Designing an AI-resistant assignment: Can we safeguard against student use of AI?

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Running Title: Student perspectives around AI use

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ABSTRACT

Background: AI chatbots and large language models (LLMs) have the potential to revolutionize higher education by providing personalized learning, enhancing accessibility, and offering real-time academic support. However, ChatGPT and similar smart text-generating LLMs can be easily exploited by students to write assignments or essays, challenging our traditional methods of assessment. For the 3rd-year Dental Hygiene (DH) students, a written assignment was designed by incorporating several features to prevent students from exploiting AI in their writing. An explanatory case study was conducted to explore students' use of AI tools in assignment writing. **Methods:** The assignment was designed as a literature review, in accordance with the milestone-based assessment approach. Qualitative and quantitative data were collected from students' written responses to reflective questions. Manifest content analysis was used to analyze the qualitative data. **Results:** Forty-seven students responded to the questions. 77% of the respondents (n=36) mentioned not using AI chatbots while completing their assignments, whereas 23% reported using AI tools. The content analysis generated three categories, representing students' reasoning for not using AI chatbots in writing the assignment: *pedagogical concerns*, *ethical concerns*, and *concerns with the technology*. **Discussion and conclusion:** As generative AI evolves, new assessment methods will be necessary to evaluate critical thinking, problem-solving, and creativity—skills that LLMs cannot replicate. The findings of our study can help educators design AI-resistant assignments while deepening their understanding of student attitudes and perceptions toward advanced AI tools.

Keywords: ai; artificial intelligence; dental education; dental hygiene; learning; teaching materials

CDHA Research Agenda category: capacity building of the dental hygiene profession

PRACTICAL IMPLICATIONS OF THIS RESEARCH

- Educators are challenged to develop AI-resistant assessments to minimize unethical use of AI tools by students in academics.
- This study can help educators understand students' behaviors and decision-making processes regarding the use of AI tools in completing a written assignment.
- It is essential to develop innovative assessments for health professional students that incorporate the guided use of AI tools. Because, with the advancement of AI, an AI-resistant assessment developed by focusing only on the limitations of AI will not remain AI-resistant for long

INTRODUCTION

Since its launch in 2022, ChatGPT, an advanced artificial intelligence (AI) chatbot, has captivated scientists, overwhelmed educators, and sparked remarkable public interest worldwide. Developed by Open AI, ChatGPT, which stands for Chat Generative Pre-Trained Transformer, uses natural language processing to create humanlike conversational dialogue.[1] ChatGPT is powered by a large language model (LLM) trained on massive amounts of publicly available text data, such as books, articles, and web pages.[2] The popularity of ChatGPT has paved the way for the rise of many other similar LLMs capable of generating human-like text in response to a prompt. Some currently popular LLMs include different versions of ChatGPT, Bing Chat, Copilot, Claude Gemini, LLaMA, and the most recent, DeepSeek.

The rapid evolution of LLMs and AI chatbots has perplexed academia. The potential of LLMs like ChatGPT in education is immense. LLMs can be used to help educators create lesson plans and assessments. Their ability to improve text, simplify concepts, and identify errors can also be helpful for students. LLMs can even be used to facilitate small group discussions.[3] However, ChatGPT and similar smart text-generating LLMs can be easily exploited by students to write assignments or complete homework, resulting in cheating and academic dishonesty, undermining the demonstration of authentic student knowledge and understanding.[4] LLMs create different text responses to the same prompt, which makes LLMs 'human-like,' but renders it difficult for educators to differentiate between work completed by students *vs*. an AI chatbot.[5]

A growing number of studies are focusing on exploring the ability of LLMs to answer questions used in high-stakes exams like medical and dental board exams.[6-8] The findings that LLMs can successfully pass and, in many cases, perform even better than real students raise concerns about the current assessment methods. As a result, educators are now challenged to develop assessments resistant to AI interference to ensure effective evaluations of students' knowledge and abilities.

Until 2023, LLMs were limited to reading and interpreting text-based data. However, rapid advancements have since enabled LLMs to "see," "hear," and "speak."[9,10] Leveraging sophisticated neural networks, models like GPT-4 can now analyze visual data, detect patterns, and extract meaningful insights.[11] The latest iteration, GPT-4.1 (released in May 2025), is specifically optimized for following detailed instructions and handling web development tasks.[12] In addition to OpenAI's ChatGPT, other AI-powered tools, such as Consensus,[13] Elicit,[14] and Research Rabbit,[15] support research workflows by helping users find, summarize, and organize academic literature.

Khlaif et al.[16] propose the Against, Avoid, Adopt, and Explore (AAAE) framework for designing assessments, based on which an assessment in the current AI era can be categorized as one of the four types: (1) Traditional assessments, like written or oral exams and presentations, where students are prohibited from using AI tools. (2) New innovative tasks or assignments aimed at minimizing or eliminating the use of AI by students. (3) Assessment materials developed using AI tools by the educators, and (4) Designing tasks where students are encouraged to explore and uncover the potential of generative AI in the learning process. Of these four categories, the 2nd one is focused on designing tasks or assignments that are resistant to AI, meaning that students will not be able to use an AI tool to complete the whole assignment.

The concept of AI-resistant assessment is being explored, aiming to design tasks for students that minimize their reliance on generative AI tools and emphasize the utilization of critical thinking, decision-making, or similar skills that AI cannot replicate.[16-19] LLMs are reported to have several limitations, a clear understanding of which can equip educators with the knowledge to design AI-resistant assessments for students. Often, LLMs are found to provide false information, create text with incorrect references, and provide citations that do not exist or are irrelevant.[20,21] ChatGPT was trained on a massive corpus of open-source data drawn from the internet prior to September 2021, limiting the ability of this Chatbot to respond accurately to current events.[22] Studies also reported poor performance of LLMs in critical appraisal of literature and interpretation-type questions.[23]

AI-resistant assessments support core educational values by promoting academic integrity[24] and emphasizing real-world relevance, ensuring that student learning outcomes reflect authentic human skills and understanding.[17,25] Designing and implementing AI-resistant assessments can improve critical thinking, reduce excessive dependence on AI, and prepare students for informed use of AI as a supportive tool. [16] The incorporation of AI also fits with Vygotsky's theory of the zone of proximal development,[26] by creating a learning environment where the LLM can provide the social interaction and guided support that is hypothesized to be necessary for learning to occur effectively. The just-in-time support of AI can provide problem-solving prompts and gradually reduce the scaffolding.

We designed a literature review assignment as an AI-resistant assessment for the 3rd-year Dental Hygiene (DH) students at the University of Alberta, incorporating specific design elements intended to discourage over-reliance on generative AI tools such as chatbots. This initiative aimed to foster authentic academic engagement and critical thinking. Our assignment design was guided by a milestone-based assessment approach, which is particularly well-suited for tasks such as literature reviews, essays, and research proposals.[27] This approach emphasizes dividing the large task into multiple smaller tasks or scored milestones to promote self-regulated spaced learning over time. It incorporates quantitative elements to assess student progress, enhances the authenticity and transparency of the writing process, and supports the development of stronger writing and critical thinking skills.[27] To better understand students' interactions with AI in academic settings, we conducted a study examining the behaviors and decision-making processes of DH students regarding the use of AI tools in completing this assignment.

Our research questions were:

1. How many DH students report using AI chatbots in the completion of their assignments?

2. For what purposes do these students use AI chatbots in their assignments?

3. What factors influence DH students' decisions to use or avoid using AI chatbots in their academic writing?

METHODS

Design and implementation of the AI-resistant assignment

The AI-resistant assignment was designed in accordance with the milestone-based assessment approach.[27] The assigned task for the students was to conduct a brief literature review

on a given topic within a 1,000-word limit. To promote self-regulated spaced learning, students were provided with a list of topics to choose from, a marking rubric, and detailed instructions for their assignment at the beginning of the course. To implement scored milestones and ensure the authenticity of students' literature searches, the assignment was broken down into smaller parts. In the first part of the assignment, students must provide the name of the database, the search terms, and the full citation of the papers they have selected for their literature review. To guide students, the expected format of the literature review was provided. For example, the paper should be divided into three main parts: an introduction, a main body, and concluding remarks. Suggested content for each section was outlined in the instructions. To foster critical thinking among students, a detailed marking rubric was provided, emphasizing that the main body of the paper must include an insightful and critical evaluation of the included papers. Marks were explicitly allocated to the critical appraisal of literature, as LLMs were reported to show poor performance in this sector.

This literature review assignment was incorporated into a third-year DH course in the Fall of 2024. It was mandatory and worth 10% of the course grade. Students were expected to complete the assignment individually outside of the in-class time.

Exploration of students' use of AI in assignment writing

(i) *Study design and participants:* Interpretative description guided the study design, aiming to provide a coherent, interpretative summary of essential meanings to inform practice.[28] All 3rd year DH students enrolled in the Oral Biology II course (OBIOL

302) in the Fall of 2024 were included in this study (n=48). The University of Alberta Research Ethics Board reviewed and approved the study design (ID: Pro00144136).

(ii) *Data collection:* Qualitative and quantitative data were collected from students' written responses to reflective questions. In the assignment, students were asked to provide written responses to the following two reflective questions:

- Have you used AI chatbots (e.g., ChatGPT) in your assignment?
- If 'yes,' which chatbot did you use, and what help did you get from the chatbot? If 'no,' why did you choose not to use an AI chatbot?

(iii) *Data analysis:* The data were anonymized before sharing with the research team for analysis. Descriptive statistics, such as percentages, were calculated using Microsoft Excel for the quantitative data.

Manifest content analysis was employed to examine students' responses to the reflective question. This technique involves a multi-step process for summarizing perceptions through categories and subcategories.[29] Anonymized text responses to the reflective question were imported into Microsoft Excel. The authors read the data repeatedly and independently before analysis to familiarize themselves with the data. Two authors independently identified the 'meaning units' and coded them for the entire data set. These codes were then organized into subcategories and categories, established through discussion among the authors. The categories and subcategories were examined to ensure they encompassed all relevant data. Methodological rigor

was ensured by using an established research method to coherently guide the study design, performing data analysis iteratively, and consistently checking interpretations against the data.

RESULTS

Students' report on using AI chatbots to complete the assignment

Forty-seven students (98% of the class) responded to the question: *Have you used AI chatbots (e.g., ChatGPT) in your assignment*? 77% of respondents (n=36) mentioned not using ChatGPT or similar AI chatbots while completing their assignments. 23% of respondents (n=11) reported to use AI tools (Figure 1A).

Students' reasons for using AI chatbots in the assignment

Nine students elaborated in response to the question: *If 'yes,' which chatbot did you use, and what help did you get from the chatbot*? Students reported using ChatGPT (n=3), Grammarly (n=2), and Quillbot (n=1). Four students only mentioned 'chatbot' or 'AI-chatbot' without providing a specific name. (Figure 1A). The reasons for using such AI tools, as reported by students (Figure 1B), included:

- To check for grammar and spelling (n=6)
- To improve writing (n=3)
- As a thesaurus to find synonyms (n=3)
- To simplify ideas from the literature (n=2)

- To learn about the structure of a literature review (n=2)
- For formatting references to the appropriate style (n=1)

Students' reasons for not using AI chatbots in the assignment

Thirty-six students answered the reflective question: *If 'no,' why did you choose not to use an AI chatbot?* which resulted in 36 meaning units, each containing at least one code. The codes condensed into three categories: 1) *pedagogical concerns*, which included the subcategories of "sense of accomplishment" and "better for learning," 2) *integrity/ethical concerns*, encompassing "violation of guidelines," "fear/repercussions of getting caught," and "incompatible with moral compass," and 3) *concerns with the technology* including "distrust of AI" and "lack of familiarity with the technology." The subcategory of "authentic demonstration of knowledge" spanned both the *pedagogical concerns* and *integrity/ ethical concerns* categories (Figure 2). Categories, subcategories, and representative quotes are included in Table 1.

Pedagogical concerns

Thirty-four meaning units were included in this category, highlighting the pedagogical concerns that led students to avoid using AI chatbots for the assignment. Many students (23 meaning units) realized that completing the assignment was essential to their educational experience and that utilizing a chatbot could undermine their learning opportunity. Students expressed concern that their lack of knowledge would negatively impact the patient care they would provide in their future profession. Several indicated that engaging with the literature and summarizing the concepts compelled them to gain knowledge beyond the classroom. Many

students aimed to enhance their research and writing skills through this assignment and therefore chose not to use any AI tools for it. A few students (3 meaning units) avoided using AI chatbots, as they take pride in originality and value the sense of accomplishment. Several other students opted not to use AI chatbots to ensure the assignment is a complete and authentic reflection of their effort.

Integrity/Ethical concerns

This category describes the ethical concerns and moral incompatibilities that prevented students from using AI chatbots in the assignment. Four subcategories: “violation of guidelines,” “fear/repercussions of getting caught,” “incompatibility with moral compass,” and “authentic demonstration of knowledge,” were included in the category, resulting in a total of 30 meaning units. Many students did not utilize AI chatbots due to fears of violating academic integrity (7 meaning units) or concerns about getting caught and penalized (10 meaning units). Students emphasized that the use of chatbots is strictly prohibited for all academic assessments and violates the university's code of academic integrity; therefore, they refrain from using any AI tools for the assignment. Several students mentioned fearing that their work would be flagged for plagiarism or AI use, resulting in a zero or a more severe consequence. On the other hand, some students thought using AI chatbots would be unfair to their peers. They refrained from using AI chatbots because this action was incompatible with their moral compass (5 meaning units).

Concerns with the technology

Many students expressed concerns about AI technology itself, generating 16 meaning units for this category. Nine meaning units reflect students' skepticism regarding the accuracy of

information provided by chatbots. Several students expressed discomfort about uploading their writing to the AI chatbot system. For some, since the assignment involves a review of existing literature, a chatbot offers no additional help; indeed, chatbots are known to provide misleading sources of information.

Several other students reported that they did not use AI chatbots because they were unfamiliar with the technology and had never used it before (7 meaning units). Some students perceived that learning to use an AI tool would add to the workload of writing the literature review. Others felt confident in their ability to complete the literature independently and lacked the motivation to explore and learn a new technology.

DISCUSSION

Generative AI tools and LLMs, like ChatGPT and other chatbots, are rapidly penetrating academia with immense potential; however, several concerns have also arisen. A growing number of higher educational institutions are embracing the concept of AI-resistant assessments; yet, guidelines on *how to create one* and reports on *what works and what doesn't* remain limited. We designed a literature review assignment aimed at minimizing the exploitation of AI by students, without providing any specific instructions or guidelines regarding the use of AI tools for the assignment. The qualitative data from students' reflections revealed that their decision to use or not use the AI tool was broadly influenced by pedagogical concerns, ethical considerations, and apprehensions regarding the technology itself.

The sets of topics for the literature review assignment were chosen thoughtfully to allow students to explore the literature and go beyond what is taught in the didactic lecture in terms of

clinical application. For example, DH students study salivary protein in the didactic lecture. One topic of the literature review asks to summarize the effects of tobacco use on the salivary protein. The effect of tobacco use is not taught in this particular course, but it is an important consideration for oral health and patient care of professional dental hygienists. A study by Pines et al. showed that students feel a sense of pride and accomplishment in assignments where they put the most effort and that are relevant to them.[30] A large number of DH students chose not to use AI tools as they perceived the knowledge gained by this assignment to be beneficial to them and their future profession, and they felt a sense of pride and accomplishment on submitting their own work, which is in alignment with the findings of Pines et al. The literature review assignment was new for several DH students who chose to improve their literature search and writing skills through this activity, without relying on AI tools for assistance. For health professional students, assignments that are clinically relevant and offer opportunities for skill development and self-directed learning can help reduce the unwanted use of AI tools.

Many DH students have refrained from using AI tools in their assignments due to concerns about academic integrity. The range of AI tools includes basic text editing and composing entire assignments. Reflections from students reveal a certain degree of uncertainty, as many mentioned avoiding AI tools based on what they heard from peers in other courses. AI tools are rapidly evolving. The assignment was designed and implemented in the fall of 2024, and AI has improved significantly since then, particularly in pattern recognition and analyzing research articles. An AI-resistant assessment, which is focused on the limitations of AI, will not remain AI-resistant for long. It is essential to educate students on the ethical use of these tools and provide a clear explanation of how much AI tool use is expected in certain assignments. Perkins et al. have developed an Artificial Intelligence Assessment Scale (AIAS) as a framework

for ethical integration of generative AI in educational assessments.[31] This AIAS scale can be included in assessments to clearly outline the level of AI use that is acceptable in a particular assignment. Recent guidelines also recommend that institutions create strategies for the effective and responsible integration of generative AI, while encouraging educators to help students strengthen their critical evaluation and academic writing skills by leveraging the capabilities of generative AI.[32]

In alignment with the findings of our study, Alkhaaldi et al.[33] found in a survey that, when asked about the use of ChatGPT, most medical students denied utilizing ChatGPT for academic purposes. In another study, 66.7% of healthcare students exhibited positive attitudes toward ChatGPT, while only 22% reported using ChatGPT in academics.[34] The potential of advanced AI technologies, including large language models (LLMs), in health professional education is substantial. Student hesitation to use technology can stem from concerns about overreliance on these tools and a lack of familiarity with them.[35] However, with rapid advances in AI and the demonstration that, in some cases, AI can detect clinical abnormalities more efficiently and reliably than humans,[36,37] it may be crucial to consider educating health professional students, as neglecting to use AI may, in the future, compromise patient care.

We acknowledge several limitations of this study. The findings are based on a small sample of dental hygiene (DH) students, and demographic data from the participants were not collected. Students' use of AI tools relied solely on self-reporting, and no other measures were available to verify this use of AI. Correlation between students' reported use of AI and assignment grade was not analyzed.

Future research should consider exploring perceptions within larger and more diverse populations. Individual interviews and focus group discussions can be conducted to further explore students' perceptions, understanding of the guidelines, and hesitancy towards the use of AI tools. Faculty perceptions and attitudes toward the incorporation of AI tools and AI-resistant assessments can also be explored. The correlation between students' reported use of AI and their assignment grades can also be analyzed.

It is essential to be aware that there is a spectrum for the use of AI tools in academic writing, ranging from simple grammar editing to writing entire assignments. Students did not receive any specific instructions about the use of generative AI tools for the assignment. Our results showed that several students used chatbots to improve their grammar and writing, whereas others avoided Grammarly due to the integrated AI in that tool. Future studies can be conducted to explore students' comfort and use of AI tools after providing students with a clear guideline and the AIAS scale in a writing assignment.

CONCLUSIONS

From an education perspective, faculty are dually challenged to simultaneously educate students on the appropriate and effective use of AI while reformulating their assessments and teaching practices to ensure students have foundational knowledge and critical thinking skills necessary to critically analyze AI-generated content. The insights from our study may aid educators in developing AI-resistant assignments while also deepening their understanding of students' behaviors and decision-making processes regarding the use of AI tools in completing a written assignment.

CONFLICTS OF INTEREST

The authors of this study declared no conflict of interest.

ETHICS APPROVAL

This study has been approved by the Research Ethics Board of the University of Alberta (ID: Pro00144136).

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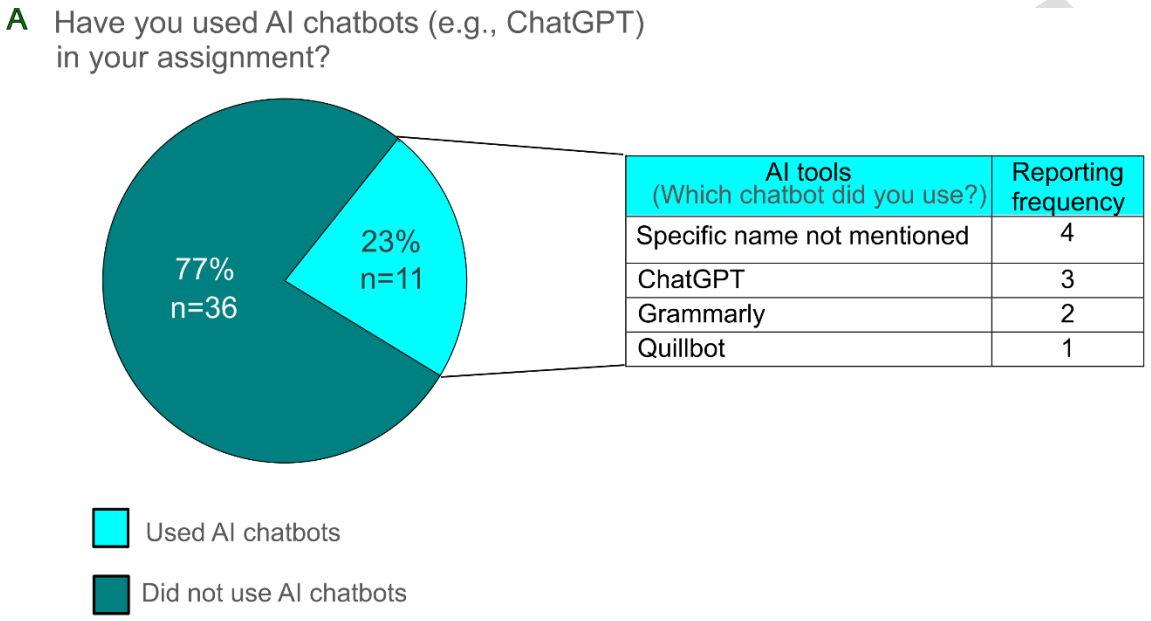
Figures and Tables

Figure 1 Students' response to questions: (A) Have you used AI chatbots (e.g., ChatGPT) in your assignment? and (B) What help did you get from the chatbot? Descriptive statistics were used to calculate students' responses to the questions.



AI tools (Which chatbot did you use?)	Reporting frequency
Specific name not mentioned	4
ChatGPT	3
Grammarly	2
Quillbot	1

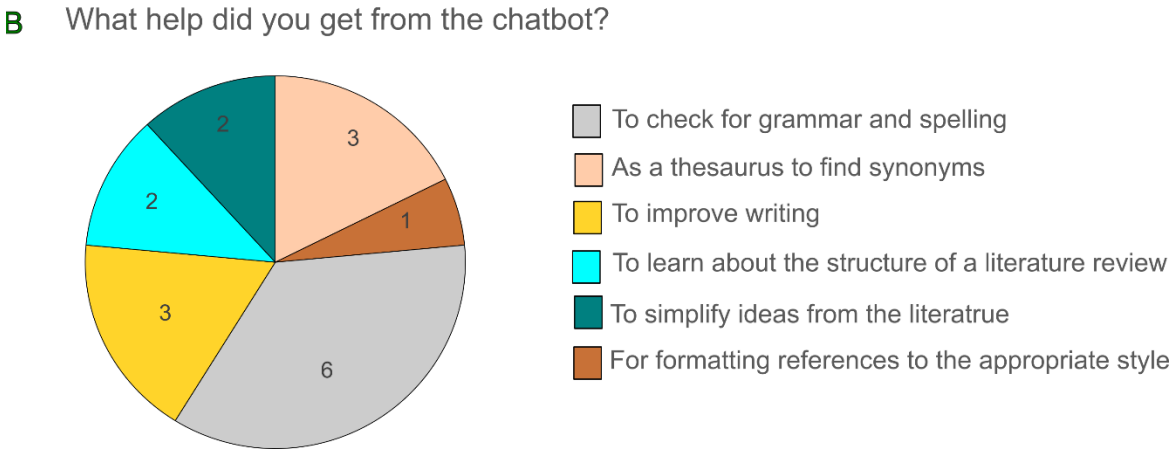


Figure 2 Outline of qualitative data analysis. 36 meaning units were analyzed, each resulted in single or multiple codes. The codes were compiled into eight subcategories, which were further condensed into three categories: pedagogical concerns, integrity/ethical concerns, and concerns with the technology. One subcategory spanned both the pedagogical and integrity categories

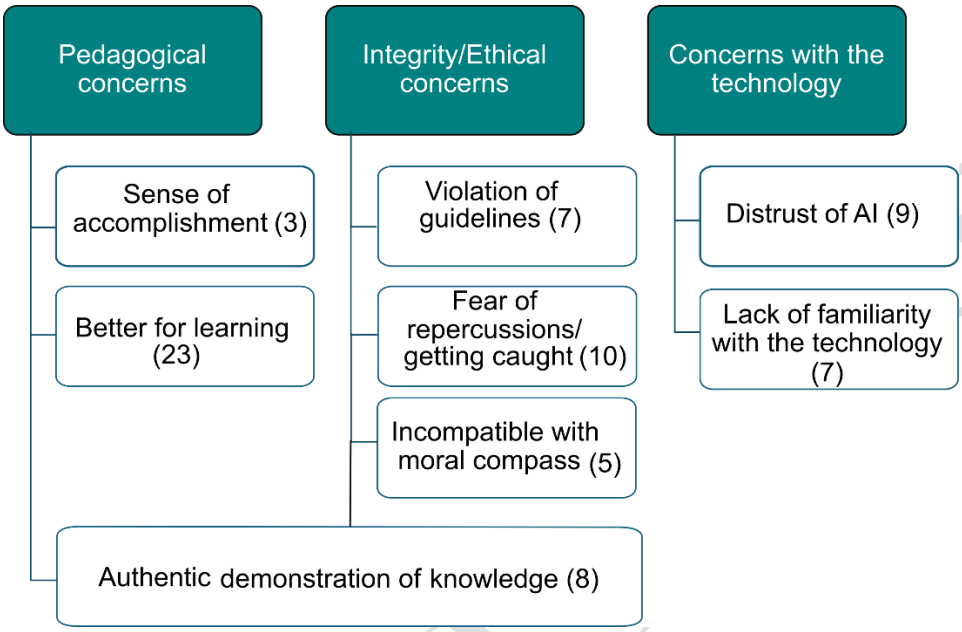


Figure 3 An overview of the study. An assignment was designed for dental hygiene (DH) students, which included some features to limit students' use of AI tools in writing the assignment. A study was conducted to explore why DH students may or may not rely on AI tools while doing the assignment.

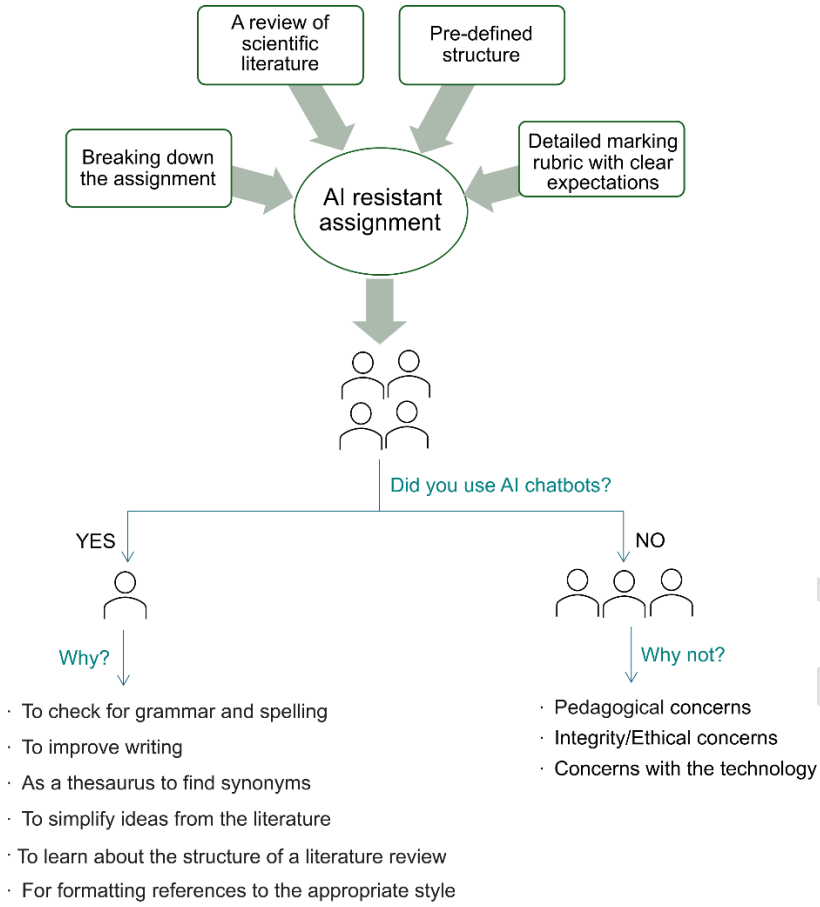


Table 1 Categories, subcategories, and representative quotes

Categories	Subcategories	Representative quotes
Pedagogical concerns (34)	Sense of accomplishment (3)	*I believe that my work should be done by myself. I feel a sense of pride being able to finish an assignment or paper being able to call it my own.* (Participant-2) *There is a sense of accomplishment and pride in finishing an assignment and knowing I was the sole person behind the work. The feeling of independence and the personal satisfaction of knowing I did it on my own is something I truly value.* (Participant-34)
	Better for learning (23)	*I feel if I use AI chatbot I would not be doing the assignment and that would not help me integrate/expand my knowledge and be able to apply it clinically it would be more of a long term loss.* (Participant-28) *For this assignment, I decided not to use any AI chatbots, as I figured it would be beneficial for me to work on my writing skills.* (Participant-46)

Categories	Subcategories	Representative quotes
Integrity/Ethical concerns (30)	Authentic demonstration of knowledge (8)	*I chose not to use an AI chatbot to ensure the assignment fully reflected my understanding and research skills. Relying on my own analysis helped me engage more deeply with the material and gain a stronger grasp of the topic.* (Participant-21) *Although AI probably writes better than me I wanted to create a piece of writing that was authentic to me.* (Participant-14)
	Violation of guidelines (7)	*No, I did not use any AI chatbot to complete this assignment because the use of chatbots is strictly prohibited for all academic assessments and is against the university code of academic integrity. I refrain from using any AI tools as it is considered cheating and can result in academic penalty.* (Participant-35) *I did not use it as many of our classes restrict the use of AI chat bots for assignments. Unless stated otherwise I do not use the help fo AI to write my assignments. (sic)* (Participant-16)
	Fear of repercussions/ getting caught (10)	*I choose to not use an AI Chatbot. Throughout my time in high school and university I have always been wary of AI for fear of having my work flagged and receiving a zero or, receiving a heavier consequence.* (Participant 29) *I avoid Chatbot programs at all costs, because I have the irrational fear of being flagged for plagiarism or AI use, even without being involved with either.* (Participant 26)
	Incompatible with moral compass (5)	*Throughout my university career, using AI has caused many students to violate academic integrity. Even when given the opportunity to use it, I won't because there is not easy path to success. It would not only be unfair to my peers, but harm my own learning and building of skills.* (Participant 42) *I don't think that it is appropriate to use a Chatbot to help formulate ideas or to edit an assignment. Using a Chatbot blurs, if not crosses the line of academic integrity and makes it unfair for others who choose not to use it. I don't think that it's fair for individuals who choose to do their own work to be marked against a chatbot user.* (Participant 25)
Concerns with the technology (16)	Distrust of AI (9)	*I decided not to use Chatbot as I felt although AI can help assist one's learning, it is difficult to distinguish what is accurate information and what is not.* (Participant 31) *I have never used an AI chatbot for schoolwork before. I do not want to get into the habit of using AI because I do not want to become reliant on it. I do not even use grammarly anymore as it uses AI as well.* (Participant 48)
	Lack of familiarity with the technology (7)	*I did not use AI chatbot to write this literature review. I am not a tech savvy person and have no idea how to use AI. I have never used AI before and feel as though it is more confusing to learn something new than to an assignment in the way I know how to use it.* (Participant 43)

Categories	Subcategories	Representative quotes
		I am unfamiliar with how to use AI chatbots and I do not have a lot of motivation to try one out since I have been able to complete assignments without it. (Participant 33)