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Generative AI in Collaborative Learning Environments

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Both potentials and concerns related to generative AI in education have been heavily discussed, particularly since the launch of ChatGPT towards the end of 2022. Potentials to improve students' learning experiences through interactions with AI have for example been emphasized while academic integrity has been a central concern. However, much of this discussion has centred on the individual (Sharples 2023); the individual student's or teacher's interaction with a chatbot, the individual student's potential "cheating" at exams, and the individual student's need for AI literacy. In this context, collaboration has often been understood to refer to human-AI collaboration, i.e. collaboration between an individual and AI, not collaboration between humans while interacting with generative AI. However, generative AI has been argued to have the potential to contribute to the "social learning process of setting shared goals, performing tasks together, exploring possibilities, and conversing to reach agreements" (Sharples 2023). Through this special issue of Academic Quarter, we have aimed to direct attention specifically towards the dynamics when generative AI is integrated in such collaborative learning environments.

Empirical research in this area is surprisingly scarce. In the following, we highlight three exemptions, all conducted within the context of higher education. Firstly, Perifanou and Economides (2025) explore student teams' use of generative AI in project work. They find that, as opposed to e.g. independently developing prompts and then discussing their respective outputs, students prefer a working mode where they collaborate on iteratively generating and revising prompts and on evaluating output, finding that this provides a shared discussion space and supports a collective way of thinking. Secondly, Law et al. (2025) explore how generative AI mediates knowledge building in an extra-curricular hackathon setting where students work in teams. They conceptualize AI literacy as part of digital competence and e.g. explore which roles GAI tools play in a knowledge building process. Drawing on a large dataset of pre- and post-surveys, interim reports and workspace logs, they find that generative AI facilitates collaborative, inquiry-driven learning. Students for instance used generative AI tools for ideation, to understand technical concepts, to develop and debug prototypes as well as for presentations and website development. The teams also highlighted how they engaged in iterative dialogue

with generative AI and negotiated understanding. Thirdly, Kaup et al. (2025) explore how generative AI can support collaborative learning in higher education, specifically when students work with course literature. Drawing on class interactions, focus group interviews and prompt logs, the authors find that when used as a mediating artefact, generative AI leads to student-to-student dialogues around prompts and AI output. In this way, their interaction with the literature is supported, and this seems to extend their understanding of the literature and its concepts.

In the call for papers for this issue, we solicited contributions providing us with more insight into how generative AI unfolds in collaborative learning environments, suggesting a computer-supported collaborative learning (CSCL) and socio-material perspective. In the following, we will introduce these theoretical frameworks as well as introduce the contributions of the issue.

Generative AI, Socio-Materiality and Computer-Supported Collaborative Learning

Orlikowski and Scott (2008) consider socio-materiality as a palette of approaches that may advance the way we study technology, work, and organizations, by moving beyond analytical separations between humans and technologies and instead foregrounding how work practices are constituted through their ongoing socio-material entanglements. In learning contexts, CSCL can serve as a framework for examining the materiality of socio-material dynamics, as CSCL emphasizes how technology supports collaboration and learning. The socio-material perspective, in combination with CSCL, makes it possible to shed light on material aspects of collaboration that would otherwise have been overlooked in the shadow of human interaction. This perspective opens a deeper understanding of how technology's material and digital dimensions not only support, but also actively shape collaborative processes. In the context of CSCL, this means exploring how technologies like generative AI function not just as neutral tools, but as actors that influence and transform the human-technology dynamic.

CSCL investigates how collaborative learning can be intentionally designed and supported so that technology enriches the interactions that drive learning. It brings together instructional design and learning technologies to enable guided, purposeful collabora-

tion across diverse pedagogical contexts from small groups working on short, structured tasks to large online communities sharing knowledge over long periods. CSCL considers a broad range of tools, from basic communication platforms to specialized systems that scaffold specific collaborative processes, all aimed at weaving technology-supported collaboration meaningfully into educational practice (Dillenbourg and Fischer 2007).

Recently, generative AI has been embedded into education and workplace practices, affecting learning activities in a variety of ways. As mentioned above, its impact on collaboration has received limited attention, including how it mediates interaction, supports shared understanding, and changes the social dynamics of learning altogether. This special issue addresses this gap by examining generative AI through a CSCL lens and its role in collaborative learning dynamics, regardless of whether the work is coordinated individual work (cooperative) or work involving shared goals and mutual interdependencies (collaborative) (Bang and Dalsgaard 2005).

Contributions to the special issue

The issue comprises six articles which have all explored the topic within formal educational settings, ranging from primary school to higher education. The contributions give us interesting insights into different disciplinary settings, different uses of generative AI and different levels of scaffolding of collaborative activities.

In the first article of the issue, *Fostering Creativity and Self Efficacy Through Collaborative Learning Using Generative Artificial Intelligence (AI) in the Product Design Visualization Process*, Mohamed Kamil et al. explore how generative image models can be integrated into product design students' visualization processes. Their findings show that these tools significantly enhance students' creativity and self-efficacy while strengthening collaborative learning dynamics. The study highlights the transformative potential of generative AI in product design education, positioning it as an active co-creator within both learning and design practices.

Next, in the article *AI-Aided Collaborative Design in Industrial Design Education for Final Year Projects (FYP): Improving Workflow and Innovation,* Me et al. study how AI-assisted tools shape creativity, collaboration, and workflow efficiency among final-year Industrial Design students. Drawing on a mixed-methods comparison be-

tween an AI-supported class and a traditionally taught class, the study shows that integrating AI across research, ideation, simulation, reporting, and prototyping leads to higher creativity and stronger design outcomes. The authors argue that AI works best as a creative partner when paired with a human-centered learning approach that preserves students' critical thinking, originality, and ethical responsibility.

In another disciplinary context, Meyer and Gregersen, in their article *Collaborative language learning through generative AI: the case of French,* investigate the ways in which generative AI becomes part of and influences the collective learning processes of the French language in Danish public schooling. Inquiring into the rhythms of such socio-material entanglement by interviewing preservice teachers, observing classroom teaching, and analysing learning materials, the authors find that generative AI contributes to the students' agency in language learning.

Kaup et al., in their article *Transformative AI Agency: how Students Negotiate and Collaborate with Generative AI in Higher Education,* explore collaborative practices through lenses of cultural-historical activity theory. During a case study of an elective course where students in pedagogically scaffolded activities explored literature using ChatGPT, the authors collected audio recordings, prompts and response logs from ChatGPT, written reflections, and performed focus group interviews with students. The authors find that scaffolded and planned teaching activities can promote critical engagement and collective reflection when using ChatGPT as a mediating artefact.

Next, Jensen et al., in their article entitled *Ethical Implications of Generative AI in Collaborative Learning for Decision-Making in Circular Construction,* explore how students in a circular construction course navigate the role of generative AI in early-stage collaborative design processes. They do so drawing on an exploratory case study of students working in interdisciplinary teams. They conducted focus groups interviews with four groups and adopted a socio-material perspective. The authors find that, in these design processes that are characterized by value-laden trade-offs, generative AI contributes to creative ideation. Based on the finding that generative AI influences which ideas gain legitimacy, and how knowledge is mobilised, the authors argue that generative AI reconfigures epistemic

authority in collaborative processes. The students also point to a need for source verification when working with generative AI and to issues of accountability and transparency.

Finally, in *Artificial Intelligence-Generated Vignettes as Triggers for Reflection: Exploring Methodological Potentials in Higher Education,* Kaup et al. investigate how generative AI may be used to foster collaborative reflection and judgement in education. Prompting generative AI to produce realistic albeit fictional scenarios of everyday practices for social educators, the authors analyze how video vignettes can support students' collaborative reflections in relation to the authentic and real-world dilemmas addressed in the vignette. The authors find vignettes to be a valuable pedagogical tool when including ethical and moral deliberation and professional judgement, often part of professional practice. Further, Kaup et al. find the vignettes to support collective reflective processes.

Conclusion

Our intention with this special issue has been to give attention to the collaborative settings where generative AI is deployed and to the socio-material dynamics this entails. The contributions have addressed this in different formal educational settings and have helped shed valuable light on potentials and limitations of generative AI. In the coming years, we should maintain a focus on not only human-AI collaboration in education, but also what we might call human-AI-human collaboration, cultivating learning environments that leverage the potentials of generative AI in collaborative contexts while mitigating risks as to the learning process.

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