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Navigating the Terrain:

Emerging Frontiers in Learning Spaces, Pedagogies, and Technologies

Students' perceptions of using artificial intelligence in tertiary education: A phenomenographic study

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Artificial Intelligence (AI) is increasingly influencing various aspects of teaching and learning in tertiary educational institutes. This concise paper presents the preliminary findings of an ongoing research that aims at exploring university students' perceptions of the use of AI in higher education settings. Phenomenographic framework has been adapted as the methodological guide for this research. Semi-structured interviews were conducted among students of an international university to capture students' perceptions. Findings revealed that university students possess diverse perspectives on the use of AI in higher education settings. Four qualitatively distinct categories of perceptions of AI emerged from the interview data. It is found that university students perceive the use of AI as a) an essential academic aid, b) a facilitator of personalized learning, c) an inhibitor to critical thinking, and d) an ethical challenger. Findings have pedagogical, administrative, and ethical implications for developing AI-driven technology-focused policy that facilitates diverse student needs.

Keywords: Artificial Intelligence, student perception, tertiary education, phenomenography, engineering

Introduction:

Artificial intelligence (AI) has become an essential component of tertiary education over the last few years. Higher education institutions have endeavoured to integrate AI into various educational processes to keep pace with rapidly advancing technologies. To effectively implement AI technologies in higher educational settings, understanding how education stakeholders, particularly students, perceive the potential of AI technology and interact with it is crucial.

Understanding student perceptions about the use of AI from different perspectives is crucial. For example, how students perceive the use of AI dictates their AI usage, which may lead to cognitive engagement and eventually affect the learning outcomes (Banele, 2023). Additionally, AI usage may vary depending on how students perceive the potential benefits, such as personalised learning, and limitations, such as ethical concerns (Kumar & Raman, 2022). Moreover, student perceptions may also vary from discipline to discipline (Hasan et al., 2024). Exploring student perceptions in a particular educational context, such as engineering education for this research, may help integrate AI to facilitate technology-oriented learning effectively.

Although research has been conducted to explore how higher education students perceive the potential use of AI, the majority of them were conducted from a quantitative paradigm, adapting a deductive approach based on established theories (Chan & Hu, 2023; Kumar & Raman, 2022; Obenza et al., 2024). In contrast, investigating a new phenomenon, such as the use of AI tools in academia, demands a qualitative paradigm, adapting an inductive approach to gain a deeper understanding of the phenomenon. Despite a few studies exploring students' perceptions of AI using interviews, students' voices were not echoed as those were

conducted from a first-order perspective (Antony & Ramnath, 2023). In order to fill all these voids in the current literature, this study utilised a phenomenographic approach, which followed a second-order perspective to capture students' perceptions of AI looking through students' eyes, guided by the following research question: How do university students perceive the use of AI in higher education settings?

Method

The phenomenographic approach is a suitable research approach that provides a comprehensive framework for exploring how students perceive the use of AI. As well-established in qualitative research, this method allows participants to express their thoughts and beliefs in depth, capturing their understanding of a particular phenomenon, i.e., the use of AI in this research (Marton, 1986). This approach not only reveals the collective understanding of students but also informs the development of effective educational strategies and interventions by uncovering their nuanced perspectives (Bowden & Green, 2005). Ten students from an international university in Bangladesh participated in the study.

Sample

Participants were purposively selected from students who were experienced in using AI tools for educational purposes from an international university in Bangladesh. International universities in Bangladesh are governed and funded by collaborative efforts between local government and international organisations. Such universities are established to attract a diverse student body, comprising both local and international students, while providing education aligned with global standards. A consent form was provided to the students who voluntarily participated in the study. In phenomenography, capturing a wide variation in the sample is crucial for identifying differences in understanding (see Table 1). While a sample size of 15 to 30 is recommended (Bowden & Green, 2005), smaller sizes can be appropriate depending on the study's context (Trigwell, 2000). Therefore, ten students from the Electrical and Electronic BSC Engineering discipline were considered sufficient in number for this short paper to provide in-depth insights.

Table 1
Characteristics of Sample

Participant	Gender	Student Status	Year of Study	Experience with AI use
P1	Male	International	4th	2 years
P2	Male	National	2nd	1 year
P3	Female	International	3rd	1.5 years
P4	Female	National	2nd	1 year
P5	Female	National	3rd	1.5 years
P6	Female	National	4th	2 years
P7	Female	National	2nd	1 year
P8	Male	National	1st	1 year
P9	Male	National	1st	1 year
P10	Female	National	3rd	1 year

Data collection

An interview is the recommended data collection technique in phenomenography (Åkerlind, 2005), ten participants were interviewed using in-depth, semi-structured interviews, focusing on critical aspects of AI use in higher education. In a 30-40-minute interview, they were asked to define AI, describe its contribution to teaching and learning, explain their use of AI for academic purposes, detail their strategies for utilizing AI tools, and discuss advantages and limitations. Probing follow-up questions were used to ensure comprehensive data, e.g., "Can you explain that more?".

Data analysis

The data analysis adhered to an eight-step procedure developed by Mubarak and Khan (2022). The data analysis process began with researchers reviewing the interview raw data for clarification by cross-checking audio recordings and transcripts. Next, multiple transcripts were read for familiarization and correction. Then, responses about the conception of AI were accumulated, noting similarities and differences. Individual answers were reduced without distorting their original meanings, and excerpts with similar meanings were clustered together. The researcher compared these groups to identify discrepancies and ensure cohesion. Categories were then labelled with descriptors that best represented their themes, and these labels were compared with group items for accuracy. To ensure trustworthiness, transcripts were consulted at every analysis stage and all authors provided insights during the data analysis process. Appropriate quotes from the transcripts were used to validate the final categories. This article reports the preliminary findings of ongoing research, with an effort to extend the study with more participants to arrive at the final conclusions.

Findings

Four distinct categories were identified that reflect how engineering students perceive the role of AI in four qualitatively different ways.

Category A: AI as an essential academic aid

Students in category A view AI as an essential academic tool that improves their studies. They recognize AI as powerful software, demonstrated by apps such as ChatGPT and Gemini, which they frequently utilize for diverse academic assignments. The tasks include paraphrasing, composing content for theses, and acquiring new knowledge.

> 'Artificial intelligence AI is a software like ChatGPT, Gemini which we used in our study purposes to paraphrase or write any kinds of content for thesis purpose or to learn anything.'

> 'Artificial intelligence is mainly AI tools that we use for different purposes. Like it mainly helps us writing something. Yeah, artificial intelligence is basically a software tool that everybody uses for, the purpose of making their work easy.'

Category B: AI as a facilitator of personalized learning

The perceived foundational role of AI as an essential academic aid (Category A) is further emphasised in Category B, which focuses on how AI adapts to individual needs, thereby enhancing personalized learning experiences. The students in this category believe that AI not only facilitates general academic duties but also customizes learning experiences to meet unique academic requirements and preferences of each student. This personalized approach improves cognition and improves the overall learning experience, making education more accessible and efficient for each student.

> 'Personally, I think AI for the students, it's helping us positively, especially when you have a lot of things to do and so many assignments. Most of the time, teachers give assignments which is difficult to combine with six courses, labs, and it will be difficult, and with the exams and quizzes. So I take help from AI to answer for me. It helps me to eases the burden.'

> 'So using those AI tools, I can actually make those complicated terms, I can tell them to make me understand those complicated terms in a very simpler way.'

Category C: AI as an inhibitor to critical thinking

In contrast to the previous categories A and B, where students perceive the positive impact of AI, students in category C raise concerns about an excessive reliance on technology and highlight how it might limit the growth of critical thinking and problem-solving abilities. Although AI technologies such as ChatGPT offer significant assistance in finishing tasks and understanding technical subjects, there is a drawback to their utilization.

> 'Whenever there is an assignment I have to achieve it. I know that. I have my study buddy there. So this is something I cannot actually get this out of my brain.'

> 'Let's say, if I am using ChatGPT to solve everything of my questions, then it will inhibit my creative capacity. So I would basically not think of the questions as much as before, if I am just using ChatGPT to copy the answers. So I think that's a disadvantage.'

Category D: AI use as an ethical challenger

In this Category, students consider the ethical implications of AI use, particularly in terms of academic integrity and learning authenticity. They emphasize how AI tools can allow quick access to answers, resulting in behaviours such as copying and pasting solutions that undermine actual learning and moral standards. This viewpoint recognizes the dual character of AI: while it aids academic tasks, it raises substantial ethical concerns. Students acknowledge that using AI for assignments can be considered cheating because it bypasses the learning process and reduces the development of independent problem-solving skills.

> 'There are some ethical issues, if a teacher give an assignment. We just go to the AI and take this answer, copy and paste it. So it's not morally right. And we do not have the answers in we do not know the answers, but just copying pasting so we're not learning.'

> 'Yes, obviously, the first thing is cheating. So, the teachers, when they give us an assignment, most of the students, they don't want do the assignment by themselves, so they just go for ChatGPT, I myself do that sometimes. I go for ChatGPT because I do not want use my brain, it's hard.'

Discussion and Implications

This preliminary study explores university students' perceptions of using AI in academic settings. Preliminary findings reveal that students consider both positive and negative sides of using AI and perceive the role of AI in four qualitatively distinct ways: a) as an essential academic aid, b) as a facilitator of personalized learning, c) as an inhibitor to critical thinking and d) as an ethical challenger. In the first two categories, students see the potential benefits of AI, whereas in the last two categories, students' concerns about the use of AI are highlighted. Students in categories A and B think that utilizing AI tools in their academic pursuits is efficient in terms of time and effort, making it easier and more beneficial for personalized learning. In contrast, in categories C and D, students perceive that over-dependency on AI may lead to committing unethical consequences and also limit their creativity.

Previous studies support the findings of this study. Students' Perceptions of AI as an Essential Academic Aid in category A resonate with the category found by Leoste et al. (2021), which indicates *AI as supports learning*, *supports people in their work*, and *supports people in their private lives*. Cheng et al. (2023) found that undergraduate students perceive the use of AI as a personalised learning assistant, which supports category B of this research. Students' Perceived role of AI as an inhibitor to critical thinking and as an ethical challenger (category C and D) are associated with the conception *people have become lazy*, and thus they wish to externalize various tasks for AI-based machines and software as outlined by Mertala et al. (2022). The unique contribution of this study, which was not reflected in previous studies, is that it provides a collective understanding of a group of engineering students about the use of AI utilizing a unique qualitative phenomenographic methodology that extracts the findings through the lens of the participants.

The findings of this research have multiple implications for university students, teachers, administration, curriculum designers, artificial intelligence tool designers and anyone involved in academics and research. Formulating student-supportive policies is recommended to be adapted to facilitate students' personalised learning and maintain ethical standards. Such policies will work as a guideline for teachers and students on how they should practice the use of AI for academic activities and to ensure authentic learning.

Limitations and future research

This ongoing study has a few limitations that will be overcome when the complete outcome of this study will be revealed. Currently, the sample size and the international student participation are comparatively lower. Moreover, students from one discipline (Electrical and Electronic Engineering) were recruited. The data collection process is currently in progress to overcome these limitations, which will eventually ensure comprehensive findings at the end of this study.

Conclusions

Based on the results obtained through interviewing, the following conclusions can be made. Educators in tertiary level should utilize a balanced approach to AI use so that the students understand both its benefits and limitations. Incorporating AI responsibly into curricula can enhance learning while minimizing dependence. Students may also be encouraged to utilize AI for personalized learning without compromising critical thinking skills. Additionally, institutions should establish clear guidelines around the ethical use of AI, integrating discussions on academic integrity to prevent misuse in assignments. Faculty development programs can also be introduced to help teachers design assignments that challenge students' creativity and critical thinking while using AI as a supportive tool for academic tasks.

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