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**PERCEPTIONS OF AI-ASSISTED LEARNING
MOTIVATION: A CASE STUDY ON GENDER
DIFFERENCES IN A MALAYSIAN HIGHER EDUCATION
CONTEXT**

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Abstract:

The objective of this study is to understand how male and female students interact with artificial intelligence (AI) tools, the reasons why they use them, as well as how these tools influence their learning outcomes. A qualitative research design was adopted, and convenience sampling was used to select 10 students (5 male and 5 female) as the sample. Data was gathered via semi-structured interviews on students' experiences with AI tools including the benefits, challenges and concerns. For data analysis, thematic analysis was conducted to identify students' perceptions of AI and motivation using recurring themes and patterns. Both male and female students reported positive perceptions of AI tools, particularly when it comes to improving learning efficiency and academic success. These patterns are interpreted as context-specific perceptions arising from participants' learning experiences rather than as fixed or universal gender characteristics. The challenges identified include privacy concerns and over-reliance on AI, which negatively impacted both intrinsic and extrinsic motivation. The present study is relevant to the limited research on gendered perceptions of AI tools in higher education, more specifically in the local higher education environment, highlighting insights on the use of AI tools to assist diverse learning needs. Results of this research can be used by educators, AI developers, and policymakers to develop a better understanding of how AI tools can be

designed and applied for male and female students in an effective manner.

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Keywords:

Artificial Intelligence, Gender, Higher Education, Motivation, Privacy Concerns, Thematic Analysis



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Introduction

In recent years, Artificial Intelligence (AI) has been integrated into education with the potential to improve the traditional teaching and learning methodologies. In the case of higher education, a wide range of AI tools, such as intelligent tutoring systems, automated grading systems, and AI-assisted learning platforms, have emerged. These innovations are transforming how students engage with course materials, by delivering personalized learning, and providing real-time feedback (Kaswan, Dhattewal & Ojha, 2024). AI technologies have also expanded access to educational resources, enabling students and teachers to adopt new approaches to maximize learning outcomes. This is a part of a wider trend of digitalization in various sectors characterized by the use of AI as an enabling catalyst of efficiency and personalization in the learning environment. Starting in the late 20th century, the advent and historical use of AI in education included expert systems and early intelligent tutoring systems that aimed to emulate human tutors and serve adaptive feedback to students.

The proliferation of the Internet and improvements in machine learning performance have made the AI tools more sophisticated and widely available (Mahmood et al. 2022). Applications of AI in education have expanded from simple tutoring systems to a more sophisticated approach that analyses the learning patterns, predicts the outcomes and provides personalized learning paths. Although the advantages of using AI for the purpose of education are quite notable, the process of AI implementation and its impact on reducing the motivation and engagement in education of students is a subject of ongoing research. The purpose of this study is to examine gendered perspectives on AI assisted learning motivation in relation to Malaysian higher education. A key aspect of this work, in the context of global AI research in education, is comparing how different demographic groups particularly gender, perceive and interact with the use of AI tools (Strzelecki & ElArabawy, 2024). While gender differences in

educational settings have long existed, the intersection between AI technologies and gender remains relatively underexplored in educational research. Building on this gap, the present study contributes further into the literature by investigating how male and female students view the motivational impact of AI assisted learning from this context.

Recent studies worldwide have highlighted that the educational impact of AI-supported learning is shaped not only by technological capability but also by learner characteristics, assessment practices, and perceptions of fairness and validity. For example, research conducted in Western higher education contexts has increasingly warned that AI-mediated learning environments may produce uneven motivational outcomes across different learner groups, reinforcing the need for context-sensitive and equity-oriented analyses (Zacharis & Papadakis, 2025; Zourmpakis et al., 2024). Positioning the present study within this broader international discourse allows gendered perceptions of AI-assisted learning motivation in Malaysia to be understood as part of a global challenge rather than as a purely local phenomenon.

Problem Statement

As AI tools have evolved rapidly, their integration into education has gained much interest from educators and stakeholders, particularly regarding their ability to augment learning outcomes, including in higher education. While all these advancements are being carried out, there is still an essential gap in the current research studies that explain how AI tools affect student motivation and learning behaviours, when viewed from a gendered perspective. Although AI in education has received enormous attention from different angles such as the technical and the pedagogical, little is known about motivational dynamics in adopting AI in education, particularly with respect to different gender groups (Lan, 2024). Focusing primarily on the gender of students in educational participation and achievement, various academic researchers have generated several studies that have addressed the ways these two categories of students interact with technology, which vary between them. It is not surprising that these disparities are also influenced by cultural, social and historical factors, which shape educational experiences of each gender differently.

However, understanding the diversity in students' perceptions, adoption, and motivational engagement with AI tools in AI-assisted learning contexts is complex. This is particularly because existing research largely focuses on overall effectiveness and provides limited insight into how gender influences these processes. Traditionally, educational technology research has not paid sufficient attention to the possible role that gender stereotypes and biases in the content delivered by AI systems and the interaction style students engage with these technologies can play in the development of learning motivations (Ahn, Kim & Sung, 2022). In recent years, it has been questioned whether AI tools are neutral in terms of their effects on various student population groups, and there are indications of bias in these systems in example and case study selection and in content recommendations. This issue is more serious in countries like Malaysia because gender roles and cultural norms dictate how male and female students interact with technology, which may worsen existing inequalities in learning outcomes among male and female students (George, 2024). There is a gap in the academic literature related to gender differences in AI-assisted learning motivation. Improvements in learning efficiency and personalized content delivery seem to be the general outcome of AI in education, although detailed evaluations of male and female differences are lacking. In particular, no studies have focused on how differences exist due to gender in the way students would be intrinsically or extrinsically motivated to use the AI tools, or even how gendered learning styles may affect

student engagement with technology, or how cultural and societal factors play a role in bringing out the differences.

Therefore, with AI tools being increasingly implemented in the education setting, it is important to look at how, as they are implemented, they might have the indirect effect of favoring one gender over another, which could inadvertently impact overall academic success and engagement alike (Mishra, 2024). To fill this gap, this research explores the gendered perceptions of AI assisted motivation in Malaysian higher education. The study pays attention to how male and female students experience AI tools differently, in order to find out the nuances in motivation that current literature has not touched upon. Furthermore, this research will explore historical and cultural factors that inform these perceptions in order to provide a broader picture of how gender affects those who utilize and are affected by AI as a tool in learning environments. While AI is still expanding in the educational environment, understanding these gender-based differences of motivation will help to create more inclusive and effective AI tools and their use in the future, ensuring that AI-supported learning will benefit all the students, irrespective of their gender (Salas-Pilco, Xiao & Oshima, 2022). The findings of this research are important in addressing the aforementioned educational disparities locally and in similar contexts with comparable conditions, where AI must not be used to compound gender differences and widen the learning gap between boys and their female peers. These following are the research objectives and research questions that guided the study:

Research Objectives

1. To explore and compare the perceptions of male and female students regarding the motivational influence of AI-assisted learning tools on their academic performance.
2. To investigate the differences in how male and female students interact with and utilize AI tools for academic tasks such as note-taking, problem-solving, and content summarization.
3. To examine the role of cultural and societal factors in shaping the use and effectiveness of AI-assisted learning tools for male and female students in the higher education context.
4. To identify the barriers and challenges faced by male and female students in using AI tools and to explore the strategies they employ to address these challenges.

Research Questions

1. How do male and female students perceive the motivational impact of AI-assisted learning tools in their studies?
2. What gender differences exist in the ways male and female students engage with AI tools for academic tasks such as note-taking, problem-solving, and content summarization?
3. How do cultural and societal factors influence the use and perception of AI-assisted learning tools among male and female students in the higher education context?
4. What barriers or challenges do male and female students face when using AI tools in their learning, and how do they overcome these challenges?

Research Significance

The study is significant because it discusses the ‘unknowns’ of gender differences in the perception of AI-assisted learning motivation in the context of Malaysian higher education. The research examines how male and female students experience involvement with AI tools and considers the possibility that gender-based disparities in learning experiences and motivational outcomes may exist. Knowing these distinctions will aid in the growth of more inclusive and efficient AI tools that accommodate various learning styles, ensuring fair educational prospects. Moreover, the study complements the current discourse by including a gender dimension, which has been absent from many AI in education studies. Using the findings of this research, educators, policymakers, and AI developers will gain critical insights pertaining to the design of AI-driven learning environments, and how such environments when implemented foster learning engagement among students from both genders to keep them engaged in their education.

Research Scope

This research focuses on male and female students in higher education institutions in Malaysia regarding what they perceive and what motivates them when it comes to AI-assisted learning tools. The study will analyse the impact of gender on the use of AI in learning activities such as note taking, problem-solving and content summarization. It focuses on local culture and societal factors to the Malaysian case and throws light on how cultural and social parameters impact the responses students give to AI tools. Finally, the research also examines difficulties experienced by students and how they tailor their learning approaches to overcome these barriers from a gendered point of view in the adoption of AI in education.

Literature Review

Historical Background of AI in Education

Artificial intelligence has become increasingly important in the field of education over time, reshaping the ways teaching and learning are conducted. Initially, AI was used in education primarily to automate administrative tasks and improve educational management systems. It went on to evolve into something more personalized, meaning that in personalized learning experiences. AI aids in customizing lessons to the needs of each student. According to Jeilani and Abubakar (2025), AI applications in education in the early stages were based on systems that aimed at simulating a human expert’s decision-making ability. These were intended to allow the provision, in subjects such as mathematics and language, of feedback and guidance at all stages of the learning process (in a role analogy to a real teacher) and to allow the construction of stages of the learning path so that they could be automated, according to Joseph et al. (2024). Early expert systems were the first version of AI tools, when there was a shift to more advanced AI-driven end products using machine learning algorithms that kept changing the behaviour of the student. The good news is that these modern AI tools analyse student performance in real time and generate personalised learning plans, intelligent tutoring, and instant feedback, as conveyed by Adewale et al. (2024). The use of AI in education has contributed to changing the traditional ways of teaching, by converting the teaching process from teacher-centered to student-centered. With the help of AI, education has become more interactive, flexible, and accessible, allowing for more dynamic and tailor-made learning environments to meet the needs and learning styles of students of various kinds.

Theories of Learning and AI Integration

The embedding of AI in education matches several learning theories aimed at achieving active engagement, cognitive development, collaboration, and motivation. In the case of AI- assisted learning, constructivist theories are most relevant, predicated on the idea that students actively construct their own understanding through experience. Personalised learning pathways that AI tools offer as a means of active learning help students to engage in personalised learning, receive real-time feedback, problem-solving and interactive simulations, as stressed by Ellikkal and Rajamohan (2024). By using such tools, hands-on learning in constructivist models is enabled, through which, by exploring and discovering, a deeper understanding is established. As well as cognitive theories, focused on mental processes like attention, memory, and problem-solving, it is appropriate to integrate them with AI. The study by Wei (2023) highlighted that one of the biggest advantages of AI is that it decreases cognitive load, which implies the amount of mental effort needed for processing information. As repetitive tasks like notetaking, summarizing content or giving instant feedback on their work are automated by AI tools, students are able to free up their available cognitive resources for use in higher-order cognitive tasks like analysis and synthesis. Reducing cognitive load can lead to more efficient learning and retention of information, especially in cases that are very complex, as stated by Chen and Chang (2024). Social Learning Theory states that social interactions play an important role in the learning process in terms of collaborative learning. AI can assist with collaborative learning by encouraging peer-to-peer interactions, group work, and working on problems together as per Ahmed, Zaid, and Abdullah (2024). Besides that, AI- driven platforms are able to motivate collaborative learning through communication, learning feedback and resource sharing tools provided to the students to benefit the social dimension of learning. In addition, theories of intrinsic and extrinsic motivation are important in explaining how AI affects student motivation, as stressed by Okonkwo, Anele, and Shikari (2023). Using AI tools, intrinsic motivation can be elevated by offering students unique challenges personalised to their learning styles and preferences so that surmounting the challenges creates a sense of accomplishment and drives curiosity. However, at the same time, using gamified features, rewards, and performance tracking ensures that artificial intelligence itself stimulates extrinsic motivation, which in turn encourages students to get certain learning outcomes. In this way, the AI tools can significantly increase both intrinsic and extrinsic motivation, inducing learners to be more engaged and motivated.

Gender Differences in Education and Technology Use

Gender disparities in education have been historically formed under the pretext of societal norms and cultural perceptions that have targeted one gender or the other. Due to history, educational systems were traditionally gender-biased, discouraging women to reach higher education or technical studies and directing them to fill up domestic or caregiving positions. Although substantial improvements have been made over the last few decades, there are still significant gender inequalities in a few disciplines especially in science, technology, engineering, and mathematics (STEM) sectors where women are still largely underrepresented, as stressed by Yang (2024). In addition, these historical gender disparities also exist in technology adoption and use in educational settings. Research by Zhan et al. (2022) suggests that men feel more comfortable with technology surrounding programming or engineering while women prefer technology geared towards communicating, organizing, or creative tasks. This divide has to do with socialization and with technology being perceived as man's territory. Gendered expectations contribute to the learning preferences for learning tools with women

more inclined to value collaborative, communication-dependent tools while men are drawn to those involving individual problem-solving or technical tasks, as stated by Zhan et al. (2022). Such tendencies toward this have been seen also in previous research on gender differences in educational technology use, showing that gender may play a role in how students use educational technologies. Men and women both benefit from AI tools in education but they might interact with them differently in accordance with their personal preferences, previous experiences as well as cultural conditioning, which points to the need for more gender-responsive designs in educational technologies.

Motivation and Learning Outcomes in AI-Assisted Education

In the field of education, motivational theories shed light on how AI tools can indirectly affect a student's engagement and learning outcomes. Personalised and adaptive AI learning experiences help in providing intrinsic motivation as they are self-driven, based on personal interest, and the learning process has its own reward in itself. AI can provide problems and content that are relevant to students, at the students' own pace and preference, leading to a feeling of accomplishment and desire for more, according to Sanusi et al. (2022). Slimi and Carballido (2023) highlighted that AI also plays a role in extrinsic motivation, which is attributable to external rewards like grades or accolades. Gamified features, progress tracking, and feedback mechanisms are a few things that can motivate students to complete tasks and accomplish learning objectives, for instance. A differentiation strategy enabled by AI, with the ability to offer personalised learning has a key role to play in increasing student motivation and engagement, as emphasized by Hu et al. (2022). By assessing students' performance data, AI can customize content delivery, provide targeted interventions, and continuous feedback, as thereby motivating students to remain interested and enthusiastic. In addition, student agency and mastery have a high correlation with motivation (both intrinsic and extrinsic) and these can be increased through a personalised approach. According to Bayaga (2024), in terms of academic achievement AI can be utilised to enhance learning outcomes, particularly if it can be utilised as a response to individual learning demands. Nevertheless, gender differences in motivation and engagement may influence how people view and use AI tools, and design is equally as important as AI in making sure that it benefits in equal amounts to all students, regardless of gender.

International empirical work further problematizes the assumption that AI systems motivate learners uniformly. For example, Zacharis and Papadakis (2025) demonstrate that AI-human agreement in academic assessment can be substantially weaker than human inter-rater reliability, raising concerns about learner trust, perceived fairness, and motivational regulation when AI mediates feedback. Similarly, Zourmpakis et al. (2024) show that adaptive digital learning designs may interact with gendered participation patterns, suggesting that motivational responses emerge from learning design and context rather than gender as a fixed attribute.

Cultural Context: The Malaysian Higher Education System

Malaysia's system of higher education is diverse and constantly changing, and draws teaching, educational research, and training for programs designed for the public and private sectors. The system values both academic excellence as well as technical skills and has seen rising interest in the areas of research innovation. In the context of Malaysia, many initiatives have been undertaken by the government to enhance the quality of education as well as to make education

accessible to students, all in view of Malaysia being billed as a regional hub for higher education, as stressed by Naseer et al. (2025). Despite these efforts, inequality in access to higher education especially in the rural areas, remains a challenge in the education system and women are underrepresented in some disciplines including STEM. On the other hand, the Malaysian education system is influenced by cultural and societal factors, as stressed by Borgonovi, Han, and Greiff (2023). The perception of education and the expectations surrounding students are usually influenced by traditional values. Gender roles in Malaysian society are shown to have a tremendous effect on educational opportunities and career choices, in particular, as conveyed by Gao et al. (2023). Furthermore, women are often expected to fulfill family responsibilities, and this often leads to very limited participation in higher education, even in demanding fields, as conveyed by Ahmed et al. (2022). Even though Malaysia has made progress in promoting gender equality in education, these societal expectations are still a part of students' actual academic paths, according to Stöhr, Ou, and Malmström (2024). However, with the integration of AI tools in Malaysian higher education still being at an early stage, the application of these solutions for optimizing learning outcomes has started receiving due attention, as highlighted by Hu (2024). But AI tool's function and are perceived by people according to cultural norms. For example, male students may be attracted to AI for the most technical or problem-solving tasks, and they could find other tools more suitable tasks that help them communicate and collaborate. The cultural sensitivity of AI systems is important, as these gendered preferences indicate that all students must be included in the learning process.

Challenges in AI-Assisted Learning

AI tools certainly have great strengths in education, but such tools come with many challenges when utilised by students. Technical difficulties, especially those concerning AI software compatibility, lack of training, or lack of internet connectivity, are one of the most common challenges, as these prevent students from using these tools to their full capacity, as per Lin and Mubarak (2024). Furthermore, the quality of data that is used for training AI systems is often compromised, and the outputs they produce tend to be false or biased, something that will frustrate students and erode their confidence in their use, as per Ali et al. (2025). Beyond the technical factors that give rise to barriers to the effective use of AI tools, cultural and personal factors create obstacles to their exploitation. For example, the study of Mizan & Norman (2024) stressed that many educational contexts might not be willing to adopt new technologies that are against the traditional learning practices or lack the awareness of potential benefits of AI. Moreover, according to Almogren, Al-Rahmi, and Dahri (2024) students may find it difficult to cope with the lack of personal touch in AI tools and the absence of the kind of interaction and emotional support they get from teachers and peers. Consequently, over-reliance on AI tools can affect students' critical thinking and independent learning skills, as stressed by Abd Razak and Khan (2024). Students who use AI too much to provide answers or feedback end up bypassing the critical thinking process that is necessary to have an in-depth understanding about that material, as conveyed by Mohammad et al. (2025). Moreover, gendered challenges emerge in the adoption of AI for learning as male students may tend to dominate fields of technology that employ AI tools more frequently than female students, who may find it difficult to engage with AI tools designed to suit their learning preferences thus perpetuating gender divisions in the use of educational technology around AI tools.

Literature Gap

While the existing research on AI-assisted learning examines the effectiveness of AI-supporting tools in improving academic outcomes, little is dedicated to understanding the differences students may have with regarding to how these tools are used based on gender. The few studies conducted on the impact of AI on student motivation, achievement, and personalised learning are generalized, without adequate exploration of the different ways in which male and female students perceive, adopt, and use different AI tools in such learning environments. In addition, the existing literature often fails to consider how cultural and societal factors, for example in the case of Malaysia, play a role in shaping students' interactions with AI, since gender roles and assumptions of what students should aspire towards in education may also alter such interactions. However, the extent to which the use of AI-generated content potentially reinforces, or challenges gender stereotypes remains underexplored, as does the potential impact of the biases on students' motivation and academic engagement. In light of these gaps, this research looks into gendered perceptions of AI-assisted learning and its influence on the Malaysian higher education system.

Methodology

Research Design

This study used a primary qualitative research design to investigate gender differences in AI-assisted learning motivation in Malaysian higher education. It chose a qualitative rather than quantitative approach because it allows for an understanding of students' perspectives, experiences, values, etc., which cannot be easily quantified. For this reason, the study looked at the subjective perceptions of both male and female students, so that nuanced insights could be revealed, which otherwise quantitative methods might otherwise fail to do (Muzari, Shava & Shonhiwa, 2022). Using a qualitative approach, the researcher has been able to allow open-ended responses enabling richer discussions and giving participants the opportunity to describe their individual experiences with AI tools in their learning process.

Research Population and Sampling

The research population—for this study comprised male and female students from a private higher education institution in Malaysia. Participants were selected using a convenience sampling approach, whereby students who were available and willing to participate were included in the study. An exploratory qualitative design that emphasises the depth, richness, and relevance of participants' experiences over statistical representativeness was employed. Convenience sampling was employed to access information-rich cases capable of providing detailed insights into students lived experiences of AI-assisted learning motivation, consistent with established qualitative research practices (Wild, Kyröläinen & Kuperman, 2022).

A total of five male and five female students were selected to maintain a balance of gender perspectives. Given the small qualitative sample, findings are interpreted as context-specific perceptions rather than generalisable gender claims, and conclusions are framed accordingly. In addition, data collection was considered sufficient when recurring themes and patterns became evident across interviews, indicating an adequate level of thematic saturation for the exploratory aims of the study. The size of this sample has been deemed a sufficiently efficient

number for providing themes and patterns regarding gender differences in perceptions and experiences with AI-assisted learning.

Data Collection

Semi-structured interviews have been used as a method of data collection in this study in order to obtain in-depth information on students' perceptions and experiences of using AI tools in educational context. It has enabled participants to give their views freely in a semi-organized way, while making sure all the important topics are covered (Belina, 2023). Various dimensions of AI-assisted learning, such as students' engagement, motivation, perceived benefits, challenges, and the role of gender in the use of AI tools, are extracted through the designed interview questions. In order to obtain gender-specific experiences and limit any bias that may occur in the responses, different sets of interviews have been created for male and female students. The data gathered through each interview were transcribed following participants' consent, and consent to record was also obtained for each interview.

Data Analysis

The data came from interviews and were analysed using thematic analysis. Thematic analysis is a flexible but very commonly used qualitative data analysis method that identifies, analyses, and reports patterns (themes) within the data. Since this method enables a thorough examination of students' perceptions and experiences of utilizing AI tools, as it provides the ability to study gender differences in these experiences, it was selected (Braun & Clarke, 2024). The transcribed interview data were reviewed very carefully in order to identify several recurring themes, patterns, and categories in relation to the research questions. Inductively, these themes were developed from the raw data so that the analysis could be kept grounded in participants' own words and experiences (Abd Razak & Khan, 2024). By means of thematic analysis, key factors influencing AI-assisted learning motivation specifically with regards to gender, culture context, and how male and female students utilised AI tools, have been identified. All data analysis, coding decisions, and interpretation were conducted manually by the researchers, with iterative revisions undertaken to ensure analytical rigour and authorial voice.

Ethical Consideration

The ethical considerations of this research were important. First of all, informed consent was obtained from all participants through their awareness of the purpose of the study and the data collection methods, as well as their rights as participants. Participants were informed that their participation in the study was voluntary and that they can withdraw from the study at any time without repercussions. The research process ensured confidentiality and anonymity measures, by using no personal details during the analysis and by keeping data confidential and separate from the analysis process. In the transcriptions of the data, the identities of the participants were anonymized (Hazari, 2024). Furthermore, the research ensured that the interview questions were polite as well as sensitive to cultural aspects, particularly with respect to gender. Stringent ethical guidelines were observed in carrying out the study in order to respect the dignity, privacy, and integrity of the participants as well as of the study.

Results

This section reports the gender-related patterns that reflect participants' perceptions within a specific institutional and cultural context. Therefore, these perceptions should not be interpreted as fixed or universal characteristics of male or female learners, but rather as tendencies emerging from individual learning experiences, disciplinary exposure, and contextual influences. Table 1 presents qualitative comparisons of interview responses from male and female students across five identified themes related to AI in education.

Table 1: Gender-Based Comparison of Student Perceptions on AI-Assisted Learning Motivation

Theme	Sample Excerpt		Similarity	Differences
	Male Students	Female Students		
Theme 1: Engagement with AI Tools and Learning Efficiency	<p>M1: "AI tools help a lot, especially in coding like MATLAB... I double-check answers." M3: "Convenient but may reduce critical thinking." M5: "They condense complex theories and provide immediate feedback..."</p>	<p>F1: "AI tools save time and simplify repetitive tasks." F2: "Immediate Q&A format makes learning digestible." F4: "Helps learning independently, but I still consult lecturers."</p>	Both genders find AI tools helpful for simplifying tasks and increasing learning efficiency.	Males emphasize technical use (e.g., MATLAB, coding), females focus on usability (e.g., summarization, visual aids).
Theme 2: Gendered Perceptions and Bias in AI Tools	<p>M1: "AI tools can still have biases, especially in male-dominated case studies." M3: "Examples tend to favour male perspectives in engineering."</p>	<p>F1: "AI does not and should not see gender." F4: "AI can break gender norms; avoids bias in teaching."</p>	Both recognize AI as being generally gender-neutral but acknowledge that it can reflect societal biases.	Males more often note male-centric examples; females emphasize AI neutrality and potential for breaking gender bias.
Theme 3: AI's Impact on Motivation: Intrinsic vs. Extrinsic	<p>M2: "AI explanations encouraged me to complete assignments." M4: "Memorizing answers vs.</p>	<p>F3: "Using AI to solve study puzzles was euphoric." F5: "Learning becomes a game, but screen time makes me tired."</p>	Both genders experience mixed motivation. AI can be both encouraging and demotivating.	Males focus on cognitive effects (e.g., lack of deep learning), females on emotional and behavioural effects (e.g., procrastination).

learning deeply
demotivates me.”

Table 1 (continued)

Theme	Sample Excerpt		Similarity	Differences
	Male Students	Female Students		
Theme 4: Privacy Concerns and Ethical Issues	M1: “Privacy is a concern... platforms collect a lot of data.” M5: “Scared of personal info being used by AI managers.”	F2: “AI managers can track requests and personal data.” F4: “Risk of data breaches; privacy needs strong systems.”	Both express concerns about data privacy, though the degree and focus vary slightly.	Males express concern about job threats and data misuse, females are more concerned with transparency and ethical use.
Theme 5: Future of AI in Education: Personalisation and Interactive Learning	M2: “AI will make learning more personalised and efficient.” M4: “Future AI will provide virtual labs and personalized learning plans.”	F4: “VR and AR will make topics more engaging.” F5: “AI helps broaden understanding but lacks specifics unless prompted right.”	Both foresee AI enhancing personalisation and interactivity in future education.	Males mention AI integration with devices and VR labs, females highlight global collaboration and immersive tech like AR.

Note (M = Male; F= Female)

Theme 1: Engagement with AI Tools and Learning Efficiency

Engagement with AI tools and-learner efficiency was common across responses-from both male and female students, demonstrating the significant role of AI in enhancing learning experiences (M1, M3, M5, F1, F2, F4). Most students reported that AI tools made learning easier by simplifying tasks and improving learning efficiency (M5, F1, F2). For instance, a male student reported using AI for coding tasks such as MATLAB, where AI tools assisted in debugging and problem-solving, thereby improving learning efficiency (M1). In terms of time-saving, female students benefited from AI through support in idea generation, simplified explanations of complex concepts, and easier handling of repetitive tasks (F1, F2). AI was perceived as effective for condensing complex content and simplifying learning tasks (M5, F1). AI-generated summaries were especially useful to male students, enabling them to condense complex theoretical content into more manageable and readable formats (M5). On the other hand, while male students emphasised task efficiency,-female students highlighted AI’s role in breaking down dense theoretical content into more comprehensible explanations, supporting a better grasp of the material (F2, F4). Despite generally positive perceptions of AI, one male student expressed concern that overreliance on AI tools could undermine critical thinking by encouraging quick solutions rather than conceptual understanding (M3).

Theme 2: Gendered Perceptions and Bias in AI Tools

One notable emphasis concerned gendered perceptions of bias in AI tools, particularly the tendency for AI-generated content in technical fields to reflect male-dominated examples (M1, M3). In contrast, female students generally viewed AI tools as gender-neutral and did not perceive significant gender-based barriers in using AI for learning (F1, F4).

Theme 3: AI's Impact on Motivation: Intrinsic vs. Extrinsic

Students described mixed effects of AI tools on their learning motivation, reporting both encouraging and demotivating experiences (M2, M4, F3, F5). Male students reported that AI explanations encouraged them to complete academic assignments more effectively (M2). Female students described AI use as enjoyable and motivating, noting that it made learning feel easier and more engaging (F3). However, one male student reported demotivating effects associated with AI use, noting that over-reliance reduced his motivation to engage in deep learning and weakened his confidence in his own critical thinking (M4). At the same time, some female students reported that prolonged AI use led to tiredness and reduced motivation due to increased screen time (F5).

Theme 4: Privacy Concerns and Ethical Issues

Privacy concerns and ethical issues were raised by both male and female students in relation to how personal data is handled when using AI tools for learning (M1, M5, F2, F4). Across both genders, a common concern related to the collection and tracking of personal data by AI platforms was identified (M1, F2, F4). Male students expressed concern that AI platforms collect personal information that could be accessed or misused, with one participant highlighting ethical fears regarding potential misuse of personal data (M1, M5). Female students highlighted concerns about the risk of data breaches and the need for stronger privacy protection systems (F4). Male students also expressed concern that misuse of personal data could contribute to job-related threats associated with AI technologies (M5). Overall, students' privacy concerns reflected a desire for greater transparency and ethical handling of personal data by AI platforms (M1, F2, F4).

Theme 5: Future of AI in Education: Personalisation and Interactive Learning

Students anticipated that AI would shape the future of education through greater personalisation and interactive learning experiences (M2, M4, F4, F5). Both male and female students expected AI to enhance personalised learning in future educational settings (M2, F4). Male students highlighted the potential of AI to support personalised learning plans tailored to individual learning needs (M2). Female students similarly anticipated that AI-supported personalisation would enhance engagement with learning content (F4).

Interactive learning was identified as a key expectation for the future role of AI in education by both male and female students (M4, F4, F5). Students expressed enthusiasm about the integration of AI with immersive technologies such as virtual reality and augmented reality to enhance learning engagement (M4, F4). One such example was given by a male student, who suggested that AI-powered virtual labs might be used as a way of having hands-on experience in subjects which would normally require physical presence (M4). At the same time, some

female students cautioned that while AI can broaden understanding, its usefulness depends on how specifically it is prompted (F5).

Discussion

This section interprets the thematic findings with reference to the four research questions, situating students' reported experiences within established motivation and educational technology frameworks without extending beyond the empirical scope of the data.

Addressing RQ1: How Do Male and Female Students Perceive the Motivational Impact Of AI-Assisted Learning Tools in Their Studies?

Findings from this study indicate that AI-assisted learning tools have value in motivating undergraduate male and female students in the pursuit of their academic endeavors, but with some distinction in how they interact with AI in their learning process. Beyond summarising empirical patterns, the findings can be interpreted through established perspectives on learning motivation, learner trust, and the mediating role of educational technology. Rather than treating gender differences as inherent traits, the present discussion interprets them as contextually shaped responses to task design, feedback mechanisms, and perceived usefulness of AI tools in academic work. AI was particularly efficient in solving problems and technical tasks (e.g. mathematic, coding) and therefore provided male students with motivation to fulfil academic expectations.

On the other hand, female students understood that AI can be used to generate ideas and ease complex content, and in turn, extrinsic motivation is created through these characteristics, which also serves as fuel for their intrinsic motivation, making learning more enjoyable and less stressful. This corroborates the findings of other existing literature that has found that AI tools can stimulate motivation by providing immediate feedback and personalised learning paths, which sustain student engagement Joseph et al. (2024). Therefore, these patterns suggest that AI-assisted learning appears to support extrinsic motivation by reducing task difficulty and providing immediate performance feedback when viewed from a motivational theory perspective. However, the extent to which this extrinsic support translates into sustained intrinsic motivation appears to depend on whether students perceive AI feedback as credible, transparent, and aligned with their learning goals. According to Zacharis and Papadakis (2025), when learners question the validity or consistency of AI-generated feedback, motivational gains may be weakened rather than strengthened.

Addressing RQ2: What Gender Differences Exist in The Ways Male and Female Students Engage with AI Tools For Academic Tasks Such as Note-Taking, Problem-Solving, And Content Summarization?

According to the results, male students seemed to be more prone to use AI in technical topics for solving problems and debugging, while female students used the AI tool in more ways including organizing content, simplifying theory, and visualizing for better understanding. These differences can be interpreted as context-dependent learning strategies shaped by disciplinary expectations, prior exposure to technology, and task demands, rather than reflecting fixed gender preferences. Looking at this context, studies on digital learning environments suggest that engagement patterns often emerge from how tools are framed and integrated into coursework, as opposed to gender alone (Zourmpakis et al., 2024). These

findings are consistent with such studies that explain technical domain gender differences in which male dominate technical fields and females tend to adopt tools that support collaborative and exploratory learning styles Adewale et al. (2024).

Addressing RQ3: How Do Cultural and Societal Factors Influence the Use and Perception Of AI-Assisted Learning Tools Among Male and Female Students in Higher Education Context?

Students' interactions with AI tools appear to be influenced by broader cultural norms, particularly those related to gender roles. Some participants, particularly male students, suggested that male-dominated examples in technical content may discourage female engagement, while female students tended to frame AI as neutral or potentially inclusive. At the same time, some female students noted that the examples used in AI-generated content lacked inclusivity, although they also perceived AI as an equalizer in providing access to learning resources.

These perceptions align with gendered views of technology, whereby AI content bias may reproduce existing social stereotypes and potentially influence student engagement and motivation. In Malaysia, societal norms continue to play an important role in shaping students' academic choices and their comfort with technology, which in turn influences their attitudes toward AI-assisted learning tools (Ellikkal & Rajamohan, 2024). Overall, these findings indicate that AI adoption in higher education is mediated by sociocultural norms and institutional practices rather than by technological capability alone. Thus, gendered perceptions of AI-assisted learning motivation should be understood as socially situated responses that intersect with cultural expectations, academic disciplines, and learning environments.

Addressing RQ4: What Barriers or Challenges Do Male and Female Students Face When Using AI Tools In Their Learning, And How Do They Overcome These Challenges?

In addition to the privacy-related concerns identified in the findings, this discussion also draws on broader patterns reported in the literature to contextualise students perceived challenges when using AI tools. While privacy concerns were the most explicitly articulated challenges in the findings, students' comments also implicitly reflected broader anxieties about reliability and transparency when AI outputs were perceived as untrustworthy. Technical issues were also seen as problematic properties, namely inaccurate AI-generated content, and a lack of transparency in data use. Students narrated frustrations with AI tools, in particular, when they did not provide the correct solutions (mostly in technical subjects); however, female students expressed fears of becoming too reliant on AI which will prevent proper critical thinking. Therefore, AI is useful for enhancing learning efficiency, but a potential side effect may be the generation of dependency and an inability to use deeper cognitive processes during learning. In order to overcome these issues, students used strategies of cross-checking AI-generated results with other resources, consulting their colleagues and instructors, and balancing the use of AI independent learning. Such coping mechanisms seem to fit in with existing research on the restrictions of AI tools and the necessity of a well-balanced approach to the use of technology in education (Wei, 2023). Notably, concerns about over-reliance on AI reveal a tension between efficiency and learning autonomy. When AI tools are perceived as alternatives rather than supports for cognitive effort, students may experience declines in self-efficacy and intrinsic motivation. This situation reinforces calls within international research for

pedagogically guided AI use that complements, rather than replaces, active learning and critical thinking.

Thus, the insights from these findings suggest that motivational responses to AI-assisted learning may be shaped by how students evaluate feedback credibility, perceived fairness, and task authenticity when AI mediates the learning process. In line with this, international studies warn that inconsistencies between AI-generated feedback and human judgment can influence learner trust and self-regulation, thereby affecting motivation (Zacharis & Papadakis, 2025). Furthermore, evidence also shows that gendered differences in engagement often arise from learning design and contextual framing rather than inherent gender traits, reinforcing the importance of pedagogically guided and inclusive AI implementation (Zourmpakis et al., 2024).

Overall, based on the gender-related differences observed in this study, these findings appear to reflect how students engage with AI tools to meet academic demands rather than inherent motivational disparities. AI-assisted learning motivation is not entirely a direct outcome of technology use, but rather an emergent process shaped by learner perceptions, task structure, and contextual conditions. Thus, the motivational effects of educational AI depend on design transparency, perceived fairness, and alignment with pedagogical goals (Zacharis & Papadakis, 2025; Zourmpakis et al., 2024). As a result, the study's findings contribute to ongoing discussions on responsible and inclusive AI integration in higher education.

Limitations

This study is exploratory and context-specific, drawing on a small qualitative sample from a single Malaysian private university. While the findings offer in-depth insights into students' perceptions of AI-assisted learning motivation, they are not intended to be statistically generalisable. Gender-related patterns identified in this study should therefore be interpreted as situated experiences rather than essentialised or universal traits. Future studies employing larger, multi-institutional samples and mixed-methods designs may further extend the transferability of these findings.

Conclusion

This study has attempted to identify how gender differences can influence the perception of AI-assisted learning motivation among male and female students in Malaysian higher education. Both male and female students recognise the advantages of AI tools in encouraging learning efficiency, personalised learning experiences and motivating academic engagement. While students use such tools in similar ways, gendered differences appear in how students use the tools since males tend to apply these tools for technical problem-solving, while the female's students tend to use these tools for organizing content or simplifying complex theories. Students' comfort and use of AI tools are influenced by cultural and societal factors, especially on gender roles in Malaysia. Although male and female students see AI tools as largely neutral, the content examples shown in these tools may convey gender biases that could influence students' involvement. Moreover, privacy concerns and overreliance on AI in learning processes were apparent, which only strengthens the argument for a balanced use of AI in learning processes. In conclusion, the use of AI tools in education has great potential to improve learning; however, gender concerns, inclusive content, and ethical aspects, such as privacy, should be taken into account to ensure equitable and adequate use of AI tools for educational

purposes. Future research is necessary to investigate how AI tools can be designed to cater to different learning preferences and address the challenges identified in the present study.

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