

Generative AI for Supporting Pre-Service Teachers' Collaborative Learning

Theoretical groundings

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Abstract

This work in progress paper outlines assumptions and expectations about the possibilities of artificial intelligence (AI) for supporting learning. We highlight topics that should be taken into account when considering the use of AI, especially large language models such as ChatGPT and Copilot, for supporting collaborative learning practices. The utilization of these technologies requires elevating the pedagogical questions to the central role. We assume that with an appropriate pedagogical design, these applications can serve as valuable tools to foster and stimulate students' cognitive engagement and collaborative knowledge creation, instead of substituting these important elements of the learning process. Especially, the research conducted within the field of collaborative learning, offers valuable perspectives to be considered as the starting points for utilizing AI. Within this paper we outline some of these key themes. This work in progress paper offers pedagogical perspectives for the utilization of artificial intelligence as well as an example of an upcoming research pilot.

Keywords: e-learning; artificial intelligence; collaborative learning; teacher training

Leveraging AI for Learning

This paper outlines assumptions and expectations about the possibilities of artificial intelligence (AI) for supporting learning. The aim is to build understanding about the role of AI as part of the learning process, AI as part of a collaborative learning. Within the field of

educational technology there has been a long chase for automating personalized support and guidance (Mousavinasab et al. 2021). Different, *more or less* adaptive educational systems have provided students with various tasks and tutoring based on their learning activities and AI (e.g., MacLellan, C. J., & Koedinger, 2022). For these aims the generative AI, implemented as the different chat tools such as ChatGPT and Copilot, provide more flexible possibilities. These tools allow students to chat with and ask questions related to different content areas. The responses the systems provide are correct, incorrect or something between. We assume that these applications can provide valuable tools for supporting students learning in small groups.

The role of AI in education can be seen in various ways for various purposes. Within the literature the AI is recommended as a tool for teachers to design and create learning activities and materials (Jeon & Lee, 2023). Again, like in this case, AI is also seen as a technology for supporting students learning processes (Sharples, 2023; Sabzalieva & Valentini, 2023). When used as a technology for supporting learning the role of AI can be seen continuing the long tradition of educational technology development (Resnick, 2023). AI is used as a technology for targeting effective drill and practice like activities, based on instructionist approach for learning and on the other end, AI is used merely as technology for supporting students' creativity and collaboration aligning with constructionist approach for learning. In order to use AI for supporting students active and collaborative learning, Sharples (2023) and Sabzalieva and Valentini (2023) suggest different roles for AI such as *Collaboration coach*, *Study buddy*, *Socratic opponent* and *Storyteller*. Common for all these different roles is that they emphasize AI as a human like resource, peer student or tutor, aimed for using AI in a way that do not provide ready-made answers or learning paths but rather triggers students thinking, discussions, formulating questions and assessing responses. These roles allow AI to support individual students' learning and collaborative learning in small groups.

Within the field of collaborative learning, the role of technology has traditionally been for enabling and supporting the dialogue between students or as a shared reference point, triggering students' discussion (Feyzi Behnagh, & Yasrebi, 2020). Within the roles of AI described by Sharples (2023) and Sabzalieva and Valentini (2023) AI is seen increasingly viewed as member of a group or as a tutor triggering conversation. Students are able to share and test their ideas with AI, gain ideas and perspectives and to ask advice. Again, what makes AI especially interesting from the perspective of learning, is the demands that formulating good prompts can provide. Prompting is seen here as a process that activates students thinking, similar to when students are asking questions from their peers, teachers or tutors. According to Chin and Osborne (2008) posing questions activate students' knowledge and focuses their attention to the topic, challenging them to articulate and formulate their understanding so that others can understand. Similarly with writing a prompt we can assume that the process, alone or especially with small groups, challenges students to elaborate their understanding. We assume, in line with ideas by Webb and Mastergeorge (2003), that the prompting as its best can demand students to clarify and even transform and reorganize their understanding.

Again, currently AI is an *intelligence* that may "hallucinate" i.e., the results may be true or completely false ones (Alkaissi & McFarlane, 2023). Even though this can sound as a rather normal situation within a group of students or even experts, every now and then the comments and ideas may be totally incorrect. Still, with AI it seems that this risk of

hallucinating is better known and often deliberately highlighted. We assume that this feature of AI needs to be emphasized, to nourish students' critical approach to the responses provided by AI. We see this as a possibility for learning, when students are critically assessing the results, discussing them, even searching additional information for confirming or rejecting the results. Again, while elaborating with the results gained from AI, this process can be seen as a way to create cognitive conflicts, indicating the dissonance between new information and existing understanding (see Piaget, 1976). Resolving the differences and conflicting ideas between students and AI can serve as an efficient way to support students learning.

Along with seeing AI more or less as a member student groups, the role of AI as tutor or even teacher, responding students' questions can provide promising opportunities for learning. As indicated above, prompting and asking for help or advice is beneficial for students' learning. Still, this does not go without problems (Mäkitalo-Siegl, Kohnle & Fischer, 2011). According to Ryan, et al., (2001) students may worry about negative judgements and reactions from their peer students or even from their teacher. These challenges show especially with low-achieving students while for high achieving students do not perceive the same challenges (Ryan & Pintrich, 1997). Again, in order to avoid these challenges, the "avoidance of help seeking" AI may provide new solutions. Instead of avoiding the assumed consequences of asking for help and support, with AI this can be done more privately and ask questions that normally might be felt even embarrassing.

Since the early days of educational technology, the role of AI has been mainly seen as intelligent tutor or learning analytics (Ye, 2022). Now the generative AI provides more flexible opportunities for supporting students' learning. The possibilities outlined above are assumptions based on previous research on learning and altogether on use of educational technology. Within this paper we use those assumptions as a starting point for developing the course using AI for supporting the learning of quantitative research methods.

Experiment with AI

The context of this study will be a course for pre-service teachers focusing on quantitative research methods. The course contains ten face-to-face classes and home assignments. The home assignments will be tasks where pre-service teachers will use Jamovi software to design research instruments, analyze and report quantitative data sets. Tasks will be open inquiries, meaning there will be no one single right way to make them. In order to conduct these tasks pre-service teachers are encouraged to use AI, in this case *Copilot* or *ChatGPT*. The role of AI will be introduced as an extra support, to provide pre-service teachers with help when needed. Pre-service teachers will be advised to work in pairs or groups of 3 students, to formulate and try different types of questions with AI and to evaluate the nature of responses. Within instructions the pre-service teachers will be encouraged to devote effort for thinking and formulating questions, prompts, to think when the right time is to pose questions, acknowledging the value of these activities for their own learning (see Webb & Mastergeorge 2003). Based on previous studies, collaboration and asking questions has been shown as a challenging task demanding strong guidance and even detailed scripting (Mäkitalo-Siegl et al. 2011). The emphasis is on guiding students to think what the areas are

they already understand and what they do not understand, to support their metacognitive level thinking (see. Webb & Mastergeorge 2003). Instead of trying to get direct answers and ready-made tasks, the aim is that students, future teachers, would comprehend the benefits of AI for pedagogy. Also, the aim is that pre-service teachers would reflect the result gained, possibly check the correctness of the results elsewhere or test their usability with Jamovi software. We assume that these activities will trigger pre-service teachers' thinking and discussing the topic and learning. Along with mere content areas the target of this experiment is that pre-service teachers would gain authentic experiences of using AI for learning, to understand how capable the current AI systems are, and how they can be used in the future for supporting teaching and learning. The role of AI will be important within their future work as teachers, so these experiences will be needed.

The aim of this work is to deepen understanding about how AI can serve as an educational technology, supporting collaborative learning. For this reason, the target group, pre-service teachers, will be ideal, as a group of students with a pedagogical background to critically assess the possibilities and challenges related to AI. The target group will be approximately 50 second year pre-service teachers. Experiments are scheduled for autumn 2024. The main data will consist of diaries written by pre-service teachers about their experiences of learning with AI. Participants will compose brief memos after each session and if needed, additional materials will be collected in order to gain deeper perspectives for the AI experiment.

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