how AI can positively transform the educational landscape.

Table 1. Benefits of AI in Education

Aspect of AI in Education	Description
Personalized Learning	AI tailors the educational experience to individual students, enabling them to learn at their own pace and in line with their specific needs and skills, resulting in enhanced learning outcomes and higher student engagement.
Increased Efficiency	AI automates routine tasks like grading, data analysis, and administrative duties, allowing educators and students to allocate more time to substantial, impactful activities.
Improved Student Engagement	AI enhances student engagement through interactive learning experiences. Tools such as chatbots and virtual assistants make learning more enjoyable and dynamic, while adaptive learning technologies keep

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	students involved by aligning content with their comprehension level.
Better Data Analysis	AI efficiently processes vast data sets to extract insights about student performance. This analysis empowers educators to understand their students' needs more deeply and customize their teaching methods for improved outcomes and student achievement.

Further we have undertaken an extensive examination of the challenges and obstacles presented by the integration of artificial intelligence (AI) into the education sector. This detailed analysis focuses on identifying and understanding the various complexities and issues that arise when implementing AI technologies in educational settings. We address concerns such as ethical implications, data privacy and security, the potential for bias in AI algorithms, and the need for adequate infrastructure and resources. Additionally, the table highlights the challenges in ensuring equitable access to AI technology across different socio-economic groups and regions, as well as the importance of training educators to effectively utilize AI tools. The analysis also considers the impact of AI on traditional teaching methods and the potential resistance to change within educational institutions. By exploring these challenges in depth, Table 2 aims to provide a holistic view of the hurdles faced in harnessing AI for educational advancement.

Table 2. Challenges of AI in Education

Aspect of AI in Education	Description
Privacy and Securit	Risk of personal data misuse necessitates strong privacy and security measures to protect student information.

y Concerns	
Lack of Trust	Students may prefer human evaluation over AI-generated feedback, highlighting the need for trust-building.
Cost	High costs of AI implementation and maintenance can be prohibitive, especially for budget-constrained institutions.
Potential Bias	Biases in training data can lead to unfair treatment of students, requiring careful attention to prevent inequality.
Ensuring Accessibility	AI systems must be designed to be accessible to all students, including those with disabilities.
Transparency	AI decision-making processes need to be transparent to build trust and understanding among students.
Fairness	AI in education should treat all students equally, avoiding discrimination based on race, gender, or other factors.
Future of AI in Education:	The future of AI in education is promising, with potential for significant innovation and growth. Advanced AI systems are expected to offer more sophisticated understanding of human emotions, provide in-depth feedback, and develop individualized lesson plans, revolutionizing personalized and effective education.

Challenges of AI and ML in Education Pedagogy

Despite the recognized importance of integrating AI and machine learning (ML) in education pedagogy, there are significant challenges faced by educational institutions. Key benefits highlighted by researchers like Warburton (2003) and Cheng, Chae, and Feng (2021) include enhanced technology mastery and increased teacher efficacy. Moreover, AI and ML are instrumental in special education and predicting academic performance as noted by Ali (2020) and

Villegas-ch and Palacios-pacheco (2020). However, several obstacles hinder the effective implementation of these technologies:

Limited AI/ML Knowledge Among Teachers: Many educators still view AI and ML as threats to their jobs, resulting in resistance to incorporating these technologies in teaching. This attitude leads to a lack of essential 21st-century skills in education (Thanh et al., 2021; Okagbue, Ezeachikulo, & Muhideen, 2022).

Inadequate Infrastructure: Financial constraints and a lack of digital competencies impede the adoption of AI and ML infrastructure in schools. The reluctance of some administrators to invest in AI technology due to a limited understanding of its benefits also plays a role (Francis et al., 2023; T. Wang & Cheng, 2021; Luan et al., 2020).

Absence of AI-Driven Curriculum: The lack of a curriculum that incorporates AI and ML hampers the practical teaching of these technologies, preventing students and teachers from fully understanding and utilizing them (Ouyang & Jiao, 2021).

No Comprehensive AI/ML Education Policy: Educational policymakers have not yet established policies to support the widespread integration of AI and ML in pedagogy. Such policies are necessary for fostering effective teaching, learning, and sustainable technology integration (Luckin & Cukurova, 2019; Zawacki-Richter et al., 2019).

Discussion

As we have explored the various ways in which AI has impacted classroom students in terms of enhancing their professional communicative competencies, it is evident that the use of AI technology offers significant pedagogical and psychological benefits. By incorporating AI tools and platforms into the learning environment, students are provided with personalized learning experiences, instant feedback, and opportunities for collaborative engagement. Moreover, the psychological impacts of AI contribute to fostering a supportive and inclusive

classroom environment, where students feel empowered to express themselves and develop their communication skills.

Overall, the integration of AI in the classroom has the potential to effectively prepare students for the demands of the professional world, while also positively influencing their psychological well-being. As AI continues to advance, educators need to harness its potential to maximize the communicative competencies of their students. In conclusion, the pedagogical and psychological impacts of AI on students in the classroom are significant and beneficial, leading to enhanced professional communicative competencies and preparing students for success in their future careers. By using AI in the classroom, teachers can provide personalized learning experiences to cater to individual students' needs and preferences.

On the other hand, the integration of AI in the classroom has raised concerns about the potential negative impacts on students' learning and development. Critics argue that the reliance on AI tools and platforms may lead to a reduction in critical thinking and problem-solving skills among students. Instead of fostering independent learning, AI technology could create a dependency on automated feedback and solutions, limiting students' ability to think creatively and develop essential cognitive skills. Furthermore, the use of AI may also exacerbate existing inequalities among students, as access to advanced AI technologies could be limited by socioeconomic factors, leading to disparities in educational outcomes.

As AI continues to become more prevalent in the classroom, it is important to critically assess its potential drawbacks and consider the long-term implications for students' learning experiences. While AI can offer personalized learning opportunities, educators must balance its use with traditional teaching methods to ensure the holistic development of students. Additionally, addressing the digital literacy and ethical considerations associated with AI use in education is crucial to empower students to navigate and critically evaluate the impact of AI on their learning journey.

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