Human-AI Collaboration: A Student-Centered Perspective of Generative AI Use in Higher Education

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Abstract: The increasing adoption of generative AI (Gen AI) has made it even more important to investigate how education and learning is transformed. The paper investigates the evolving relationship between humans and AI in performing learning and knowledge-intensive tasks. Based on mixed data collected from business school students, the article explores the evolving relationships between human and AI in knowledge collaboration. The article sets out to address how Gen AI usage affects students' behavior, their academic work and their attitudes towards AI. It investigates how students use Gen AI in an academic context to support students' work processes. Our analysis draws on collaborative learning theories and revisits the automation-augmentation paradox in the context of management education. The aim is to address the following research questions: How does collaboration with AI affect student academic work? And how do students in higher education use Gen AI for academic work? We present insights into students' perception of benefits and drawbacks of using Gen AI, their attitude towards Gen AI, knowledge tasks in which they collaborate or delegate to Gen AI and we discuss the potential risks associated with the use of Gen AI. Students are collaborating with AI using ChatGPT for expanding knowledge on academic themes, summarizing concepts, theories, and generating ideas for research topics and methods. Time saving, enhanced productivity and user-friendliness of the tool were identified as the main benefits associated with Gen AI, whereas the risk of plagiarism, its inaccuracy in responses and the need for prior knowledge were identified as the main drawbacks. While our findings underscore the potential of Gen AI to significantly enhance student learning experiences, they also underscore the importance of exercising caution and awareness of associated risks to automate learning. This study seeks to enrich our comprehension of AI's transformative role in higher education, with a specific focus on the student-centered perspective.

Keywords: Generative AI, ChatGPT, Collaboration, Higher education

1. Introduction

The advent of generative AI has opened up opportunities for collaborative relationships to emerge between humans and machines in the performance of knowledge work and learning. AI has gained momentum in education with the development of Generative AI based on Large Language Models (LLMs).

Human-AI collaboration brings new frontiers in the development of knowledge work tasks in teams to support collaborative intelligence (Daugherty & Wilson, 2018), various areas of education including data science (Ellis & Slade, 2023; Molenaar, 2022) journalism and media education (Pavlik, 2023) and self-regulated learning (Järvelä et al., 2023). Since the adoption of AI in higher education is increasing, it is important to explore the consequences of this large-scale adoption for teaching and learning through empirical studies in different country contexts (O'Dea, 2024).

The comparison of Gen AI to calculators is interesting because both tools assist humans in managing cognitive load, but they do so in fundamentally different ways. While calculators offload numerical computation tasks, Gen AI can assist in a broader range of cognitive functions, such as generating content, solving complex problems, and enhancing creativity. Distinctive relationships between learners and machines can be formed. Gen AI can be used for cognitive offloading or as an extended mind (Lodge et al., 2023).

The rise of a new generation of Gen AI tools (AI) (such as ChatGPT by OpenAI, Copilot by Microsoft, Claude by Anthropic, and Gemini by Google) has brought new possibilities to develop (human) knowledge through prompts and interaction with AI. Among the many available chatbots, chatGPT is one of the most popular ones. ChatGPT is an artificial intelligence language model integrating a variant of GPT (Generative Pre-trained Transformer) (Banh & Strobel, 2023). Many recent studies have emphasized the oppportunities of using chatGPT (Kasneci et al., 2023) in generating text that can be difficult to differentiate from that produced by humans e.g. (Stokel-Walker, 2022).

There are at least 10 different roles of ChatGPT in teaching and learning, according to a Unesco report (Sabzalieva & Valentini, 2023). ChatGPT can act as a possibility engine, Socratic opponent, collaboration coach, guide on the side, personal tutor, co-designer, exploratorium, study buddy, motivator or dynamic assessor.

Gen AI and GPTs can be used for language processing creating chatbots or means of automating the production of repetitive or time-consuming tasks (Cotton et al., 2024). Cotton et al. (2024) have written an article about

academic integrity entitled "Chatting and cheating: Ensuring academic integrity in the era of ChatGPT" by providing prompts to ChatGPT. Chatbots offer the possibility to automate cognitive processes associated with the human mind, including problem solving, decision making, and learning. The knowledge and cognitive capabilities" of ChatGPT was tested at American universities, where the chatbot was used to pass academic law and management exams (Kelly, 2023).

Gen AI has brought the opportunity to automate activities that are associated with the human mind by giving the illusion that it can think both humanly and rationally which is one of the long-term goals of artificial intelligence (Russel and Norvig, 2010). AI encompasses a cluster of computing technologies, including intelligent agents, machine learning, natural language processing, and decision-making supported by algorithms (Tredinnick, 2017). Digital platforms increasingly incorporate AI to support communication, knowledge sharing and collaboration (Maedche et al., 2019; Roda et al., 2003). AI has started to play an increasingly important role in knowledge collaboration through facilitation of human-AI interaction in different forms, including AI-based assistants (e.g., chatbots or voice-based assistants (e.g. Siri by Apple, Alexa by Amazon), algorithmic technologies (Kellogg et al., 2020)).

As Gen AI becomes prevalent in learning, knowledge collaboration, decision making and the future of work, it becomes imperative to understand how collaboration with AI will impact student behavior, their agency and their learning. Furthermore, as AI-based interaction, e.g. human-chatbot conversations (Hill et al., 2015)), and different forms of persuasion or content personalization will proliferate, we expect AI will play an instrumental role in the future of education. It is unclear what the long-term consequences will be for management education and learning. The use of Gen AI in academia by students has so far been less explored and how business schools should adapt teaching, learning and exams to the AI age is subject to an ongoing debate (Rudolph et al., 2023). Understanding students' use and perceptions of Gen AI is essential for understanding the rapid changes associated with the large-scale adoption of these systems (Shoufan, 2023). Moreover, while existing research has predominantly reflected the perspectives of educators, recent studies emphasize the need to consider student viewpoints when assessing the utility of technologies like ChatGPT (Malmström et al., 2023; Shoufan, 2023). This shift suggests a growing recognition of the importance of including learners' experiences and feedback in the evaluation of educational tools.

In addition to understanding how AI is changing student work and learning, the research seeks to contribute to the transformative effects of AI on knowledge collaboration and learning as it raises questions of control, trust, and expertise in the future of AI-enabled work more generally (Benbya et al., 2020). This paper aims to investigate the multifaceted role of Gen AI for learning, and in shaping new forms of collaboration, by focusing on a student perspective.

We take as a point of departure collaborative learning theories combined with an automation-augmentation paradox view adopted recently in AI in management literature (Raisch & Krakowski, 2021) . Automation implies that machines take over or are delegated the human tasks, while augmentation involves a close collaboration between humans and AI on specific tasks (Raisch & Krakowski, 2021). Taking the automation-augmentation paradox as a conceptual starting point, the question is how the competing logics of automation and augmentation will be implemented and deployed in higher education. Augmenting intelligence involves human-machine collaboration in which machines perform what they do best (e.g., computing, doing repetitive tasks) to aid humans in doing what humans do best (e.g., abstract reasoning, creating, and making discoveries) (Paul et al., 2022). Particularly, the aim is to address the following research questions:

How does collaboration with AI affect student academic work? and How do students in higher education use Gen AI for academic work?

2. Theoretical Background

2.1 The Role of Gen AI in Collaboration

Collaborative learning relies on the integration of a collaborative activity within an educational context (Dillenbourg, 1999). Collaborative learning theories emphasize the social aspect of learning and how learning and motivation can be constructed through interactions. In the age of Gen AI, the principles of social constructivism (Illeris, 2018; Mondahl et al., 2009) remain pertinent, emphasizing that learning is deeply embedded within the dynamic interplay of social interactions and individual cognitive processes (Mondahl & Razmerita, 2014).

Traditionally, knowledge collaboration has centered on the sharing, transfer, accumulation, co-creation, and transformation of knowledge through direct human interaction (Faraj et al., 2011). In the era of generative AI, however, the landscape of knowledge collaboration is evolving. It now encompasses a variety of collaborative processes that extend beyond human-to-human interaction to include engagements with AI, such as chatbots. These interactions often involve sharing knowledge, communicating, and contributing ideas through prompts that facilitate a new dimension of collaboration that may substitute human social interaction.

The introduction of AI tools in educational settings brings a new dimension to this interplay, which might enhance the traditional modes of collaboration, including collaborative learning, knowledge sharing, and problem-solving. These AI-enhanced collaborative environments not only facilitate learning processes and adapt to the evolving communicative landscapes that surround learners by making them multimodal and inclusive (Lewis, 2022), but also through hybridity by incorporating the Gen AI learning ability to scaffold human self-regulated learning e.g. (Lodge et al., 2023; Molenaar, 2022; O'Dea, 2024). Learning involves adapting to constant change and can be a challenging process (Hermansen, 2005). The integration of AI into education can create more nuanced and supportive learning experiences, thus easing the 'painful' aspects of learning by providing personalized support, context-aware insights and interactions. AI can support learning processes by providing timely answers and feedback to the students' questions similar to a "study buddy" (Sabzalieva & Valentini, 2023). The concept of trust has been acknowledged as an important element in human collaboration. More recently the concept of trustworthy human-AI collaboration has been developed. The OECD work on AI has outlined five value-based principles for responsible stewardship of trustworthy AI that aim to foster innovation and trust in AI (OECD, 2023):

- inclusive growth, sustainable development and well-being;
- human-centered values and fairness;
- transparency and explainability;
- robustness, security and safety;
- and accountability.

Trustworthy AI is defined as "fully human-centered and aims to offer high levels of human control, with the goal to lead to wider adoption and increase human performance, while supporting human self-efficacy, mastery, creativity and responsibility" (Razmerita et al., 2021).

3. Methodology

The data for this study was collected between spring 2023 (the early adoption of Gen AI) – to spring 2024 and consisted of a mixed method approach. A pre-study consisting of 16 interviews with students was conducted to understand how students use chatbots (e.g. ChatGPT) for academic work, their perception of benefits and challenges in relation to the use of Gen AI and ChatGPT. Qualitative data was also collected from business school students following an initial exploratory inductive approach. An exploratory approach focuses on generating new insights and theories rather than testing existing ones, as there is limited prior knowledge and understanding of the phenomenon. The qualitative interviews were coded for preliminary descriptive themes following an open inductive approach (Myers, 2013). This open approach is exploring new themes or patterns focusing on understanding participants' experiences and their perspectives rather than forcing data to fit into existing theories. Participant involvement allowed their perspectives to shape the direction of the study. The codes of themes covered included knowledge tasks, benefits and drawbacks, which were integrated in the design of the initial survey.

The questionnaire was conducted anonymously. Using a five-point Likert-scale question design provides the respondent with a neutral answer option which is important to increase the measurement reliability (Schutt, 2019). The survey data provides insights into Human-AI collaboration in relation to academic tasks, students' attitudes towards generative AI, including ethical considerations, the perceived benefits and challenges of adoption of chatbots in higher education as well as other AI tools they use. It also includes behavioral data (e.g. performance expectancy, facilitating conditions and behavioral intention) to measure usability and the acceptance of (Gen AI) technology in an educational context (Granić & Marangunić, 2019; Shoufan, 2023).

4. Data Analysis and Results

The final dataset used for analysis consists of 215 complete valid survey responses out of 332 collected answers. This gives us a response rate of approx. 64.8% valid answers. The demographic characteristics (N=215) are available in Table 1.

Table 1: Demographic characteristics (N=215)

Level	Frequency	Percentage
Gender		
Male	85	39.5
Female	129	60.0
Non-binary / third gender	1	0.5
Age		
Under 20	12	5.6
20-25	160	74.4
25-30	41	19.1
Above 30	2	0.9
Education		
Bachelor	159	74.0
Master	56	26.0
Frequency of GPT usage		
Very Often	17	7.9
Often	34	15.8
Sometimes	81	37.7
Hardly ever	52	24.2
Never	31	14.4

The gender distribution in the dataset is fairly even with 60% female and 39.5% male (1% non-binary). Respondents are master and bachelor students from different study programs at business schools in Northern Europe. As represented in Table 1, 74.4% of the respondents are between 20 and 25 years old. 19.1% are between 25 and 30 years, 12 respondents are under 20 years and 2 respondents are over 30 years. In relation to the frequency of use of Gen AI for academic purposes: the majority of students use chatbots only sometimes (37.7%), often (15.8%) and very often (7.9%) while some use it hardly ever (24.2%) or never (14.4%). The survey data emphasized the popularity of ChatGPT, in particular the use of the freeware version 3.5 as Gen AI tool.

An overview of the most important benefits perceived by students, presented in Figure 1, are time saving (M = 4.54 SD = 0.84), user-friendly tool (M = 4.19, SD = 0.95), enhanced productivity (M = 4.03, SD = 0.98), keeping the conversation history (M = 3.95, SD = 1.09), human-like characteristics (M = 3.61, SD = 1.02), improved learning processes (M = 3.61, SD = 1.11), and improved writing quality (M = 3.60, SD = 1.17). The least stated benefits are enhanced creativity (M = 3.36, SD = 1.20), personalization of responses (M = 3.32, SD = 1.10).

A majority of students are using ChatGPT because of time saving: “It saves me so many hours of reading and research” and “it answers anything I ask superfast.” Enhanced productivity is also important as “…it allows me to spend my time more productively and get more things done.” Students associate human-like characteristics with AI as “it feels like talking to an actual person because I can ask questions in a spoken language format, and it understands it.”

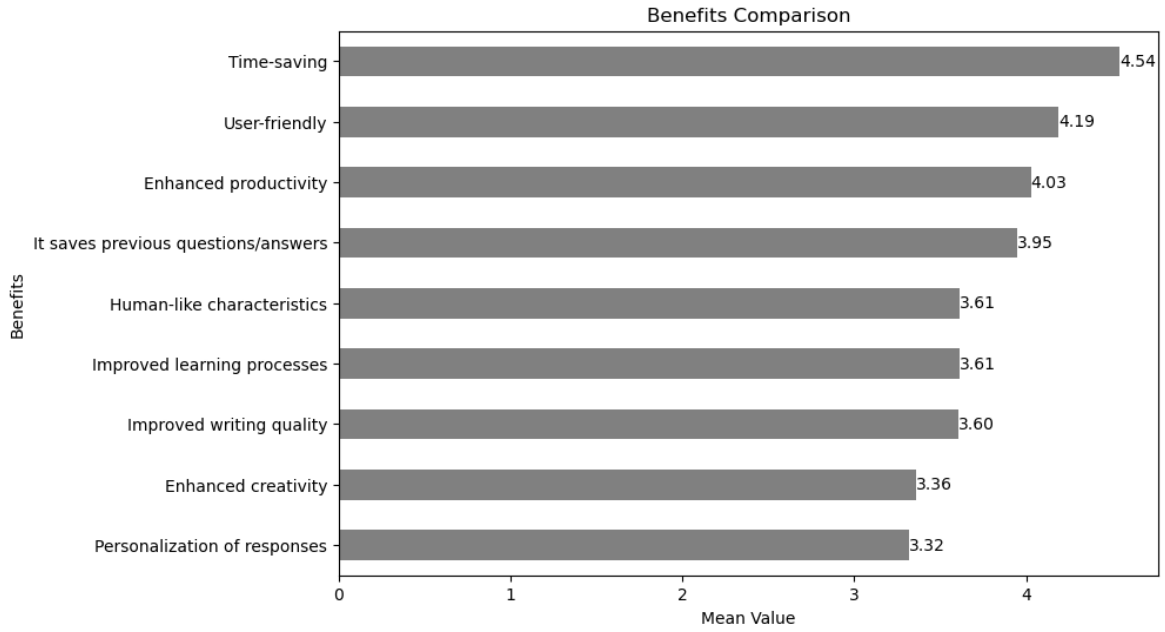

Figure 1: The mean value of participants' benefits perception of Gen AI use (n=215)

The data shows that some students perceived an improved learning process: “for me I feel like it improves my learning and thought process” while for other students it is associated with a loss of learning. For some students the use of ChatGPT leads to enhanced creativity: “it allows to be more creative in a faster way” while others perceived the opposite. “I wonder how much it takes over my own ability to think critically [..] I already feel like I am losing my creativity.”

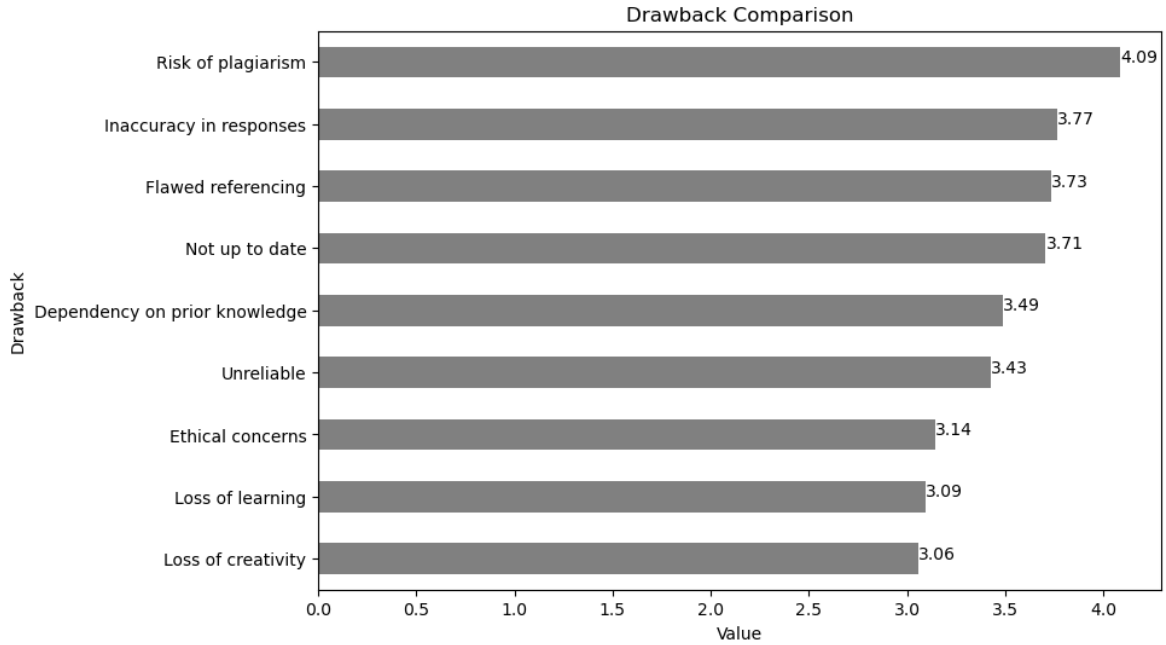

Figure 2: The mean value of participants' drawback perception of Gen AI use (n=215)

The main drawbacks in student-AI collaboration using Gen AI, as represented in Figure 2, are: the risk of plagiarism (M = 4.09 SD = 1.13), inaccuracy of responses (M = 3.77, SD = 1.01), flawed referencing (M = 3.73, SD = 1.11), not up to date in terms of knowledge (M = 3.71, SD = 1.07), dependency on prior knowledge (M = 3.49, SD = 0.99), unreliable (M = 3.43, SD = 1.06), ethical concerns (M = 3.14, SD = 1.25), loss of learning (M = 3.09, SD = 1.29) and loss of creativity (M = 3.06, SD = 1.28). Despite these drawbacks students prefer to improve their productivity and save time. By trying to save time and improve their productivity, students may automate human knowledge processes such as learning, thinking and writing, which can be detrimental for their future work skills.

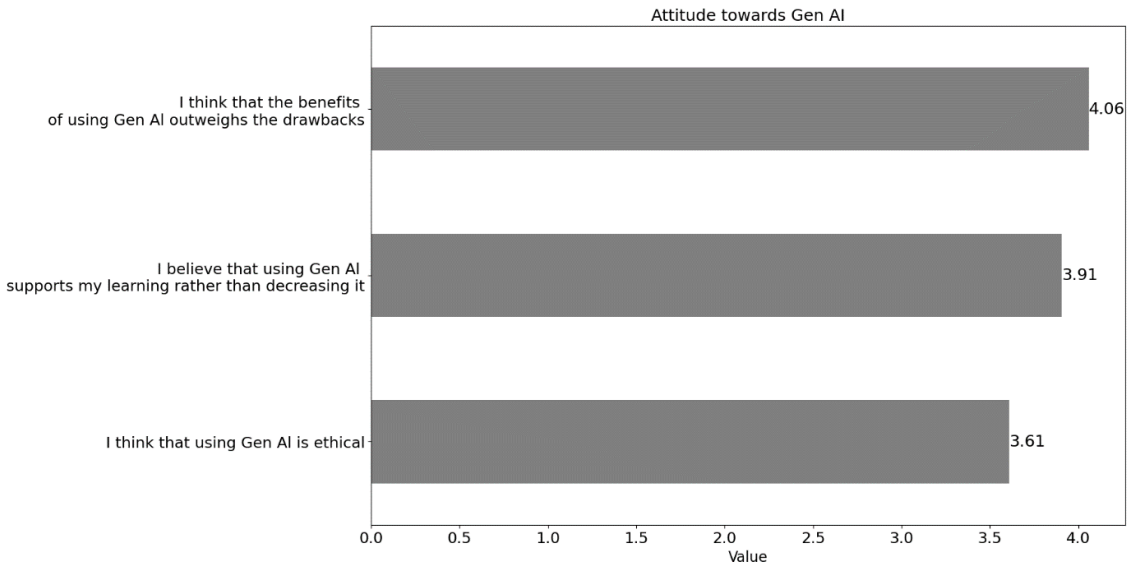

Figure 3: Attitude towards the Gen AI (n = 215)

The students' attitudes towards Gen AI, as represented in Figure 3, are: "I think that the benefits of using Gen AI outweigh the drawbacks" (M = 4.06, SD = 0.99), "I believe that using Gen AI supports my learning rather than decreasing it" (M = 3.91, SD = 1.07), "I think that using Gen AI is ethical" (M = 3.61, SD = 1.03).

An overview of the knowledge tasks involving the use of Gen AI is presented in Figure 4.

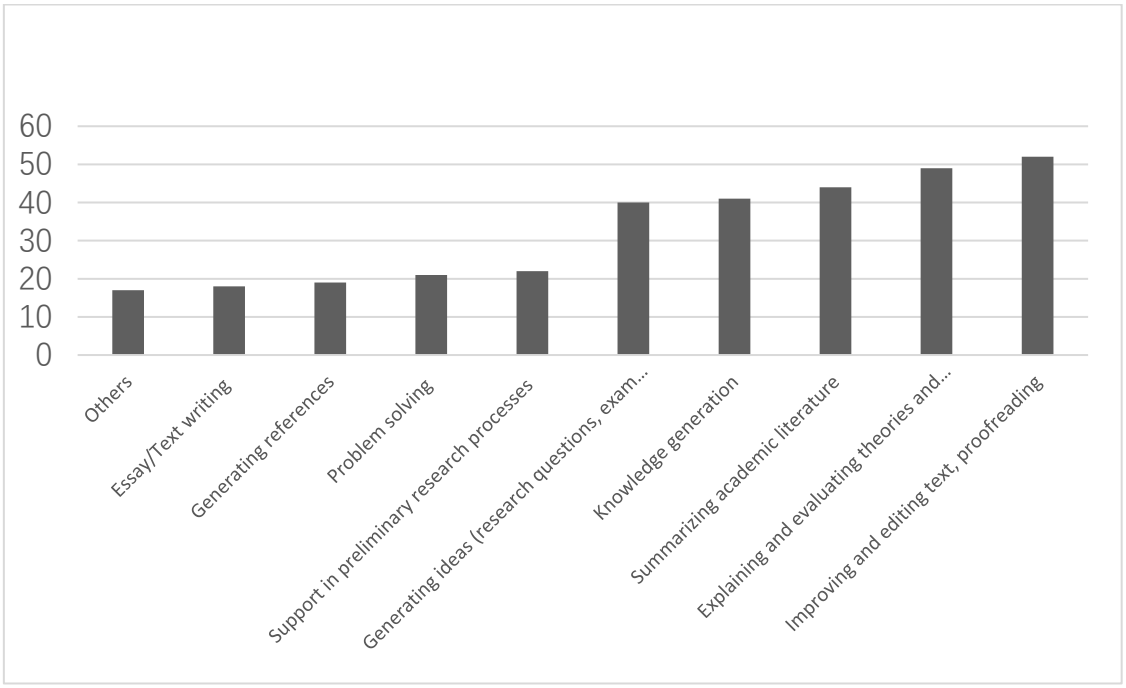

Figure 4: Knowledge intensive tasks associated with the use of Gen AI

Gen AI chatbots can play multiple roles in education. The students use them for a multitude of academic tasks, as represented in Figure 5. Improving and editing text, proofreading, followed by explaining and evaluating theories summarizing academic literature, but also knowledge generation, are the most important knowledge-intensive tasks associated with the use of chatbots.

Chatbots are also involved in creative-oriented processes: generating ideas, support in research processes problem solving, and essay and text writing but also in programing and code writing. The academic tasks were refined in the second step of data collection considering the Bloom taxonomy (Forehand, 2012) into lower-order cognitive skills versus higher-level cognitive skills and therefore it includes only a subset of 89 answers. The revised Bloom taxonomy includes (from the highest-level cognitive skills to the lowest level cognitive skills):

creating, evaluating, analyzing, applying, understanding and remembering. The students are collaborating with AI and delegating tasks to Gen AI for all categories essay/text writing, generating ideas (creating) and problem solving (applying), explaining and evaluating theories, summarizing academic literature (understanding and remembering).

The study findings emphasize that students perceive human-AI collaboration beneficial even though it may lead to different outcomes improved learning, enhanced creativity and "thought processes" or even loss of learning, loss of creativity. One student states that: "I like the fact that it can help you get started and inspire you in terms of what scholars to explore further or dive deeper into." And "It is incredible at delivering very specific answers and perspectives to my questions."

The process of knowledge collaboration can be extended and augmented through engineered prompts and personalized interaction. Generative AI brings new opportunities for creating personalized learning environments which may integrate personal assistants or a "study buddy" (Sabzalieva & Valentini, 2023). The management of plagiarism risk creates an interesting definition of Trustworthy AI from the student perspective. This suggests that although they experience the risk of plagiarism, inaccuracy in responses and perceived them to be unreliable, they still collaborate with ChatGPT for academic tasks.

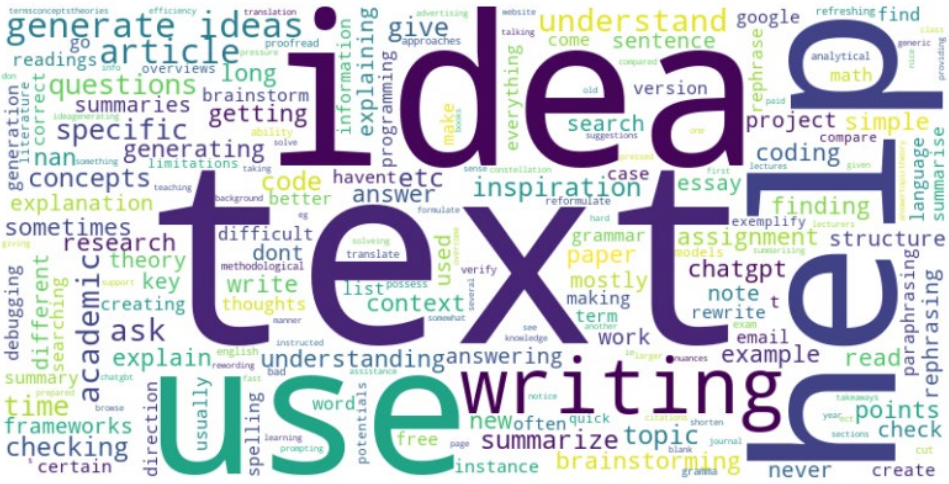

Figure 5: Gen AI in higher education word cloud

A word cloud was generated using the Python natural language toolkit (nltk) library for text analysis based on the open question text provided to "Which other tasks have you been using Gen AI in an academic context? beyond the one specified in the survey". Further we conducted sentiment analysis using the VADER package, and the results indicate that the neutral sentiment score was 0.335, indicating the overall neutral sentiment toward Gen AI.

Table 2: The top 18-word frequency based on the open question

	Word	Frequency		Word	Frequency
1	ideas	24	10	ask	7
2	texts	13	11	understand	7
3	help	12	12	questions	6
4	use	11	13	time	6
5	writing	10	14	specific	6
6	generate	10	15	concepts	5
7	text	9	16	inspiration	5
8	articles	8	17	summarize	5
9	academic	7	18	give	5

Based on Table 2, the most frequent words from the open text are ideas (n = 24), texts (n = 13), help (n = 12).

5. Discussion and Conclusions

The transformative potential of AI in education and management learning has been widely discussed, but theoretical development and empirical results have been lacking in the literature so far. This research investigates the evolving relationship between humans and AI in performing learning and knowledge-intensive tasks, using knowledge collaboration theories. Students collaborate with AI using ChatGPT for expanding knowledge on academic themes, summarizing concepts, theories, and generating ideas for research topics and methods. Time-saving, enhanced productivity and user-friendliness of the tool were identified as the main benefits associated with Gen AI (e.g. ChatGPT), whereas the risk of plagiarism, its inaccuracy in responses and the need for prior knowledge were identified as the main drawbacks.

In educational contexts, this relationship implies that learners use Gen AI not merely as a tool for finding answers, but as a platform for exploring new ways of thinking and understanding. This can transform learning experiences by potentially promoting a deeper engagement with material, facilitating personalized learning paths, and encouraging creative problem-solving.

Lodge et al. (2023) discuss these roles of AI in learning environments, emphasizing how AI can be leveraged to support both the acquisition of knowledge and the application of that knowledge in new, innovative ways. This relationship between learners and AI tools points to a future where education is not only about knowledge transmission but also about developing a symbiotic relationship with technology, which can significantly alter how we learn, teach, and apply knowledge in real-world situations.

However, the ability to enact human agency as regards setting (learning) goals, monitoring the students' progress toward it but also evaluating the Gen AI responses to adapt their (learning) strategies (Lodge et al. 2023) and prompts are essential for collaborating effectively with AI. A critical evaluation of the output of Gen AI requires self-regulation skills and learning strategy adaptations depending on the learners' needs and the learning task (e.g. individual or collaborative). Furthermore, a fully trustworthy human-Gen AI collaboration may lead to overreliance on Gen AI, decrease analytical and problem-solving skills and shortcut learning. Gen AI can be a "coach" (Mollick & Mollick, 2023), an expert system, or a study buddy (Sabzalieva & Valentini, 2023).

For the next phase of this research, we intend to use the preliminary data to explore the relationship between the automation/augmentation paradox (Raisch and Krakowski, 2021) and concepts from the student-centered learning literature e.g. (Doyle, 2023). As the set of learning tasks is subject to a combination of automation and augmentation in partnership with AI, the benefits of increased task efficiency and time-saving may come at the expense of future learning and skills. From a student-centric perspective, teaching faces new challenges of how to optimize learning opportunities in collaboration with AI, how to teach life-long learning skills, and how to obtain student buy-in for more active learning approaches. With this AI-human collaboration research, we hope to contribute to the literature on student-centered learning, and on the emerging human-AI collaboration literature.

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