

Exploring Generative AI as a Tool for Academic Writing Support

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Abstract:

Artificial intelligence (AI) results from the continuous development of technology and advances in information processing. One form of AI that has developed rapidly in recent years is generative AI (GAI), particularly following the launch of ChatGPT in December 2022. This launch sparked controversy and discussion about how GAI can be used in higher education. The use of GAI in studies can contribute to improved results; however, it can also have the opposite effect and negatively impact learning if used incorrectly. This study aims to supplement existing research on GAI with up-to-date information on how students currently use GAI and how the functionality of GAI tools can be designed to support university students' academic writing.

A qualitative study was conducted using semi-structured interviews with 12 Level 4 students from the English Department at Tripoli University, Faculty of Education, Gaser Ben Ghashir. The results were analyzed through thematic analysis, identifying three main themes: organizing the text, idea generation, and revising the text. The findings provide suggestions for functionalities that are important for GAI tools to support students' academic writing and how students can use them, thereby increasing the potential for creating favorable conditions and outcomes for the students. The study concludes that GAI tools should be designed to support students without compromising the originality of their ideas and thoughts, while also providing clear guidelines for appropriate usage in academic contexts.

Keywords: Generative Artificial Intelligence, Academic Writing

1. Introduction

Artificial intelligence (AI) has emerged as a transformative force in contemporary society, propelled by advancements in technology and information processing (Ali et al., 2023; Dakakni & Safa, 2023). Among the various forms of AI, generative AI (GAI) has gained significant traction, particularly with the proliferation of user-friendly chatbots such as ChatGPT from OpenAI, Bard from Google, and Bing from Microsoft. This surge in accessibility has sparked widespread public interest and debate surrounding GAI's potential applications in various domains, notably higher education (Barrett & Pack, 2023). The introduction of ChatGPT in December 2022 ignited discussions about the implications of GAI on academic practices,

highlighting a pressing need for pedagogical adaptation in response to these rapid technological developments (Dai et al., 2023; Moorhouse et al., 2023).

While GAI has the potential to enhance academic outcomes, its misuse poses risks that could undermine learning experiences. Concerns arise regarding the accuracy of information generated by GAI, which often lacks the capability to assess the credibility of its output (Ilieva et al., 2023). Moreover, the historically ambiguous perceptions of academic dishonesty among students complicate the integration of GAI into educational contexts (Barrett & Pack, 2023). As GAI continues to evolve, it presents both opportunities and challenges for students' academic writing processes, necessitating careful consideration of its role as a supportive tool (Barrett & Pack, 2023).

Current text-generating AI tools demonstrate capabilities comparable to human writing, positioning GAI as a valuable resource for students, educators, and researchers alike (Segbenya et al., 2023). However, the academic writing process remains inherently complex, requiring mastery of language conventions and communication norms (Nguyen et al., 2024). GAI offers promising avenues for personalized support, particularly for students grappling with critical thinking and writing challenges (Essel et al., 2024; Ilieva et al., 2023). Nonetheless, the design of GAI tools must prioritize the preservation of students' originality and thought processes, balancing assistance with the necessity for independent critical engagement (Cummings et al., 2024; Ilieva et al., 2023).

Despite the growing interest in GAI, there remains a significant gap in understanding how these tools can be effectively developed to aid academic writing. This study seeks to contribute to the dialogue surrounding GAI by exploring its current usage among students and identifying essential functionalities that can enhance academic writing support. The research aims to address the question: How can GAI be designed to support university students' academic writing? This inquiry is particularly urgent given the rapid adoption of GAI tools by students, often in the absence of clear institutional guidelines. At Tripoli University's Faculty of Education, where English is the medium of instruction, students face the dual challenge of mastering academic discourse in a second language while adapting to emerging AI technologies. Understanding how GAI can be purposefully designed to meet these challenges is critical for fostering academic integrity and promoting genuine learning outcomes.

1.1 The Study objectives

The present study will examine whether the use of generative AI (GAI) tools leads to measurable improvements in students' academic writing skills compared to traditional methods. It will also explore how students perceive generative AI as a tool for academic writing. Are there concerns about reliance on technology, or is there enthusiasm for its potential benefits? Additionally, the study aims to identify how the use of generative AI tools affects students' understanding and practice of academic integrity. What measures can be implemented to ensure originality in student work?

1. Literature Review

1.1 Academic Writing

As Barrett and Pack (2023) define, academic writing process comprises four steps. The initial phase is planning which involves brainstorming and organization of the content. The second phase is writing where the student concentrates on expressing his/her thoughts to a chosen audience using a draft. The third phase is revising the text with references to the viewpoint on the first variant (Barrett and Pack, 2023). Lastly, the evaluation is the culminating point that plays a significant role in enhancing the text.

Since the writing process is part of memory capacity, high levels of cognitive load can affect and even hinder the writing process (Nguyen et al., 2024). Nguyen et al. (2024) address Flower and Hayes' (1981) framework for the cognitive process of writing in their study, which consists of planning the content, converting the writer's thoughts into text, and reviewing content to improve the text, which is comparable to Barrett and Pack's (2023) process.

Itua et al. (2012) write that academic texts must contain good grammar, logical and well-structured paragraphs, a clear common thread and formal language. According to Paltridge (2004), it is difficult for university students to write academically, especially when writing in a language other than their native language. Paltridge (2004) also mentions that critical thinking is a requirement for writing academic texts. According to Boscolo et al. (2007), academic writing requires the use of references. This makes academic writing a complex process that involves the relationship between the text being written, information from references and the student's previous experience (Boscolo et al., 2007). Itua et al. (2012) describe that the most challenging aspects of academic writing for students are understanding how to use references correctly, structuring the text so that it is clear and understandable, and using academic language.

2.2 Generative AI

GAI is a type of AI that can generate new and unique data such as texts, images, audio files and 3D models based on training data (Chiu, 2024). Text-generating AI can also be improved by being trained on user prompts, where the responses are processed by an algorithm to strengthen the learning process (Escalante et al., 2023). Since GAI can generate complex content that can mimic human creativity, GAI is considered a useful and helpful tool in various situations and fields (Chiu, 2024).

GPT is a type of "large language model" (LLM) that works by using generative algorithms to predict a sequence of words that humans would likely have created (Dwivedi et al., 2023). GPT is trained on a large amount of text-based data that enables the generation of text that mimics human language, answers questions, and performs other language-related tasks (Ilieva et al., 2023; Niedbał et al., 2023). One of the largest GPT chatbots is ChatGPT, which has an interface that is formatted as a dialog box where the user has an input field and ChatGPT then responds in a dialog form (Dai et al., 2023; Escalante et al., 2023; Essel et al., 2024). Just two months after the launch of ChatGPT, one fifth of students in higher education used it in academic tasks (Sullivan et al., 2023).

2.3 AI in Teaching

The launch of ChatGPT in November 2022 has caught the attention of researchers (Dwivedi et al., 2023). According to Chiu (2024), new opportunities for using GAI in college and university teaching were opened by the new development of GPT. Many students have started using ChatGPT in schoolwork because of these opportunities, which Dai et al. (2023) explains that it has made it almost impossible to prohibit or control its use. Barrett and Pack (2023) explain that this will be further complicated as the development creates more opportunities for students to use GAI in the writing process. As GAI enters the teaching sphere, this area of research is novel, particularly the emergence of a new form of LLM and its ability (Bernabei et al., 2023).

2.3.1 Concerns About Generative AI

With GAI tools' ability to generate texts, the boundaries between human and machine-generated works become blurred (Niedbał et al., 2023). Niedbał et al. (2023) write that there is a lack of ethical guidelines for the use of GAI at present and that new rules are therefore needed to govern the use of these tools. The

most critical problem with ChatGPT is that it sometimes produces irrelevant or incorrect information (Dai et al., 2023; Hassoulas et al., 2023; Steele, 2023). This is a phenomenon called AI hallucination (Dai et al., 2023; Sweeney, 2023). Sweeney (2023) explains that AI hallucination is because GAI does not have human intelligence.

The use of GAI risks that students may become dependent on it, which can lead to reduced ability to write and think critically (Moorhouse et al., 2023; Segbenya et al., 2023). According to Barrett and Pack (2023), writing is considered a fundamental skill that is necessary for the academic development of students. Writing contributes to the development of critical thinking and rhetorical knowledge that is grounded in creativity, responsibility, perseverance, and curiosity (Barrett & Pack, 2023).

2.3.2 Opportunities with Generative AI

Although GAI can generate inaccurate and biased information, the tool has the potential to increase student learning (Sullivan et al., 2023). According to the Best College survey, 61% of university students believe that AI tools will eventually become the norm (Dai et al., 2023). GAI has proven itself capable of performing various tasks such as writing highly creative texts, correcting texts and programming codes, answering user questions, summarizing texts, and reformulating texts in different tones and styles (Escalante et al., 2023).

GAI chatbots can be used as a tool that reflects on texts to generate ideas or understand the text better instead of letting GAI write the entire text (Escalante et al., 2023). In the context of writing academic texts, GAI can be used to get feedback on the grammar, vocabulary and tone of the text, which can assist the student during different phases of the writing process (Escalante et al., 2023). Barrett and Pack (2023) explain that in their study they found that both students and teachers agree that using GAI in the early stages of the writing process such as generating ideas and creating an outline for the text should not be prohibited or seen as cheating.

The tools also help provide students with immediate feedback, which contributes to students' reflection, which provides an opportunity to learn from their mistakes, which increases their self-confidence (Chiu, 2024). GAI can help students summarize texts and develop the ability to research by providing them with information and sources about the area to be written about (Niedbał et al., 2023).

2.3.3 Related Studies

Cummings et al. (2024) previously investigated students' interaction with three different types of generative AI tools that can be used during writing. Cummings et al. (2024) concluded that the main uses of the GAI tools investigated were to provide a helping hand to relieve the burden of searching for references, generating ideas and receiving feedback on the text. Albayati's (2024) study explored the use of the ChatGPT tool for providing recommendations for how GAI tools can be designed to create a more user-friendly tool and meet the user's needs and expectations.

2.4 Synthesis of Literature

According to the literature investigation, three general categories of students' use of GAI in academic writing were found. The first category will assist in framing the text by creating a layout with headers and bullet items for a common thread throughout the text. The second usage is in the form of idea generation, used to generate a topic to write about, generate ideas for research questions or generate counterarguments. Finally, the last category identified is revising and rewriting the text. This can be achieved using GAI that searches for spelling mistakes and offers suggestions for improved grammar and language

3. Methodology

3.1 Research Design

This study applied a qualitative research design aiming to examine the experience and views of the students regarding the use of GAI in writing for academic purposes. Qualitative methods were adopted for their ability to understand the nuanced knowledge about the participants' experiences and contextual factors affecting their engagement with GAI tools (Bryman, 2018).

3.2 Participants and Setting

This study was carried out at Tripoli University's faculty of Education Qaser Ben Ghashir, English Language Department. Participants were recruited through purposive sampling, with criteria including: (1) enrollment as fourth-year students, (2) regular engagement with academic writing tasks, and (3) varying levels of GAI experience. The final sample comprised 12 students (aged 19-22), representing diverse backgrounds within the English Department program.

3.3 Data Collection

Semi-structured interviews were conducted over three days in quiet, private spaces within the university. Interview duration ranged from 20 to 60 minutes, yielding approximately 7 hours of audio data. The interview guide, developed from literature review findings, explored three thematic areas: text organization, idea generation, and text revision.

A pilot study with two students refined the interview protocol, eliminating redundancies and clarifying ambiguous questions. All interviews were conducted in English, audio-recorded with consent, and supplemented with field notes.

3.4 Data Analysis

Interview recordings were transcribed using Good Tape AI transcription software, with manual verification for accuracy. Thematic analysis followed a hybrid deductive-inductive approach (Braun & Clarke, 2006). The three categories identified from literature served as primary themes, while inductive coding revealed subthemes within each category.

Analysis proceeded through six phases: (1) familiarization with data, (2) initial coding, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. Miro software facilitated visual mapping of codes and theme development.

3.5 Ethical Considerations

The study adhered to established ethical principles (Bryman, 2018). Participants received comprehensive information about the study purpose, voluntary participation, and data usage. Confidentiality was maintained through alphabetic pseudonyms, and all recordings were deleted post-analysis. Informed consent was obtained before each interview.

4. Data analysis

4.1 Students' Experience

The students' experiences of academic writing varied. This was because several students found certain aspects of the writing process challenging. Respondents A, C, E, F and H found academic writing challenging, frustrating and boring even though they were interested in the area they were writing about. The reason for this was, among other things, that it was challenging to start writing, adapt what the student wanted to write in a certain format and structure the text. This was due to the complex structure of academic texts.

"It's not my favorite, if I may say so. I think they have a complex structure. I find it to be a bit angular and quite rigid and inflexible form of writing..." - Respondent H

Respondents B, I and K instead had positive experiences and found it fun to write academic texts. They explained that it was fun when there was a common thread throughout the text and when the right words were found. Interest in writing was also a significant factor in the experience of academic writing.

Respondents D, G, J and L explained that they felt that the quality of academic texts would be higher in higher education compared to secondary school. They explained that it was important to cite sources correctly and not to include personal opinions. It was also important that the content of the text met the criteria for the task. A common mistake was writing text under the wrong heading, which created challenges with wording.

4.1.1 Permitted Use

Most students lacked knowledge of the school's guidelines for the use of AI during their studies. Several respondents believed it could be used as a tool and aid at the beginning of the process, but not to do the work for the student. Most respondents used GAI tools and agreed that it had the potential to be a good aid, but that it could also be used incorrectly. Respondent J expresses:

"I think it tends to be a tool where teachers say you can't use it but students will use it, and then I think it's better to inform about ways it can help you than just try to ignore it and say it doesn't exist." - Respondent J

Respondents expressed concerns that GAI could be used incorrectly. Respondent L believed that the use of GAI will increase and that it will result in students having to do less work themselves, which could lead to students not learning as much. Respondent I believed that more people who were not familiar with the subject or did not try to do the task could still be approved by using GAI. This was something that several students testified that they had seen happen already and often without being detected by teachers. Respondents D, E and J explain that they believed that the method of examining will change in order to be able to check that the student owns their work and wrote it themselves.

Several respondents also expressed a positive opinion about GAI as a tool and thought it should be used as long as it was only used as an aid or tool. Respondent J believed that many people could dare to ask questions to GAI tools that they would not dare to ask a teacher and in this way learn more about the subject. Respondent L explained that it will make it easier to get started with a project and get off to a good start.

4.2 Laying Out the Text

Several students used GAI as a tool to help them structure the text. Respondent K explained that Miro was a tool that was used as part of the process of structuring the text because the tool made it easier to gather facts and categorize them in preparation for writing.

Respondent A described using Google Docs to structure the text by starting by setting out the main information in the form of bullet points which were then worked on during the writing process to become more detailed and specific.

Furthermore, respondents E and F explained the importance of starting by writing headings and specifying what information each heading would cover and that the headings were then processed, reformulated and moved to create a common thread throughout the text.

"...write titles, and under the titles in bullet form I write down everything that should be included. Then if I get an idea for a whole paragraph or a whole sentence or something I want to write down, I try to write it down as completely as possible almost immediately..." - Respondent E

There were also students who described their way of using the existing GAI tools to help simplify and structure scientific articles that were to be used. Respondent F said that there were other aspects that GAI could help with during the writing process. GAI could facilitate the process of starting to write and formulating a text. Respondent F explained:

"If I read a scientific article that is going to be included in a text, I like to highlight what is important. It can be a very long bullet point list because you read a lot when you are going to write a text, so I like to add all the points and ask ChatGPT write it down into a text, and then I don't copy-paste that text, but it still gives a start on how to formulate yourself..." - Respondent F

This category also identified challenges currently experienced with structuring the text. Respondent E explained that it was difficult to decide exactly what to use in the text, which made the writing process more difficult. Respondent L agreed and mentioned that it was common for students to write good text, but under the wrong heading. Respondent E said:

"I always find the structure to be a problem, which is why I started doing it in the first place. Writing down that 'I'm going to have an introduction, 'I want a bit about this, a bit about this and then I'm going to have a summary here' and then writing down how many words I'm going to have for each part so that I actually have something to go on." - Respondent E

Students' opinions on how GAI could be used to improve the process of organizing the text were identified. Respondent I felt that ChatGPT did not provide concrete answers when it came to academic writing and therefore could not be used in a good way to organize the text. Respondent I explained:

"It can be very vague, and it is certainly great at writing speeches and such, but I don't think it is for academic texts with divisions. It is also that it may not know much about the particular subject we are writing about." - Respondent I

4.3 Idea Generation

In the category of idea generation, it was identified how students currently approach generating ideas for texts, which was an early and fundamental step in the writing process for academic writing. Students' approaches to generating ideas varied between methods without GAI and methods with GAI as a tool. Respondents C and D explained that they did not use GAI and that they instead usually started by creating a mind map from which they started to create an idea. Respondents E, F, H and K instead agreed that they mainly started from themselves and their own thoughts on the topic. Respondent E expressed himself as follows:

"The first thing I write down is something that stands out." - Respondent E

Respondent K instead explained:

"I'm a very creative person, so I always start with myself first and foremost." - Respondent K

Respondent K also explained that once there was a basic idea, it was developed further while reading texts on the subject and writing text based on it. This was something that both respondents B and E agreed with.

"Once you get started and start writing an introduction and a coherent text, additional ideas are generated as you go." - Respondent E

Respondent E said that by starting from one's own idea of what was interesting and then doing searches based on that, new perspectives could be discovered that could change and develop the idea. Respondent H instead explained that by starting from oneself and writing down thoughts in a bulleted list, the idea could be developed further before the search began.

Several respondents were already using GAI in the idea generation process. Respondents D, E, F and Hall mentioned that they would like to have someone to brainstorm with. This was a task they explained that GAI tools such as ChatGPT could be used for if the work was not written in a group where it was possible to brainstorm with a workmate. Respondent H expressed:

"...there's a lot of potential in this because generative AI is a thought process you can play with..." - Respondent H

Respondent K explained that it could be beneficial to use GAI tools early in the writing process for academic writing to gain inspiration and not get locked into one idea without having explored other potential possibilities and paths to take.

"When it's stuck in my head, I think it's a great way to ask a question. 'Can you tell me a little bit about this?' It gives even more ideas..." - Respondent K

Another occasion when GAI could be used as a tool, said respondents A, H, J, K and L, was to ask questions about the topic to create a greater understanding or to provoke thoughts. Respondent H mentioned that GAI could also be used to ask more practical questions about how something could be designed, and respondent A in turn mentioned that GAI could also be used to generate ideas for proposed research questions that could be used as a basis for the work.

4.3.1 Searching and Processing References

An important part of idea generation was searching for and processing references, which according to respondents B, E and K was a way to develop the basic idea and inspire new ways of thinking. The respondents mainly used scientific databases such as Google Scholar, Scopus, OneSearch, IEEE Xplore. Respondents I and K explained that they used to start with an initial search with the search engine Google to get a general view of the area explained in everyday language before searching in scientific databases. "I always find it easiest to search for solutions on Google first because they talk a little more openly." - Respondent K

Searching for references was something that most respondents agreed was a challenge. Respondents A, E, F, H and K said that their biggest challenge was finding references about a specific area. They also explained that combined areas were challenging and that they instead had to solve it by searching for each area separately and then drawing conclusions and connections between them.

"Even though it's similar for a field, it's very specific to that particular field. My solution to that has been to search, search, search, but also to think a little more freely about it. That even if I'm writing about something specific, maybe there's something of value in an article that might be more about something else." - Respondent F

Respondents A, D and H highlighted that it was also challenging to know which search terms to use to get references that were about what was being searched for. Respondent A expressed himself:

"Because sometimes you think, 'I'm searching for what I want to know.' Why do so many other things come up?" - Respondent A

Respondent A explained that it was difficult to know which search terms would give the right results. Respondent D explained that one way to solve the problem could be to look for synonyms for the search

terms, or alternatively test other words that could be linked to the same theme. Respondent H solved the problem by trying to find a reference that generally talked about the topic from the beginning and then picking out words to specify the next search more.

"I often try to find texts where I can find keywords that I can then use to find more texts, but it's not always easy because many of these texts are very specific..." - Respondent H

Respondents A, B, D, F, H and I explained that after they have done their search they start by looking through the titles of the search results to see if anything sounded interesting or relevant. After seeing the title, they look at the headings and abstract to see if the article was still relevant. Only after that do they read the full text. Respondents E and I explained that they also looked for specific words in the text to see if it was relevant.

A shortcoming that GAI tools had was explained by respondents F and J to be providing credible information. They explained that GAI did not have its own understanding of what was true, yet it was still able to make information sound credible through its confident way of presenting the information.

"Yes, but the thing about citing sources is that you don't really know how true the text is when you're writing about things, and that's because it can sound very credible but it's not..." - Respondent J

According to respondent F, it would have been easier were it possible to find out where ChatGPT got the information. This would have at least allowed clarifying whether the information has been interpreted in the tool correctly and whether the source of information was valid or not.

Respondent K said that references were challenging and time-consuming to find and handle, a process that GAI could complement with improvement. Respondent I, for his part,

believed that the tool had been designed to help the search because it was hard to be aware of what keywords to input in finding the results. Respondent I replied that had the GAI tool been more open to search leading to the retrieval of the articles, then this process would have been made easier.

4.4 Revising the Text

Some students were also able to revise their text by reading it, and in some cases read it aloud to determine whether memory could detect a common thread and whether the writing was grammatically correct. Other students asked someone else to read the text they had written. Other students asked someone else to read what they had written. The person who read the text could range from a friend, classmate, person that had no knowledge of the subject matter or to obtain feedback from a teacher about how the text could be improved. Respondents A, B, C, D, E, G, I and J explained that they used to talk, discuss and ask others to read the texts to give feedback on grammar, word choice, spelling and whether the purpose was clear. Respondent D thought that it was a good way to get different perspectives on how the text could be improved.

"Yes, it helps to have another pair of eyes also looking at the same text." - Respondent D

Respondent E instead explained that one way was to read aloud to people who had no knowledge of the subject to ensure that the text was understandable to everyone. Respondent A described the process as an iterative process. Respondent K felt that taking a break from the text and then going back and reading the text aloud to oneself helped to identify areas for improvement. Respondent H highlighted the importance of continuous criticism during the writing process and that the writing process became more difficult when criticism was not given.

"I actually appreciate it if someone comes in and questions. It's something I like and that I think should happen continuously in a writing process if there are several people, but if you write by yourself, it's much, much more difficult because you don't get the active feedback all the time." - Respondent H
Some students did not feel the need to revise texts or receive feedback because they felt confident enough in their own abilities.

4.4.1 Revision with Digital Tools

There were students who used GAI tools such as Grammarly and ChatGPT during the writing process to revise the text. Students also expressed different opinions about their experience using the tools.

Respondent K initially relied on himself to improve the text, but it was also possible to get help from ChatGPT during this process by getting suggestions on how different paragraphs could be combined to include new material in the text.

"Sometimes it can give you food for thought, so you go back to the text and read it through and try to improve it, clarify it or remove it completely if it doesn't fit." - Respondent K

Respondent E explained that ChatGPT was sometimes used to get feedback on certain sentences, but the respondent felt that ChatGPT only gave positive answers. What the respondent meant was that criticism was an important part of improving texts and that it took a lot of work to get a response from ChatGPT on what was asked.

"...then I test ChatGPT. 'What do you think of this sentence? Does it feel coherent?' Another problem with ChatGPT is that it is far too positive..." - Respondent E

Respondents had varied opinions and experiences about the tools. The variation depended on the language they wrote in. Respondents A, B, E, J and K said that they used Google Docs' built-in tools to help correct grammar and spelling when they wrote in Arabic. Respondent A thought that Google Docs was not effective when it came to special spelling in Arabic, so the respondent tended to look up the words on Google if there was uncertainty. Respondent A, however, thought that Grammarly was a useful tool for checking spelling and grammar in English. Respondent J also thought that Grammarly was a helpful tool for English-language texts, but when it came to using Grammarly, respondent A experienced the tools as lacking and that they easily missed errors in the text because they did not always have a sufficient understanding of the text. Respondent I described that the experience of using Grammarly was poor and that ChatGPT worked better.

Respondent D explained that he used to use Overleaf because it included a spell checker. The respondent explained that he used to write in English but that the tool could also support the Arabic language. However, the respondent explained that he had no experience using the tool in Arabic and did not know how well it worked or what limitations there were.

4.4.2 Challenges with the Tools

When it came to the challenges and concerns that students had when revising the text and how GAI could be developed to improve it, respondent A explained that there were difficulties in expressing themselves in academic language, but despite this, he would not have chosen to use ChatGPT to correct the text because of how the tool formulated the answers.

"The problem I would have with using ChatGPT is getting it to understand what I want." - Respondent
Furthermore, respondent D thought that GAI was more of a hindrance and that it might seem like it produced good sentences but that it actually wasn't. The respondent also explained that students risked losing their ability to write academically if they used GAI too much.

"Some grammar, some sentence structures can be strange and sometimes when it's just supposed to writefluff, I think it can say the same thing several times with slightly different words which becomes redundant." - Respondent D

Respondent G said that it was important to double-check all information produced by GAI tools to ensure that the information was correct. Respondent H expressed:

"Make sure it hasn't further manipulated the text, or anything in the wrong direction, or changed the content." - Respondent H

Respondent J mentioned that one development could be that it would be possible to submit a text and ask the tool to suggest how the text could be adapted to be clearer for a specific target group. Furthermore, respondent H mentioned that it was important to develop GAI tools with the aim of assisting people and not replacing them.

5. Discussion

How GAI will affect academic writing in the future is something that students see as both positive and frightening. Sullivan et al. (2023) explain that although GAI can generate inaccurate and biased information, there is a great opportunity to increase student learning. GAI also allows students to receive personalized support in all different parts of the writing process that can contribute to improved skills.

Despite the students' uncertainty about how GAI can be used during the writing process, everyone agreed that the text generated by GAI should not be used directly in their texts but should only be used as inspiration. This is also something that Barrett and Pack's (2023) study shows, which indicates that there is a universal understanding from the students that the text generated by GAI should not be used directly in the students' own texts. However, the interviews showed that there is a risk that students use GAI to do the work entirely for them. Several respondents testify to occasions when this has happened without being detected by examiners and also express their concern about unfair assessment and that more students who do not really take the education seriously will still stay longer.

According to Niedbał et al. (2023), this is because by receiving information in a simple way that GAI allows, it can discourage students from conducting their own research and developing their own conclusions. Barrett and Pack (2023) instead explain that this is because students are not aware of what they are allowed to use GAI tools for as a result of inadequate information from the school. Several students highlight that if GAI is used too much, it can lead to a loss of the ability to think and write critically, which Dai et al. (2023) mentions that it can also lead to difficulties in delving into a subject and also affect students' ability to solve problems.

To avoid ambiguity and concern, it is important that the school sets clear ethical guidelines and informs students about how GAI may be used in their studies. In addition to an ethical perspective, this is also important so that students' ability to think critically is not impaired. It can also be concluded that some form of adaptation or change to the examination will need to be made in order to ensure each student's ability and knowledge instead of only assessing the quality of the text.

5.1 Organizing the Text

Respondents expressed their preference for using GAI tools at the beginning of the writing process as a way to help them get started writing a text. Respondents also explained that GAI can help them get an overview of what the text should contain in order to cover important topics and to maintain a common thread. This is something that Barrett and Pack (2023) explain, and both teachers and students in their study agreed that it should not be considered cheating. Nguyen et al. (2024) explain that GAI can help

students structure and adapt the content for a specific context. This is something that respondents also reinforced during the interviews.

Steele (2023) explains that by generating a framework that students can use, the pace of writing increases. On the other hand, respondents highlight that GAI tools can repeat the same information with different words and that it is therefore important to review the text that GAI generates. Bernabei et al. (2023) study showed that students sometimes do not review the information that GAI generates which can lead to repeated points.

The conclusion that can be drawn from the literature and the respondents' answers is that GAI can currently only be used to generate suggestions that the student can then review and adapt to create a basis for the text. However, GAI can already facilitate the process of organizing the text. By only functioning as a suggestion, the student must reflect on what can be used and what should be adapted, which contributes to the reflective ability. The development of GAI is still ongoing and with more data, GAI will increase its ability to generate frameworks that are also suitable for more specific areas.

Based on both the literature and the respondents, GAI tools can help the student start writing and get a picture of the content of the text by suggesting points and content that a text should include. Design suggestions: Provide suggestions for points, content, structure and framework for the text that the student can use and adapt for the specific text.

5.2 Idea Generation

Based on the interviews, several students expressed that GAI tools already help with coming up with ideas because it is possible to brainstorm ideas with the GAI tool. However, GAI tools have a deficient understanding of what the student is asking for. Ali et al. (2023) identify this as a challenge for using ChatGPT. Ali et al. (2023) mention that this is due to the tool's limited understanding of a topic, which in turn depends on the data on which the tool is trained.

Respondents felt that GAI tools like ChatGPT can simplify and create an understanding of complex topics, which makes writing easier. This is also mentioned by Bernabei et al. (2023) in their study. ChatGPT is helpful when it comes to reflecting about the content of the text which is an important aspect for coming up with new ideas (Li et al., 2023). Based on the interviews, it was discovered that GAI can help during idea generation. Niedbał et al. (2023) explain also that GAI can help students by suggesting new aspects or encouraging them to see ideas from different perspectives.

GAI is experienced by some respondents as challenging to communicate with as each prompt must be written in a way that allows the tool to understand it and can connect the data it is trained on to it. Both the literature and the respondents explain that in order to help students generate ideas for a text, an important further development is that it should be possible to understand even less specific prompts. If GAI tools collaborate with students and have a better understanding of the context of the conversation, it can lead to building better communication between students and GAI tools. In addition, GAI gives the student a different perspective that helps with developing the ideas.

Design suggestions: Support with different perspectives on ideas. Design suggestion: Collaborate with the student by following and remembering the conversation and having a better understanding of context, topic, and the student's prompts.

5.2.1 Reference Management

Using references in academic writing, according to Boscolo et al. (2007), makes writing a complex process. Itua et al. (2012) also mention that one of the most challenging aspects of academic writing for

students is understanding how to use references correctly. Both Albayati (2024) and the respondents mention that GAI tools have the ability to support the student in finding references and keywords, but the respondents expressed that ChatGPT is deficient in providing credible sources. Sweeney (2023) calls this phenomenon "AI hallucination". Albayati (2024) mentions that credibility is an important aspect that influences the student's attitude towards the tool and the willingness to use it.

Students also have difficulty finding sources on a specific topic, which Ali et al. (2023) explains is because GAI tools like ChatGPT are based on a large amount of data, but despite that, information can be missing in more specific areas. Rejeb et al. (2024) also mention that GAI can provide students with personalized references to the topic being written about which shows the potential that the tools may have for further development and improvement in the future. The respondents also wish to be able to find out where the information that GAI provides comes from in order to be able to more easily determine whether the information is credible, which is something that is not possible today.

According to both the literature and the respondents, it turned out that the development of GAI tools should be done in a way that enables the student to get suggestions for search terms based on the need and to be able to see where the information the tool provides comes from. This can lead to major changes in how students handle references during academic writing. This by improving and facilitating searches and checking the credibility of references.

Design suggestions: Allow broader search/suggest search terms from what the student describes. Design suggestion: Be transparent about where the information presented comes from.

5.3 Revising the Text

Correct spelling and grammar have a major impact on the readability of the text. Furthermore, they are two important components that academic texts should contain according to Itua et al. (2012). Respondents felt that GAI tools such as ChatGPT require a lot of explanation and work to get the desired result. Dwivedi et al. (2023) mention that despite the tool's impressive ability to hold conversations, it cannot answer all questions, therefore the user needs to reformulate their prompt until the tool can understand it according to the data that GAI is trained on.

The interviews showed that there are students who ask for feedback on their texts from the teacher or examiner, and there are others who prefer to get it from a friend. According to Essel et al. (2024) this is because the student prefers an interaction with a human being as it feels more personal, which GAI does not currently meet. Respondents feel that GAI sometimes only gives positive feedback and that they have to specify their prompt very much to get the feedback they want. On the other hand, based on the interviews, there are students who think that GAI tools can help with getting feedback on texts and that it is then also possible to ask questions that the student would not have dared to ask a human.

The respondents find it challenging to formulate academically or to write according to a certain format required in academic writing. They expressed that GAI tools can help to control the quality of texts by checking grammar and spelling. The amount of help available can vary between different languages that are written in. According to Paltridge (2004), academic writing is a challenge, especially when students write in a language other than their native language. The results showed that ChatGPT and Grammarly are the most used GAI tools that can be used during writing. Grammarly does not support the Arabic language. On the other hand, according to the respondents, Grammarly works well as a support if the text is written in English, which Ding and Zou (2024) also mention.

ChatGPT is perceived to have a greater understanding of Arabic grammar, however, ChatGPT is perceived by the respondents as the tool controlling the process too much. Dai et al. (2023) instead say that the interface is created in such a way that ensures that the user is in control. Lee et al. (2022) explain that it is important to understand the generative ability of the

tool in a specific situation and how a student interacts with the tool affects the experience of the tool. This understanding is important for designing good interactions and user experience (Lee et al., 2022).

Both the literature and respondents explain that by improving the ability for students to receive feedback on a text from GAI, the tool would need to be designed with the goal of supporting the student and increasing the understanding of prompts so that it is not perceived as challenging to get the help that the student desires. Furthermore, to be able to support students in the best way, GAI tools and the revision process need to be controlled by the student.

Design suggestions: Focus on letting the student control the process and designing the tool with the goal of providing suggestions instead of deciding. Design suggestion: Support the use of more than one language.

5.4 Synthesis of Analysis

From the analysis, we can see that the results from the interviews can be divided into three themes with subcategories. Based on how GAI is used today, it can be concluded that there is a great deal of uncertainty about how GAI can be used. The respondents believe that the tools will develop both so that they can be used as tools to a greater extent, but also so that it is easier to check what is written by a human and what is written by an AI. The respondents also believe that the way of examining will change and be adapted to check the student's knowledge.

The respondents feel that there are currently several challenges in the writing process for academic writing. Most agree that GAI should be designed with a focus on supporting humans rather than replacing it, which in turn will support and simplify the writing process. Furthermore, the respondents feel that the disposition of texts is a challenging process when it comes to the structure and content of a text to create a common thread. To help in the best way, the respondents describe that GAI tools can be developed to review whether a text contains what the student wants to include without repetitions in the information. Respondents spoke about the importance of discussing and brainstorming ideas with someone else to gain different perspectives. However, respondents described that existing GAI tools need to be improved by remembering conversations better and having a better understanding of context. It was found that reference management is a significant part of the idea generation process and that it is a challenge to find the right keywords that help find relevant references, especially if the topic being written about is complex.

Finally, the unique and formal nature of academic writing creates challenges for respondents with spelling, language, and grammar. GAI tools can help check the content of the text. However, existing tools lack the ability to generate realistic answers that meet student demand. In addition, GAI tends to direct the revision process instead of letting the student do it, which causes difficulties for students. This is also something that would need to be developed to support students.

The conclusion that can be drawn is that GAI tools should be designed with a focus on supporting students, complementing their work, giving them inspiration or giving them new perspectives instead of replacing students or doing the work for them. It is about designing tools to motivate students during the

challenging moments of academic writing. In this way, the student does not lose the opportunity to learn and develop skills through the work. The design proposals show that an improved understanding from GAI of what the student wants is important. It is also important to let the student control the process himself in order to develop critical thinking and reflection.

6. Conclusion

The purpose of the study was to answer the question on how GAI can be designed to support university students' academic writing by coming up with design proposals for how GAI can be designed to support students' academic writing and how students can use the tools. The literature and themes identified during the analysis of the interviews revealed that the manner that GAI tools can assist students during the writing process can fall under three main categories: organizing the text, generating ideas, and revising the text.

It can be concluded that GAI tools should be designed with a focus on supporting students, complementing their work, giving them inspiration or giving them new perspectives instead of replacing students or doing the work for them. It is about creating tools to provide incentives to students during the hard times of academic writing. In this way, the student does not lose the opportunity to learn and develop his/her skills through the work. The design proposals indicate that it is critical for GAI to have a better understanding of the students' desires. In addition, it is critical to allow the student to take control of the process for himself to enable critical thinking and reflection.

The study demonstrated that the development of technology and AI can have both positive and negative effects on society, specifically in the context of colleges and universities. GAI can be used to support students throughout their studies. It can also be used to do the work for them, this leads to a lost ability to think critically because academic writing according to Barrett and Pack (2023) contributes to critical thinking and creativity. Therefore, the use of GAI by students to do the work for them may result in them losing the ability to think critically or even gaining the ability. In addition, it may lead to future employees in various work fields lacking the knowledge, skills and abilities required in working life.

Further research could explore whether the design proposals proposed in this study can be applied to designing GAI tools to support writing in other contexts such as writing formal emails in the workplace or other types of texts. It could also be investigated to see if students in other programs have different needs to be able to use GAI tools as a support tool and what the design proposals would look like between different programs. The development of GAI has become part of many workplaces, which requires that students already have experience using the tools and know how it can be used to support them.

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