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### CO-WRITING AN ESSAY WITH CHATGPT: EXPERIENCES AND PERCEPTIONS OF STUDENTS IN HIGHER EDUCATION

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# CO-WRITING AN ESSAY WITH CHATGPT: EXPERIENCES AND PERCEPTIONS OF STUDENTS IN HIGHER EDUCATION

*Completed Research Paper*

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## Abstract

*This article presents a case study, in which ChatGPT has been integrated into the writing assignment of a course in a Dutch university whereby the students co-wrote an essay with the AI-powered chatbot, ChatGPT 3.5. We examined 1) how the students used it, 2) their experienced challenges and benefits, 3) their view of its responsible use, and 4) their perception of skills required for the effective collaboration with ChatGPT in the co-writing process. Based on the analysis of students' written self-reflections (N = 43), the results show that the perceived benefits and challenges are associated with different types of uses of ChatGPT. We found that some uses of ChatGPT, namely for content generation, present more challenges to the students than others. We also identified a set of skills that the students perceive they need, to use ChatGPT effectively: critical thinking, creativity, fact checking and evidence gathering, collaborative writing, ethical awareness, and effective instruction of ChatGPT.*

*Keywords: essay writing, ChatGPT, higher education, human-AI co-writing.*

## 1 Introduction

In November 2022, the new text generating Artificial Intelligence (AI) tool ChatGPT has taken the world of educators by surprise. Since then, generative AI is seen as "the most influential technology in writing in decades – nothing since the word processor has promised as much impact" (Vee et al., 2023). Educational institutions, such as universities, had to respond quickly to the new threat of easy-to-commit and difficult-to-detect fraud by students. Essay writing assignments were especially in the spotlight (e.g. Escalante et al., 2023, Liu et al., 2023). Responses ranged from going back to pen and paper (e.g. in Australia) and advocating for resisting the use of this tool (van Rooij, 2023) to a cascade of experiments to embrace and leverage ChatGPT for teaching and learning (e.g. Vee et al., 2023; Van Slyke et al., 2023). After over a year with ChatGPT, there is a growing understanding that students will continue using these tools, and that the learning and teaching practices, including student writing activities, need to account for that. Furthermore, we believe that, as these tools are here-to-stay, educators, especially in Information Systems and related disciplines, have a critical role in training students in the pedagogical and responsible use of these new tools.

Research on human-AI co-writing has made some advances in conceptualizing the different ways that AI can be used as a writing tool. For instance, Biermann et al. (2022) describe how, next to AI being used for ideation or language editing, AI can also be used as a 'writing companion' translating high-level ideas of the human into fully expanded text with minimal user input. Large language models (LLMs), the formal name of the group of models that ChatGPT belongs to, are increasingly seen as

‘active writing partners’ and not simply tools for prediction and correction (Jakesch et al., 2023). A significant amount of research on this topic focuses on creative writing (e.g. story writing or fiction), and less on argumentative writing.

*Argumentative writing* is one of the frequent tasks that students in higher education are faced with. Yet, it is one of the most complicated and challenging students’ tasks in the context of higher education (e.g., Bašić et al., 2023; Lam et al., 2018; Latifi et al., 2021; Wu & Wang, 2023). Specifically in the context of education on technology topics, argumentative writing skills gain importance, as students are expected to develop a critical stance towards digital technologies and comprehend both the positive and negative impacts thereof on individuals, economy, society.

Academic research is just starting to tap into generative AI tools for argumentative writing and already signals that AI text outputs can affect the writing process and outcomes in some unintended ways. For example, in an experimental study, Jakesch et al. (2023) uncovered that opinionated AI language technologies can affect what users write and think. In an education context, this finding may be alarming, since as educators we strive to help students think critically and independently. This emphasizes the need for empirical evidence about how students interact, experience, and perceive AI writing tools. Current research puts more spotlight on the teacher perspective, while fewer studies investigate in depth the student perspective (e.g. Allam et al., 2023; Bernabei et al., 2023). More research is needed to develop a comprehensive understanding of how generative AI can be included in the writing process in a responsible way that is beneficial to both teachers and students (Escalante et al., 2023).

Our research addresses the aforesaid gap and poses the following research question: *How do students experience co-writing an argumentative essay with ChatGPT?* To answer the overarching research question, we pose the following sub-questions:

- RQ1: How do students use ChatGPT in essay writing?
- RQ2: What are the benefits and challenges, as perceived by students, of using ChatGPT in the essay writing process?
- RQ3: What are the skills and knowledge needed to use ChatGPT effectively in essay writing?
- RQ4: How do students view responsible use of ChatGPT when writing an essay with ChatGPT?

In this study, we present results of a case study from a Dutch university, in which students were tasked to co-write an essay with ChatGPT 3.5 in the setting of a Bachelor-level course on digitalization.

## 2 Background

Previous research identified four types of uses of generative AI tools by students that are relevant to writing: as feedback generator (asking AI to provide feedback on student work), as tutor (having AI explain concepts), as team coach (using AI to help write a team work agreement), and as learner (having students assess the outputs of AI in the role of a teacher) (Mollick & Mollick, 2023). To our knowledge, the empirical evidence of using ChatGPT in the (argumentative) writing process by students in higher education is so far limited. The results of the few existing studies uncover several opportunities and challenges when using ChatGPT in the co-writing process.

Among the *benefits*, findings point to ChatGPT’s ability to generate arguments and ideas, as reported by students in higher education in United Arab Emirates (Allam et al., 2023). In another study of engineering students in Italy, students perceived ChatGPT to be useful for not only facilitating their writing process, but also the learning process, and in general, to be reliable and comprehensible in terms of the content (Bernabei et al., 2023). Further, these students also considered ChatGPT to be able to enhance performance and speed up the completion of assignments, to facilitate their understanding of complex topics through the provision of clear explanations, and overall, to be useful for initial drafting of the essay’s content and the generation of ideas (Bernabei et al., 2023).

Among the *challenges* associated with the use of ChatGPT in the co-writing process, scholars stress that the tool lacks supporting arguments from some claims, and that the system still has not fulfilled the expectations of logical reasoning (Su et al., 2023, p.10) and lacks critical reflection (Balhorn et al., 2023). Students have also reported that the use of ChatGPT takes away some of the learning process

when the student is expected to search for information and develop an argument (Allam et al., 2023). Moreover, students found ChatGPT to be lacking in comprehensiveness and readiness for its immediate use, consequently requiring further elaboration to refine the output generated by ChatGPT, especially when high-quality texts are expected (Bernabei et al., 2023). Finally, the students stress that the answers from ChatGPT are “rather generic”, suggesting that ChatGPT struggles to generate clear and detailed responses (Balhorn et al., 2023).

The discussion about students co-writing with AI in an educational setting cannot be isolated from the debates about *responsible use* of LLMs. The introduction of tools like ChatGPT raised new questions about plagiarism and authorship in student assignments (e.g. Bašić et al., 2023; Cotton et al., 2024; Livberber & Ayyvaz, 2023). Whereas the concerns pertaining to the (ir)responsible and (un)ethical use of AI is vast, the topic of responsible use of generative AI-powered chatbots in learning and teaching is less researched (Yan et al., 2023). Responsible use practices can be codified in rules and guidelines developed top-down by teachers/universities. The idea of co-creating codes of conducts with the students, however, is a powerful one. Academic research concerning responsible use of AI chatbots is often conceptual, with a few exceptions from which we derive some fragmented insights. For example, Bernabei et al. (2023) report that students consider ChatGPT as an additional source of information, not a replacement, and expressed the need for rules and guidelines on the use of ChatGPT.

Our conclusion from this review is that current empirical evidence on the use of ChatGPT in the student’s argumentative writing process is still limited. There is a paucity of research results that help us to understand how students use tools like ChatGPT and whether they enhance students’ performance or not (Bašić et al., 2023). The studies conducted so far provided limited insight in the students’ perceptions of different uses of ChatGPT (e.g. using ChatGPT to suggest an outline, come up with arguments, or to learn about the topic). Also, more in-depth qualitative insights are needed to uncover the students’ views related to responsible use of AI writing tools. Current research has been mainly based on closed-question surveys (e.g. Bernabei et al., 2023; Han et al., 2023). Having said that, our study aims to contribute in this direction and presents a case study focusing on the examination of students’ perspectives linked to the use of ChatGPT to co-write an essay.

## 3 Materials and methods

### 3.1 Case study setting

This research reports on a case of use of ChatGPT 3.5 in a course for 2nd year Bachelor students in a Dutch university. The course focused on how Information and Communication Technologies are affecting societies and industries in new ways and on the impact thereof for private and public organizations, as well as for the economy and society.

In the course, the students in pairs co-wrote an argumentative essay together with ChatGPT. The learning goal of the essay assignment was to reflect critically on the impact of digital innovations on the individual, organizations, and society at large. The students were offered a list of topics to choose from; each topic was formulated as a provoking/controversial question inviting to discuss both sides of the debate (e.g. Does AI help address or exacerbate climate change?). The requirement for this argumentative essay was that it sufficiently addresses both sides of the debate providing quality evidence and a nuanced conclusion is drawn at the end.

The essay assignment consisted of three parts.

*Part 1. Critically assess an AI-generated essay.* The course teachers provided the students with essays generated by ChatGPT on the topic of their choice (which was done to create equal starting conditions for all students). The prompt used that has been sent to ChatGPT is provided in the Annex. The students were asked to take on the role of the teacher and critically assess the essay by using an assessment rubric. In the rubric, the students were asked to provide an assessment on a three-level scale (i.e. insufficient-sufficient-good) but also written feedback about the weaknesses in AI-generated essay, and how the students plan to improve the essay with concrete suggestions.

*Part 2. Improve the AI-generated essay.* The students worked to improve the AI-generated text based on the assessment and suggestions they gave to it in Part 1. The students were instructed to use the AI-generated text as a draft and re-write it by elaborating, restructuring, providing examples, adding nuance, facts, insights, and quotes that illustrated ideas and corrected misconceptions, incorrect information, inaccuracies, or misleading statements etc. The students were asked to keep track changes on or highlight the changes they made to the ChatGPT-written text. The students were required to reach a word count of 2500 words (the ChatGPT-generated essays were around 800-1000 words) in their final re-written essay. The students were also allowed to use ChatGPT in Part 2 of the assignment.

*Part 3. Reflect on the process and technology.* The students were asked to write an 800-word reflection answering a set of guiding questions, for instance, about how they experienced this assignment, if/how they used ChatGPT in Part 2 of the assignment, and to what extent this use was responsible. The guiding questions asked corresponded to the research questions asked in this study.

### 3.2 Data collection and analysis

To answer the research questions, we analyzed the reflections written by the students as Part 3 of the essay assignment. 43 reflections were included in the analysis. The students were informed about our research, were given assurances that their personal information will be treated confidentially and were given an opportunity to decline from participation (which three students opted for).

The data were analyzed using thematic analysis and by means of semi-open coding. A set of categories deriving from the research questions were used as a start (uses of ChatGPT, benefits, challenges, (ir)responsible use, skills) and elaborated with codes inductively developed from the dataset. The data was coded by the authors in MS Word who continuously compared and checked each other's results. Table 1 (provided in the Annex) contains an excerpt illustrating our approach to coding.

## 4 Results

### 4.1 How do students use ChatGPT in essay writing assignments?

Based on coding results, we grouped the uses of ChatGPT reported by the students in our case into five categories (see also Table 2 in Annex): i) content generation, ii) feedback and writing coach, iii) support with research tasks, iv) provision of structure, and v) tool criticism. Below we discuss these categories in the order from most frequently to least frequently mentioned.

The most frequently mentioned category of use of ChatGPT was for **feedback and as a writing coach**. We have combined these uses into one category, as students mostly referred to asking ChatGPT for peer feedback. Within this category, students prompted ChatGPT for feedback on their own writing or asked for assistance with various writing tasks. These included: to generate a compelling title (SP33, SP = Student Pair), ending or catchy introductory paragraphs (SP1, 2, 6, 8, 24, 30), to rephrase text and/or give synonyms (SP21, 22, 29, 41), to improve grammar, style, and flow (SP13, 19, 26, 29, 34, 39, 42), to provide translation (SP31), as well as to offer an example of a well-structured sentence (SP31). Using ChatGPT is also considered by students as a useful means to get started with writing (SP33) and overcome the so-called 'writer's block'. Often the word 'inspiration' was mentioned in relation to these writing tasks: for example, "*we used it when we did not know how to put some things into words or to get inspiration to start writing*" (SP20).

The next category of use is for **content generation**. Within this category, the students often prompted ChatGPT for ideas or, more specifically, to generate new arguments for their essay. Students reported that using ChatGPT helped them to broaden their perspective (SP35), discover arguments they did not think of themselves (SP12, 22, 25, 28, 34, 37), and for inspiration (SP3, 12, 14). Some students, for instance, referred to this use as "*having a second 'writing partner' to create certain arguments that you, yourself, would not think of*" (SP12). Others consider the chatbot output as a good example of 'what it should look like' and orient themselves accordingly (SP14).

ChatGPT has been also used to assist students with a variety of **research tasks**. Such uses for instance, included prompting the tool to generate key concepts and (more) sources on the topic or to explain concepts and provide illustrative examples. Some students also reported that they used the chatbot to assist them with the literature review, such as asking to: provide keywords for Google Scholar (SP1), paraphrase academic texts for proper citation (SP21), and summarize scientific papers (SP16). According to some students, this input has then been used for follow-up research, and has been perceived to be helpful if one “is stuck” (SP18).

Prompting ChatGPT to provide a basic **structure** or an outline for an essay has also been explicitly articulated by the students. The students mentioned that the tool was helpful to provide a start, a plan, a base to build on (SP14, 17, 18) which was found helpful, again, if the student pair felt “stuck” (SP41) or needed inspiration for structuring the arguments (SP38). The students explained that they used the chatbot “for what it is good for”, namely providing a foundation to structure and explain arguments in an essay (SP38).

Finally, a few students also used ChatGPT for tasks that we grouped in the category of **tool criticism**. Within this category, the chatbot was prompted to: 1) provide feedback on its own text (SP27, 33), 2) provide sources underlying its own argument (SP15), 3) clarify its own arguments (SP15) or 4) to expand its own arguments or conclusions (SP28, 32). Some students reported that this did not generate useful output (SP15, 33), whereas others, in fact, adopted the outputs as a direction for the essay (SP32).

## 4.2 What are the perceived benefits and challenges of using ChatGPT in essay writing?

Based on these uses of ChatGPT, the students also highlighted a number of **benefits**. Overall, the majority agreed that ChatGPT offers a good initial basis to start with (SP16, 25, 32, 40) and thereby enhances student productivity and creativity (SP4, 23, 35). Saving time looking for information and coming up with an outline has been frequently mentioned (e.g., SP 8, 25, 29, 30, 32). Most students found it helpful to have key arguments already provided by ChatGPT which they were keen on reusing (e.g. SP5, 17, 18, 25, 30, 34). Its ease-of-use and that it saves effort was also mentioned by some, as well as the fact that one can ask rather specific questions and get a decent answer (otherwise hard to come across on the internet) (SP7, 8).

Also, using ChatGPT was seen by some students as an opportunity to learn from the tool in terms of writing. For instance, some students commented on this as follows: *“We observed that the language used by ChatGPT in the essay about [...] is often very professional and academic. The vocabulary is very creative and not unilateral at all. This can be seen as an educational opportunity. It exposed us to a wider range of words, which can enhance our writing skills and broaden our vocabulary”* (SP23).

Next to the aforesaid perceived benefits of ChatGPT, the students also mentioned a number of **challenges** to be considered. Several students noticed the fact that, at first, the generated text looks reliable but upon a closer look contains mistakes (SP20, 38, 42). The following quote captures this well: *“When you read the AI-produced essay for the first time, it looks pretty good. [...] But when you take a closer look, you see that there are still a lot of flaws. I think the biggest problem is the factual accuracy of the essay”* (SP42). The students referred to several known weaknesses of the tool, such as lack of in-text citations (e.g. SP10, 15, 40), made-up facts and sources, sometimes referred to as ‘hallucination’ (e.g. SP17, 24, 27), bias (e.g. SP8, 30, 43), outdated information (referring to year 2021) (SP9), and trivial or missing examples (SP14). This posed a challenge to the students to verify the AI outputs and find relevant supporting evidence for the arguments made by ChatGPT.

Furthermore, since the AI-generated essay already contained arguments and rather well-written text on the topic, many students found it challenging to expand or improve them further. Although some students mentioned that they found the AI output to be superficial and unsubstantiated (SP25, 29, 30) and to be lacking the awareness of the specific context of the topic (SP4), we observed that it was a common challenge for the students to achieve a meaningful contribution when improving the AI-generated text/arguments. One student pair explained it as follows: *“The act of getting the text beforehand by ChatGPT limits our process of creation [...] you end up trying to improve arguments*

*built by the tool and maybe bringing into place new arguments, but if you find yourself willing to write something extremely different from what you got in the first place, it is a harder process to trust in yourself rather than the tool”* (SP16). Other students (e.g. SP29, 38) even stressed that it was challenging to understand the reasoning behind the arguments made by ChatGPT, and that they raised additional questions.

The identified benefits and challenges are summarized in Table 2 and 3 (see Annex).

### 4.3 How do students view responsible use of ChatGPT when co-writing an essay with the chatbot?

The consensus among the students was that whether co-writing with ChatGPT is responsible or not depends on how the tool was used and what the role of the student was. From the student reflections, we identified various perceptions of the **role of the student writer** in such an AI-assisted writing process. Two broad roles emerge from the students’ reflections: one focused on *reviewing AI output* to ensure accuracy, validity, conformity with academic standards, and the other one - on *filling in the gaps* and weaknesses of ChatGPT. Although these roles overlap, they do allow us to accentuate two different approaches to AI-assisted writing. In the first role, the students reported to have engaged in fact-checking, validating, overseeing (SP3, 12, 35, 37), checking for plagiarism by ChatGPT itself (SP24), and otherwise ensuring that the AI text conforms to academic and ethical standards (SP21, 22, 24). In the second role, the students have emphasized that the student writer is there to fill in the gaps and reshape the ChatGPT output towards the final outcome. Within this role, the students “perfect” the AI-generated arguments (SP40), expand and substantiate them with (up-to-date) sources and examples (SP14, 17, 25, 43), expand the essay towards the assignment requirements (SP41), adjust structure and flow (SP31, 42), form their own opinion on the topic (SP31), tailor the text to the given context and ensure appropriate tone and positioning (SP16). Finally, several students mentioned that they viewed their contribution as adding creativity (SP3, 11, 14, 41) and making the AI text more ‘human’ (SP4).

Having said that, these views on what constitutes the role of the human correspond to how the responsible use of ChatGPT is perceived among the students. For instance, we found a *rule-based interpretation* by some students that as long as no copy-pasting takes place (SP7), and the use adheres to formal rules (SP5, 17, 25), it should be considered responsible. Most of the students indicated they were well aware that passing off AI-generated content without proper acknowledgement is not acceptable (e.g. SP20, 23, 32, 36, 42).

Another interpretation emphasizes that it is only responsible to use ChatGPT *as a tutor for feedback purposes or as a search engine* (and not for co-writing). For instance, a student pair commented (SP8): *“People should use ChatGPT to help them but not to make it do their work. I think it is responsible to use it as a kind of teacher or tutor, you can ask them anything but they will not do all the work”*. The majority of the students, however, communicated a view that co-writing with AI can be done in a responsible manner when the chatbot takes a role of a writing assistant or even collaborator (although these might overlap). When using AI as a writing assistant, as students argue, responsible use can be achieved if the AI conducts initial tasks like providing a mere basis and short first (superficial) draft which needs to be carefully checked and worked out by the human writer (SP5, 8, 10, 20, 24, 31). When using AI as a collaborator, co-writing is seen as combining strengths and enhancing (but not replacing) human capabilities. Hence, some students argue that it is acceptable to borrow ideas from the chatbot, as long as they are critically assessed and refined (SP12, 15) and if there is also input from the human in terms of new content and own creativity (SP3, 15, 39, 41). As one student pair (SP4) put it: *“To create a well-rounded and meaningful article, responsible use requires striking a balance between keeping human contribution and ethical issues and utilizing AI’s capabilities”*. In this context, some students also show awareness of the need to be transparent about the contribution made by human and by AI (SP3, 5). Several students (SP23, 29, 30) point to the need to provide training and education to support the students in responsible use of such tools, considering that this will become commonplace in their work life. On the contrary, we also found that some students expressed an opinion that reusing ideas generated by ChatGPT should also be seen as irresponsible and that the set up of this essay assignment

did not stimulate responsible use of the tool (because the students had to start from AI-generated text). One student pair (SP32) explained it as follows: “When using the generated text to elaborate and restructure it and hand it in as our own assignment, it feels and is wrong, because we are presenting a text that is not (wholly) ours as if it is”. This is supported by another statement (SP7): “Co-writing the essay could be responsible, but only when the essay it started from scratch instead of having an already made essay like we did in this assignment. It limits your creativity, because you copy existing ideas instead of using your own”.

#### 4.4 What are the skills and knowledge as perceived by students needed to use ChatGPT effectively in essay writing?

Overall, the students emphasized several skills that are critical to the effective use of ChatGPT in their essay writing process. They include the following: 1) critical thinking, 2) creativity, 3) language skills, 4) the ability to effectively communicate with LLMs, 5) research skills, and 6) ethical awareness (see also Table 5 in the Annex).

*Critical thinking* is an important skill pointed out by most students. In the context of the present study, it is understood as the students’ ability to think and reflect critically when improving a text originally generated by ChatGPT. Students have, for instance, stressed that critical analysis skills are needed to “be able to fact-check information” or detect “fallacies and inconsistencies” (SP27) to ensure the “accuracy and credibility of the information presented in the essay” (SP16). This, according to the students, refers to the students’ ability to be critical to the arguments provided by ChatGPT and to their ability to find relevant sources and references to support arguments provided (e.g. SP28). Some students for example, explicitly stated that one needs to not only “stay critical” but also “to try to find sources for almost all information ChatGPT provides you” (SP17) and “not to take everything that ChatGPT writes as truth” (SP39).

*Creativity* or the ability to think creatively has been highlighted by many study participants (e.g., SP 7, 14, 13, 41). This skill has been experienced to be critical “to address the missing areas in the essay” to be able to “improve [...] [it] and make it more complete” (SP41). Some students stressed that creativity was required when providing a new creative title and a strong opening or ending statement (SP 33). Others underscored that creative thinking skills were needed when revising and even re-writing some parts of the text such as conclusions, which are as experienced by some students (SP17), not based on the information provided in the earlier parts of the essay. The students then stated that a “new skill which is required to collaborate with [...] ChatGPT is therefore creativity” (SP7).

*Revision and collaborative writing* skills, also referred to by students as “writing skills” and “linguistic skills”, have been stressed to be key when collaborating with ChatGPT in the essay co-writing process (e.g. SP 8, 12, 17). These skills include: 1) the need of “proper knowledge and use of grammar to compliment the text instead of just writing text” (SP12), 2) the skill of choosing ‘right’ words to communicate the thought message to the reader (SP8), and 3) the ability ‘to tell’ the story, i.e., “to try and connect the arguments and make a story out of points given to you” (SP8). Some students have further specified that language skills to refine the generated text comprise: “editing sentences, rephrasing arguments and organizing the output in a coherent manner” (SP35).

*Effective instruction of LLMs* is a skill that has been emphasized as ‘a must’ for achieving anticipated writing outcomes (i.e. improved texts) by the students. In many cases, the students have underlined that it is critical to formulate “effective prompts” to get the “desired outputs” (SP28). By ‘effective’ prompting, the students pointed out the ability to formulate clear and specific prompts to ChatGPT (e.g. SP, 23, 26, 28). Some of the students have also stressed that during the process, they have developed the skill to “provide the Chatbot with right prompts” and moreover, they have learnt that one “can provide ChatGPT with a certain identity” (SP26). The latter has been perceived “to result in a writing style of high quality” (SP26).

*Fact checking and evidence gathering skills* have been explicitly mentioned by the students (e.g. SP12, 16, 19, 27, 30, 33). This kind of skill refers to ability to identify high quality research evidence and draw appropriate conclusions from it. As stressed by SP30, “the main skill required to collaborate with



ChatGPT, are mainly fact checking skills and providing scientific evidence”. Others in an equivalent way, refer to research skills in terms of the student’s ability to “verify sources” (SP9) or “to find sources that will underpin the arguments and the statements made” (SP12).

Finally, students’ *awareness of ethical issues* when collaborating with ChatGPT has been stressed to be similarly important. In this regard, the students referred to the need of a “more advanced knowledge of the digital world and privacy regulations” (SP9) and an awareness of the “biases” of ChatGPT, “in particular when talking about AI-related topics” (SP23). Further, ethical awareness has been explained in terms of accepting the “norms and values that the AI provides and what we want to use” (SP26).

Apart from the abovementioned skills, the students also stressed the two knowledge components that are essential in this process. First, students stated that “*the tool can be best used if the person who uses it already possesses a considerable level of expertise on the topic*”; this would enable to prompt ChatGPT effectively by posting detailed questions (SP23). Others further highlighted that to address several complex issues such as “*clarifying misunderstood concepts, requires more effort and careful attention*” [...] *demands a deeper understanding of the subject matter.*” (SP31). Second, the “*need to know how ChatGPT handles some things*” has been emphasized to be important for effective collaboration with it (SP20). In this study, this is explained in terms of being knowledgeable of where it takes its information sources from (SP20). In sum, effective collaboration with ChatGPT in the process of essay writing requires: 1) the learner’s elevated level of the subject targeted and 2) the knowledge of how LLMs works.

## 5 Discussion and conclusions

Our study aimed at improving our understanding of the students’ experiences and perceptions of using ChatGPT for essay writing. Based on a case study in a Dutch university, we examined how students used the chatbot in their essay writing process, what benefits and challenges they experienced, what kind of skills and knowledge are deemed necessary by students, and how they understand the responsible use of such a tool.

In our study, we identified several categories of use of ChatGPT for students in essay writing, which go beyond the uses discussed for instance by Mollick & Mollick (2023). Prompting ChatGPT and similar tools to further interrogate AI outputs (the category we labeled as tool criticism) is of particular relevance to students in courses and education programs dedicated to digitalization.

Our research provides a more in-depth qualitative account of benefits and challenges experienced by the students when using ChatGPT for essay writing, thus elevating existing preliminary research (Bernabei et al., 2023; Balhorn et al., 2023) on these issues. We further conclude that the perceived benefits and challenges are associated with different types of uses of ChatGPT in the essay writing process by students. For example, we found that **some uses of ChatGPT, namely for content generation, present more challenges** to the students than others. We also observe that some of the identified required skills correlate to specific uses of ChatGPT, although a number of skills are relevant to all types of uses. For instance, when ChatGPT is used to co-write parts of the text with the student, enhancing collaborative writing skills among students is important. On the other hand, if ChatGPT is used for content generation and for assisting with researching the topic, fact checking and evidence gathering skills come to the forefront. Critical thinking remains, what we may call, a meta-skill important for all uses of ChatGPT. We also identified a set of **skills that may be considered specific to human-AI collaboration**: effective instruction and ethical awareness. These are new types of skills the students need to develop, compared to more prevalent skills in academic education like critical thinking and collaborative writing (which occurs widely in student groups).

Furthermore, although we established that **creativity** was considered an important skill by the students that is needed to complement the outputs of ChatGPT, it was **also seen as being under threat**. In our study, we observe that the students were more likely to express their creativity in minor, complementary tasks, for instance, coming up with a title, instead of coming up with new arguments for the essay. Although we did not investigate this aspect – contribution of human vs AI to the eventual essay text –

in much depth in our study, we call on future research to study this more systematically. There is emergent work on this issue (beyond the education context) conceptualizing the level of dependency of human writers on AI tools and who retains control over the text after all. Namely, Shibani et al. (2023) suggested three archetypical levels of dependency of writers on generative AI tools like ChatGPT: fully autonomous writer, autonomous writer with ChatGPT assistance, and ChatGPT dependent writer. In the latter case, the human writer relies on ChatGPT suggestions repeatedly and the human input is limited to authoring a few sentences. We argue that **students might be at risk of developing excessive dependency on AI tools** in writing due to the lack of critical skills (compared to professional writers). Hence, we suggest this as an important avenue for future research, following the example of Woo et al. (2023), to investigate the difference among high- and low-performing students in their use of AI tools in co-writing process and what kind of support they require to enhance their learning outcomes. This is especially important given our finding that effective use of tools like ChatGPT for essay writing requires a good level of knowledge on the topic of the essay from the student at the outset.

In our research, we also identified a wide variety of interpretations among the students of what constitutes responsible use of tools like ChatGPT for essay writing. This signals that students remain confused, and there is a need for clearer rules and guidelines at different levels of education management. We especially welcome efforts of universities to develop codes of conduct, together with students.

In addition, we highlight some of the limitations of the current study design. This includes the moderate sample size ( $N = 43$ ) which might limit the degree to which our findings can be generalized. We encourage repetition of our study at other institutes, especially repetition in other cultures could enrich our reported findings. Future research should also consider longer term implications on student perspectives, especially when ChatGPT assignments are integrated in multiple courses of the curriculum.

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## Annex

Write an essay of 2500 words for me about whether a digital voice assistant is a friend or a foe in one's home. Give the essay a title.

Carefully follow these rules when you write the essay:

Do not describe your own behavior.

Avoid cliché writing and the use of jargon.

Use sophisticated writing when describing aspects of the digital voice assistants.

This is an essay. It should start with an introduction of 400 words, including a well-formulated opening sentence to capture the reader's attention and definition of main concepts and technologies. Next should come the main body of 1800 words presenting arguments for both sides of the question, it should include supporting evidence and examples. Next write a conclusion of 300 words summarizing the debate and connecting the arguments, it should end with a strong statement answering the topic question of the essay.

Provide references.

Box 1. *Prompt used to generate an essay with GPT 3.5 for one of the topics.*

Sample quote	1st order code	2nd order code	Category
<i>While writing this essay, ChatGPT and I worked together, and I asked him questions like "What is a better synonym for ...?" or "How can you write this sentence better?" or "Is this grammatically correct?"</i>	Example use	ask for feedback on writing, ask to rephrase	Feedback provision and writing coach
<i>We did however ask ChatGPT to provide a first sentence of a paragraph, and from then we wrote the paragraph ourselves. This helps us to start writing and reduces the time spend thinking about what to write.</i>	Example use	ask to give a start of a paragraph	

Table 1. *Excerpt from coding.*

Uses	Explanation
As feedback provision and writing coach	To generate a compelling title, ending or catchy introductory paragraphs, to rephrase text and/or give synonyms, to improve grammar, style, and flow, to provide translation, to offer an example of a well-structured sentence
Content generation	To generate new arguments for their essay
Research tasks	To ask for key concepts and (more) sources on the topic, to explain concepts and provide illustrative examples, to provide keywords for Google Scholar, to paraphrase academic texts for proper citation, to summarize scientific papers
Provide basic structure	To provide a start, a plan, a base to build on for structuring the arguments
Tool criticism	To provide feedback on the chatbot's own text, provide sources underlying its own argument, clarify its own arguments, to expand its own arguments or conclusions

Table 2. *Overview of uses of ChatGPT by students for essay writing.*

Benefits	Sample quotes
ChatGPT helps with setting up a structure for an essay	<ul style="list-style-type: none"> <li>• “it was easier with a set-up of the essay than without” (SP32)</li> <li>• “the general structure was there” (SP25)</li> <li>• “it provided as structured starting point for our essay and served as an outline to guide our writing process” (SP16)</li> </ul>
ChatGPT generates useful key arguments to start with	<ul style="list-style-type: none"> <li>• “three pro and three con arguments had already been given [...] We no longer had to come up with arguments by ourselves” (SP34)</li> <li>• “not much research was needed, since the arguments in favor and against [...] were already given” (SP18)</li> <li>• “there already was an idea of what arguments were relevant to the topic. This made the brainstorming process much easier” (SP25)</li> </ul>
ChatGPT facilitates the essay writing process in terms of time saving	<ul style="list-style-type: none"> <li>• “writing an essay goes faster by using chatGPT” (SP19)</li> <li>• “ChatGPT contribution saved us a lot of time” (SP40)</li> <li>• “the predefined structure was also beneficial because it saved some time” (SP27)</li> </ul>
ChatGPT saves effort researching the facts and main concepts on the topic	<ul style="list-style-type: none"> <li>• “I also found it helpful that the introduction explained well [essay topic] and what the problem is” (SP19)</li> <li>• “ChatGPT is easy to use for getting a lot of information quickly, and this is handy for learning more about the topic that we wrote about” (SP7)</li> <li>• “can be helpful to reduce the time that you have to look for certain answers” (SP8)</li> </ul>
ChatGPT enhances students’ academic writing process	<ul style="list-style-type: none"> <li>• “By using ChatGPT it was easier to write in a more academic style. Personally, sometimes I struggle with the English languages, so ChatGPT is an easy tool to improve it” (SP39)</li> <li>• “it can be useful to use ChatGPT [...] to have an example of what kind of professional language to use” (SP10)</li> <li>• “we think ChatGPT to be extremely helpful in crafting well-structured English sentences” (SP31)</li> </ul>

Table 3. Benefits of using ChatGPT for essay writing experienced by students.

Challenges	Sample quotes
To expand and improve the arguments/text generated by ChatGPT	<ul style="list-style-type: none"> <li>• “it was hard to expand the text, because the key message was already there, and the text was quite well-written” (SP32)</li> <li>• “but AI already stated good arguments in the text so to find new ones was a hard part” (SP25)</li> <li>• “Other arguments were harder to improve because we did not have a lot of knowledge about those subjects” (SP32)</li> </ul>
To verify and find relevant supporting evidence for the arguments generated by ChatGPT	<ul style="list-style-type: none"> <li>• “to find sources that validate the arguments in the essay was hard as the arguments were quite specific” (SP25)</li> <li>• “the key challenge [...] is the absence of explicit references or citations for claims and statements made by the AI” (SP28)</li> <li>• “the information and examples were missing throughout the entire essay” (SP18)</li> </ul>
To understand the reasoning behind the arguments provided by ChatGPT	<ul style="list-style-type: none"> <li>• “the reasoning behind arguments were lacking and statements made by the AI only gave the reader more questions” (SP38)</li> <li>• “ChatGPT does not take into account the different problem dimensions and socio-economic feasibility” (SP29)</li> </ul>
To make the text one’s own and in line with student’s writing style	<ul style="list-style-type: none"> <li>• “I also deleted more than half of the written text by ChatGPT because it did not fit my own writing style” (SP18)</li> <li>• “it was difficult not to use the exact same words and ideas given ChatGPT text but make it your own using different sources” (SP11)</li> <li>• “the [ChatGPT] tone/writing style does not match my own causing the parts I rewrote to mismatch with the ChatGPT parts” (SP24)</li> </ul>

Table 4. Challenges of using ChatGPT for essay writing experienced by students.

Skills	Sample quotes
Critical thinking	<ul style="list-style-type: none"> <li>• “a new skill that was required was to look more critically to the content that was already written” (SP32)</li> <li>• “the skill of critically reflecting on the ideas ChatGPT generates becomes really important” (SP42)</li> <li>• “the main skill needed for re-writing this essay was detecting flaws and shortcomings. Being critical of AI writing, as it is easy to not remove parts of the essays that are flawed.” (SP40)</li> </ul>
Creativity	<ul style="list-style-type: none"> <li>• “To address the missing areas in the essay, we needed to think creatively. We had to rephrase ideas and add examples and evidence to improve the essay and make it more complete.” (SP41)</li> <li>• “There was a strong sentence missing at the beginning of the paragraph [...] so you have to use your own creativity” (SP14)</li> <li>• “providing a new creative tile, a strong ‘hook’ and a ‘Pathian shot’ required our creativity and this is always an exciting but challenging part of writing an essay.” (SP33)</li> </ul>
Collaborative writing skills	<ul style="list-style-type: none"> <li>• “collaborating with ChatGPT requires language skills to refine the generated text. This includes editing sentences, rephrasing arguments, and organizing the output in a coherent manner.” (SP35)</li> <li>• “I think the new skills required to collaborate with the tools from ChatGPT is to try to connect arguments and make a story of points given to you.” (SP8)</li> <li>• “Also word use could be important in how the readers are interpreting a sentence.” (SP8)</li> </ul>
Fact checking and evidence gathering skills	<ul style="list-style-type: none"> <li>• “Proper research skills are also necessary...you have to do proper research to find sources that will underpin the arguments and statements made.” (SP12)</li> <li>• “And checking the references is always important when working with ChatGPT.” (SP33)</li> </ul>
Ethical awareness	<ul style="list-style-type: none"> <li>• “a skill required to work with a tool like ChatGP is a more advanced knowledge of the digital world and privacy regulations. Simply because you do not pay with money, but pay with data”. (SP9)</li> <li>• “To collaborate with tool like ChatGPT, it’s necessary to know the limitations of the tool like that. For example, the tool could be biased.” (SP23)</li> <li>• “The chatbot can be biased and therefore ethical questions arise. It should be considered to what extent we accept the norms and values that the AI provides and what we want to use.” (SP26)</li> </ul>
Effective instruction of ChatGPT	<ul style="list-style-type: none"> <li>• “Providing the Chatbot with the right prompts would be considered as a new skill. In order to het the exact output you want from then bot, you need to know its capabilities and how to effectively get the right outcome” (SP26)</li> <li>• “It is also important to ask the right questions to ChatGPT, so that you also get good answers” (SP19)</li> <li>• “By formulating clear and specific prompts, AI’s output can be steered towards the desired direction. (SP28)</li> </ul>

Table 5. Skills needed when co-writing with ChatGPT.