EDUCATORS' PERCEPTIONS AND MENTAL MODELS OF AI AND SOCIAL-INTELLIGENT ROBOTS IN ACADEMIC SETTINGS

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ABSTRACT

Background: In the 1990s, Sweden launched a nationwide program providing subsidised computers and broadband internet access (Scott, 2018). This initiative bridged the digital divide, fostering a digitally skilled population and transforming education through interactive, personalised learning experiences (Barkoczi et al., 2020; Bhimwal & Mishra, 2023; Scott, 2018; Wang et al., 2024). It also paved way for the success of companies like Spotify and King, which continue to transform lives globally (Scott, 2018). Despite the initiative's potential, adoption of digital technologies has been hindered by a lack of digital literacy, training and skills among teachers, particularly in integrating advanced technologies like Artificial Intelligence (AI) into the school curriculum (Scott, 2018; Velander et al., 2023a; Velander et al., 2023b, pp. 124-135). This challenge is heightened by AI's fast-paced evolving nature and related technologies, such as Large Language Models (LLMs) or robotics. In fact, according to Jensen Huang's recent keynote featuring social robots integrated with LLMs at Computex 2024, "***the next wave of AI is physical AI***". These models autonomously perform complex tasks, making them integral to various industries (Huang, 2024). Also, they might exhibit human-like cognitive interaction and advanced human-robot communication through their understanding and adaptable nature (Atuhurra, 2024; Belpaeme et al., 2018; Cox, 2021; Kumar, 2023). However, integrating socially intelligent robots into educational settings might require promoting further teachers' digital competencies and training. By focusing on the human-in-the-loop approach, educators need to understand how they can adapt and adopt collaborative teaching models where these machines can support teachers with monitoring of social cues, detect student engagement, track performance, enhancing educational experiences and leading to better learning outcomes (Fong et al., 2003; Dautenhahn, 2007).

Motivation and Study Gap: Research suggests that teachers' acceptance of social-intelligent robots depends on their confidence and experience with the technology (Rani et al., 2023). Additionally, positive student responses to AI educators are influenced by the ease of use and task complexity (Al Darayseh, 2023; Chen et al.,

2023). To successfully adopt AI and socially intelligent robots in educational settings, robust pedagogical frameworks and enhanced teacher understanding are crucial.

Study Aims and Objectives: This study aims to understand teachers' perceptions, knowledge, and expectations of socially intelligent robots in education. It also explores the significance of AI literacy in enhancing the integration of these robots in teaching (Ho et al., 2021; Srinivasan, 2019). The objectives of the study includes RO1: To explore challenges teachers face when implementing AI and intelligent robots in educational context, focusing on perceived usefulness, and the adequacy of existing pedagogical frameworks. RO2: To optimize the use of social-intelligent robots in education, instructional methods should focus on improving student engagement and learning outcomes.

Study Design: In this mixed-methods study, participants engaged in a structured intervention using social robots to enhance teaching and learning. An initial workshop with 7 participants, including teachers, teacher educators, and educational technologists from Spain, France, Sweden, and Japan, focusing on grades 4-9 and upper secondary education was conducted. The workshop included pre- and post-session questionnaires to capture participants' initial attitudes, experiences, and changes in perceptions. During the 3-hour interactive session, participants engaged in hands-on activities with social-intelligent robots and discussions aimed at shifting their perceptions of AI and social-intelligent robots in education. The intervention was closely monitored, and feedback was collected to enrich quantitative data with qualitative insights, providing a comprehensive understanding of the impact of AI and robots on educational practices.

Initial Findings: The study's initial findings align with the research objectives. For **RO1,** participants exhibited moderate to low knowledge of AI and socially intelligent robots, alongside concerns about readiness, student distraction, and over-reliance on technology, highlighting the challenges teachers face. These insights reveal the perceived usefulness and adequacy of existing pedagogical frameworks, informing the development of targeted training programs to enhance teachers' AI literacy and integration strategies. For **RO2,** despite knowledge gaps, participants identified specific roles for robots that enhance educational outcomes, such as assisting in various tasks and providing diverse perspectives. This indicates potential instructional methods to optimize AI use in education. Scenarios for integrating robots into lesson plans, like improving writing skills and teaching different subjects, illustrate how AI can be effectively employed to address variations in technology performance and improve student engagement.

Future Expectations: The study is expected to demonstrate improved instructional engagement among teachers using socially intelligent robots and will include additional workshops for tertiary educators and possibly K-12 students in Sweden. This will provide the study with a better perception on how to improve academic engagement amongst K-12 students in Sweden. Also, to identify better insights from the provided data, topic models and sentiment analysis will be employed to understand attitudes, and perception gaps between teachers and students.

Possible Outcomes: Enhanced teacher competency in utilizing robotics and AI within the classroom. Furthermore, the development of a robust framework will facilitate the effective integration of AI and socially intelligent robots into educational practices, preparing K-12 students for future technological advancements. Teacher training programs will offer workshops on robotics and AI techniques, fostering institutional collaboration and guiding the integration of AI to address educational challenges and opportunities in Sweden.

Keyword: Artificial Intelligence (AI), Social-Intelligent Robots, Mental Models, Educators, Teaching Practice

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