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Perceived Impact of Artificial Intelligence on University Students' Learning Experiences Across STEM, Social Science, Business and Humanities in Bangladesh

Md Mahadhi Hasan[1], Anika Binta Nazrul[1], Antura Akter[2], Shahida Afrin[3*], Mohammad Abu Nayeem[4], Zaheed Alam Munna[4]

[1]Department of English and Humanities, University of Liberal Arts Bangladesh, Dhaka, Bangladesh, [2]Information Technology, Emporia State University, United States, [3]Department of English, Comilla University, Bangladesh, [4]Department of English, Southeast University, Dhaka, Bangladesh. *Corresponding Author's Email: shahida@cou.ac.bd

Abstract

The integration of Artificial Intelligence (AI) tools in higher education is gaining significant momentum, transforming teaching and learning across academic disciplines such as STEM, Humanities, Social Sciences and Business. As these technologies become more widespread, it is essential to understand how students perceive the impact of ChatGPT, Grammarly and QuillBot on their learning experiences. This study employed a mixed-methods approach to collect quantitative and qualitative data. A purposive sampling method was used to recruit 407 students, aiming to ensure the representation across disciplines. Data were collected via a Google Forms-based survey using Likert-scale items, which underwent pilot testing and expert validation to ensure robustness. The instrument demonstrated high internal consistency, with Cronbach's alpha values above 0.80. Additionally, seven students representing diverse perspectives on AI tools participated in in-depth interviews. Descriptive statistics and one-way ANOVA showed how students across various disciplines perceive AI tools for learning. STEM students report that AI enhances their problem-solving skills by simplifying complex concepts, a benefit also experienced by Business students, who share similar advantages. Humanities and Social Sciences expressed mixed responses and skepticism about decreased creativity, critical thinking and anxiety about losing 'human touch.' Their cautious approach shows that while AI helps in summarization and research, a one-size-fits-all concept may not work for all educational backgrounds. The study emphasizes the need for discipline-specific AI tools to enhance their effectiveness in higher education. The results also showcased the importance of addressing ethical concerns and ensuring equitable access to AI tools across academic disciplines.

Keywords: Artificial Intelligence, Business, Equitable Access, Humanities, Social Sciences, STEM.

Introduction

Artificial Intelligence (AI) tools in higher education have received tremendous attention in recent years. Due to these tools being rapidly involved and AI tools maintainers continuously upgrading the servers to meet the users' expectations, they increase students' learning outcomes in various ways. AI tools such as ChatGPT, Grammarly and Quillbot, are increasingly being incorporated into the educational system. They facilitate student engagement and enhance learning experiences across various disciplines (1). While these tools provide immediate feedback to users, adaptive sessions that offer students greater advantages and personalized learning for students in disciplines like STEM, specific concerns about potential negative impacts on creativity and critical thinking are increasing (2). For example, the inability of AI tools to offer versatile analyses or interpretive opinions in areas such as the English language or literature raises questions about their impact on fostering original thought and adding a human touch to academic work (3, 4). Similarly, Social Science students may benefit from the efficiency of AI tools for summarizing large amounts of information; however, the tools' inability to replicate the intellectual thoroughness required for complex theories and critical discourse remains a significant limitation (5).

Within Humanities, specifically in TESOL, AI tools increase language acquisition and proficiency (6). At the same time, these tools may be diminishing critical discourse in writing (7). In STEM, AI supports problem solving across a variety of scientific and mathematical domains and it is also

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considered to have an impact on metacognitive skills (8). Social Sciences, on the other hand, faces ethical complications due to algorithmic biases in educational contexts (9). At the same time, Business students benefit from simulations created by AI tools that enhance their critical thinking and help them make decisions (10). These disciplinary variations reveal a universal tension. It can be said that the benefits of AI and optimizing it for learning experiences while trying to preserve cognitive skills have become a global concern, especially in EFL education, where having the best proficiency in the language with critical thinking is considered a benchmark for creativity (11)

Despite the rapid transformation of AI tools in recent years, there is limited research examining their long-term impact on learning experiences across various educational areas in the Bangladeshi context. Specifically, the impact of AI tools on students' ability to engage deeply with course content and perform well academically remains underexplored. Research indicates that STEM students benefit from AI tools' ability to process data and assist with major tasks such as coding and data analysis; these tools are widely accepted and used in this field (12). For instance, ChatGPT is often used to generate code and solve mathematical problems. It also works better with data analysis, which makes it a valuable tool for STEM students (11). Additionally, Grammarly and Quillbot are known for their perceived impact on clarity and structure in scientific writing (12).

In light of these developments, the level of engagement and comprehensive learning capacity of AI tools is also being questioned. Although students frequently use platforms such as ChatGPT, Grammarly and Quillbot, there is a significant gap in research on the effectiveness of AI tools in improving learning outcomes across various academic fields (13). The ethical and cognitive consequences of AI-based learning in those areas have received very little attention, especially in non-Western nations where access to AI technology is still in the experimental and early stages (2, 14). This means that previous studies on the impact of AI often lack regional insights and discipline-specific information, especially in the Bangladeshi context. Although recently, a study focused on evaluating DeepSeek in Chinese contexts and demonstrated how AI tools can behave differently based on sociocultural context and language factors, a significant gap remains in knowing how learning tools created by AI impact students' experiences in other educational contexts, such as Bangladesh or other non-Western academic institutions (15, 16).

Although few comparative studies have been conducted that explore the differences that AI has made in STEM versus social science and Humanities students, they have not adequately addressed whether AI tools contribute to or make issues in the development of creativity and critical thinking in these students or any other discipline of the educational process (17). The research gap on the perceived impact of AI tools on learning experiences across disciplines calls for further investigation.

To address this gap, this research examines the perceived impact of AI tools on the learning experiences of undergraduate students at private universities in Bangladesh. The study is guided by the following research question:

How do students across different academic disciplines perceive the impact of AI tools on their learning experiences?

Conceptual Framework

This study integrates Social Constructivism and the Technology Acceptance Model to study AI's impact on learning (18). Although AI enables personalized learning and scaffolding (ZPD), its algorithmic nature risks simplifying complex analyses and lacking the "human touch" that the humanities require (4, 19). Despite increased efficiency, overreliance and concerns about academic integrity persist (14, 20). The research exclusively integrates these frameworks to measure AI's perceived impact across disciplines in Bangladeshi private universities. The conceptual framework is depicted in Figure 1.

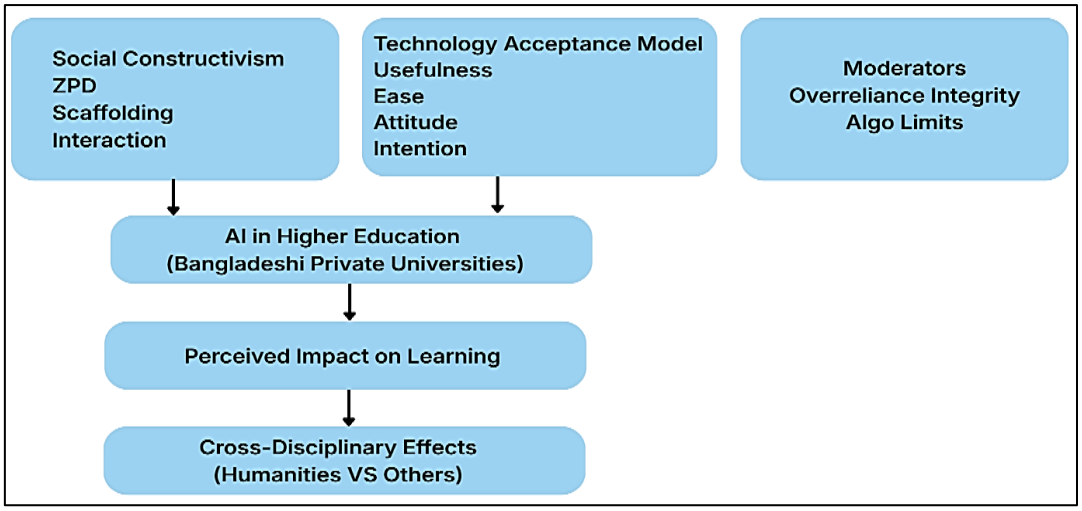

Figure 1: Conceptual Framework

Methodology

Research Design

The research used a mixed-methods approach with a combined parallel design, collecting data in parallel across quantitative and qualitative methods. They were then analyzed separately to incorporate the interpretation during the process. The survey yields wide-ranging, generalizable knowledge and the interviews that follow provide contextual, in-depth information from participants.

Study Population and Sampling

The key respondents for this study are undergraduate students from four private universities in Bangladesh across four academic areas: STEM, Social Sciences, Humanities and Business. This includes Electrical and Electronic Engineering (EEE), Computer Science and Engineering (CSE), Business Administration (BBA), English (Applied Linguistics and TESOL, Literature), Media Studies and Journalism, as well as other fields within STEM, Social Sciences, Humanities and Business. These subjects were selected to ensure a broad representation of students' learning experiences and viewpoints across a wide range of studies. Purposive sampling was used to select the respondents. Purposive sampling is justified for this study to intentionally recruit participants who are students from private universities in STEAM, Business, Social Sciences, or Humanities and who have over two-years of experience using AI tools, thereby providing in-depth, relevant insights while excluding participants from public universities or those with less AI experience. The demographic information of the samples is presented here.

This study examined 407 participants in total, as shown in Table 1. Most participants were female (57.3%), while male participants were 42.7%. Regarding the use of AI and its impact on educational outcomes, nearly half of the participants (48.9%) reported using AI tools for 2 years or more. Another 35.8% of participants have been using AI tools for over a year, while a smaller percentage (10.3%) have used them for less than a year. One respondent among 407 selected multiple overlapping options, which were noted separately to avoid confusion in data analysis. In terms of academic disciplines, students in STEM fields responded the most (32.2%), followed closely by those in the Humanities (30.7%). After that came the students of Business, who accounted for 22.3% of the sample and, lastly, the students of Social Sciences, who made up 14.8%. The diversity of this demographic profile enriches the context of analyzing learning experiences and perceptions.

Table 1: Demographics of the Respondents

Category	Count	Percentage
Gender		
Female	233	57.3%
Male	174	42.7%
AI Usage Duration		
Less than one year	44	10.3%
More than one year	153	35.8%
Two years or more	209	48.9%
More than a Year; Two years or more	1	0.2%
Field of Study/Discipline		
STEM (Science, Technology, Engineering)	131	32.2%
Humanities (Literature, Linguistics, TESOL)	125	30.7%
Business	91	22.3%

Table 2 presents the characteristics of seven undergraduate students purposively selected from a range of academic areas at various private universities in Bangladesh. The participants include three male and four female students, all of whom have been using AI tools for over two years. In this study, they represent various fields of study, including Computer Science and Engineering (CSE), Business Administration (BBA), Electrical and Electronic Engineering (EEE), Journalism and English. Specifically, there are two participants from CSE, two from English (TESOL and English Literature), one from BBA, one from Journalism and one from EEE.

Table 2: Demographic Information of the Interviewee Students

Number	Education Field	Gender	Years of AI Usage
Interviewee-A	CSE	Male	Two years or more
Interviewee-B	BBA	Male	Two years or more
Interviewee-C	EEE	Male	Two years or more
Interviewee-D	English	Female	Two years or more
Interviewee-E	CSE	Female	Two years or more
Interviewee-F	English	Female	Two years or more
Interviewee-G	Journalism	Female	Two years or more

Instrument Development and Validation

Survey Questionnaire

The survey questionnaire was adapted from previous research to ensure its relevance and reliability (21). The 10 items were selected categorically and adjusted to align with the study's research questions. Each part of the questionnaire includes Likert scale items (1 = Strongly Disagree, 5 = Strongly Agree). To authenticate the survey, expert opinions were obtained from two academics. Also, the survey was pilot tested with 30 students at the outset to assess its validity and reliability. Each section was evaluated using Cronbach's alpha and all values above 0.80 were retained, indicating good internal consistency. The interview protocol was adapted from previous studies (22, 23). The protocol incorporated open-ended questions to examine students' perceptions about AI tools in their learning experiences. To ensure the validity of the interview protocol, it was again reviewed by two experts in educational technology and qualitative research. The protocol was also pilot tested with two students to identify potential concerns and make necessary changes.

Data Collection Procedure

The survey was created in Google Forms and distributed to respondents via email, Facebook and WhatsApp. The interviews were conducted face-to-face and through Google Meet to allow detailed feedback and meaningful conversations. Each interview lasted 30-45 minutes and the conversation was audio-recorded with participants' consent. Some written interviews were also conducted to meet the participants' comfort level during the interview. Participant consent was ensured before the survey and interview. They were assured of anonymity in reporting the findings. Thus, ethical protocol was maintained.

Data Analysis

Quantitative data analysis was performed using SPSS version 27, complemented by thematic analysis of qualitative interview transcripts. The quantitative analysis included the mean, standard deviation and frequency for each Likert-scale item. For instance, the mean score for the item "AI tools have increased my interest and curiosity in learning new topics" was calculated for each discipline, providing a total acquisition of how undergraduate students perceive the role of AI in increasing their learning experiences. For the

second step, a One-Way ANOVA was conducted to compare perceptions across the four disciplines (24). This test was selected to examine whether there were statistically significant variations in how students from different fields of study perceived the AI tools in their learning experiences. The assumption of homogeneity of variance was examined using Levene's test and post hoc tests (e.g., Tukey's HSD) were used to identify differences between disciplines (24). Effect sizes (e.g., eta-squared) were calculated to assess the practical significance of significant outcomes (25).

The qualitative data from the interviews were thematically analyzed (26). The interview audio recordings were transcribed word-for-word and the transcripts were manually coded to identify recurring themes and patterns. The coding process involved both deductive and inductive approaches, allowing themes to emerge from the data and be guided by the research question (27). The qualitative and quantitative findings were incorporated with triangulation and analysis in the discussion section (28).

Results

The findings are presented here under subheadings in tables and paragraphs.

Descriptive Statistics for Perceived Impact of AI Tools Across Disciplines

The data, as presented in Table 3, show that students across disciplines perceive AI tools differently in their education. STEM students show the most positive attitudes among all the participants. They particularly value AI's ability to make complex topics easier to understand [4.42/5] and to make their learning process more engaging [4.38/5]. Business students follow closely behind, especially appreciating the personalization features that AI tools offer [4.31/5] and how they help them collaborate [4.18/5]. Social Science students also demonstrate moderate yet consistent approval; they show the strongest agreement about the capacity of AI tools to explain complex concepts [4.22/5].

On the other hand, Humanities students, particularly the students from English departments, have appeared to be more cautious about certain things. They reported the lowest usage rates [3.65/5]. They seem to see less impact on their learning motivation regarding AI tools [3.67/5]. This disciplinary divide in opinion suggests that incorporating AI tools may require tailored approaches. While technical fields readily adopt these tools, students in TESOL or English literature may require a more thoughtful integration to address their concerns. A universal challenge regarding fairness and inclusion emerged, with all disciplines showing reservations (scores ranging from 3.7 to 3.94/5). This suggests that a key area for improvement is on the horizon in the development of AI educational options. The broader range of opinions in the Humanities (SDs 1.20-1.28) compared to other fields indicates greater diversity within this discipline. This suggests that some Humanities students have accepted AI tools while others remain skeptical about their educational value in their field of study. These findings highlight the importance of developing AI strategies tailored to specific disciplines, acknowledging the uniqueness of each field's teaching methods and learning goals.

Table 3: Mean and Standard Deviation of Perceived Impact of AI Tools on Learning Experience by Academic Discipline

Item Description	STEM	Humanities	Business	Social Sciences
AI tools have significantly increased my total learning experience.	4.27 [1.02]	3.78 [1.24]	4.23[1.05]	4.05 [1.13]
AI-powered platforms make learning more interactive and engaging for me.	4.38 [0.94]	3.87 [1.22]	4.28[0.99]	4.14 [1.08]
AI tools provide personalized learning recommendations that suit my needs.	4.23 [1.01]	3.92 [1.17]	4.31[0.97]	4.12 [1.09]
AI tools help me understand complex concepts more easily.	4.42 [0.94]	3.98 [1.19]	4.33[0.98]	4.22 [1.06]
I regularly use AI-based resources for learning support.	4.11 [1.19]	3.65 [1.28]	4.12[1.15]	3.95 [1.19]
AI tools adapt well to my learning style and preferences.	4.25 [1.03]	3.87 [1.20]	4.24[1.02]	4.08 [1.11]
AI tools help me collaborate better with my classmates.	4.05 [1.14]	3.78 [1.23]	4.18[1.07]	4.05 [1.13]
AI tools have improved my ability to retain and recall information.	4.15 [1.11]	3.82 [1.24]	4.20[1.06]	4.07 [1.13]
AI tools have increased my interest and curiosity in learning new topics.	4.08 [1.15]	3.67 [1.26]	4.14[1.10]	3.98 [1.16]
AI tools provide a fair and inclusive learning environment.	3.94 [1.17]	3.72 [1.24]	3.98[1.14]	3.91 [1.16]

One-way ANOVA Analysis of AI-based Learning Experiences Across Disciplines

Table 4 presents a comprehensive analysis of students' perceptions of AI tools, which enhance their learning experiences across four major disciplines: Humanities, STEM (Science, Technology, Engineering and Mathematics), Business and Social Sciences. The table systematically compares ten key dimensions of learning experience through one-way ANOVA

results. It helps report F-statistics with degrees of freedom (3,403), p-values (significance levels), effect sizes (η^2) and mean differences (ΔM), along with their corresponding confidence intervals. The one-way ANOVA results for ten learning experience dimensions reveal statistically significant differences across academic disciplines (all $p < .05$), with effect sizes (η^2) ranging from .03 to .08. The effect sizes indicate that various disciplines account for a meaningful proportion of the variance in evaluating AI tools for students. The most substantial effects come from the view of total learning experience enhancement ($F(3,403) = 6.42$, $p < .001$, $\eta^2 = .08$) and interactive engagement ($F(3,403) = 5.87$, $p < .001$, $\eta^2 = .07$). Post-hoc Tukey HSD tests show how STEM students consistently reported more positive experiences than Humanities students across all measures, with mean differences (ΔM) ranging from +0.22 (inclusive learning environment) to +0.51 (interactive engagement).

The analysis further indicates several essential patterns in the collected data. Business students from various universities showed intermediate results. Their response outperforms their peers in Humanities across three main areas: personalized recommendations (ΔM = +0.39), learning style adaptation (ΔM = +0.37) and collaborative learning (ΔM = +0.40). These findings show that while students in STEM disciplines have the strongest connection to current AI tool capabilities, business education also shows significant incorporation of AI tools. However, the minor differences are notable in inclusive learning environments ($\eta^2 = .03$) and increased curiosity ($\eta^2 = .03$), suggesting that the benefits may be more universal across academic domains. The consistent statistical significance (all $p < .05$) and moderate effect sizes collectively. It demonstrates that discipline plays an important role, albeit not exhaustively, in shaping students' learning experiences with AI. These results provide essential insights for developing targeted, integrated AI strategies that address the specific needs of different academic disciplines.

Table 4: One-Way ANOVA Results for All AI Learning Experience Items

Item Description	F (3,403)	p-value	η^2 (Effect Size)	Post-Hoc Comparisons (Tukey HSD)
AI tools have significantly increased my total learning experience	6.42	<.001	.08	STEM > Humanities* (ΔM = +0.49)
AI-powered platforms make learning more interactive and engaging for me	5.87	<.001	.07	STEM > Humanities* (ΔM = +0.51)
AI tools provide personalized learning recommendations that suit my needs	5.23	.001	.06	STEM > Humanities* (ΔM = +0.31) Business > Humanities* (ΔM = +0.39)
AI tools help me understand complex concepts more easily	4.76	.003	.05	STEM > Humanities* (ΔM = +0.44)
I regularly use AI-based resources (e.g., chatbots, virtual tutors) for learning support	3.91	.009	.04	STEM > Humanities* (ΔM = +0.46)
AI tools adapt well to my learning style and preferences	5.45	.001	.06	STEM > Humanities* (ΔM = +0.38) Business > Humanities* (ΔM = +0.37)
AI tools help me collaborate better with my classmates	4.12	.007	.05	Business > Humanities* (ΔM = +0.40)
AI tools have improved my ability to retain and recall information	3.68	.012	.04	STEM > Humanities* (ΔM = +0.33)
AI tools have increased my interest and curiosity in learning new topics	3.25	.022	.03	STEM > Humanities* (ΔM = +0.41)
AI tools provide a fair and inclusive learning environment for all students	3.01	.030	.03	STEM > Humanities* (ΔM = +0.22)

Results from Semi-structured Interviews

The interviews were conducted with seven participants who provided insightful perspectives. Interviews with students from Computer Science and Engineering (CSE) and Electrical and Electronic Engineering (EEE) reveal that AI tools, including ChatGPT, Grammarly, Gemini and Quillbot, increase their learning experiences. Interviewee-C (EEE, Male), who has been using AI tools for more than two years, accepts that his learning experiences have significantly improved due to AI tools. He explained, "I started [my undergraduate education] with ChatGPT. I started [using it] around 2021. At that time, ChatGPT could not give good [accurate] answers. However, as time went by, I started to know how to use it properly, so the help increased." His positive perspective was echoed by Interviewee-E (CSE, Female), who noted that AI tools improved her coding skills and writing techniques. She shared, "Last semester, I was working on a data analysis project. I used AI to quickly generate Python code for data cleaning or visualization, as I was

[running] out of time and the deadline [to submit] was near. It created items such as bar charts and scatter plots, all based on the dataset I was given to work with. ChatGPT and Code generators gave me a head start by offering correct templates and easy-to-understand explanations." However, Interviewee-A (CSE, Male), who has stated several positive aspects of AI tools, also mentioned the negative impacts. He shared, "Now I am getting all the information without any difficulty. I am giving commands [prompts], the answers are coming[generating] and I am rewriting [editing] them a little and submitting them. Moreover, the answers are coming as good [precisely] as I want them." He also mentioned, "AI is no longer motivating me [to study]. Instead, it seems like I am using AI tools to finish everything quickly."

Students from Humanities and Social Sciences showed a more cautious approach towards AI tools in their learning experiences. Interviewee-D (English, Female) shared her study life with ChatGPT: "When writing a paper on the work [play] Hamlet, I went for ChatGPT as usual to break down the famous 'To be or not to be' soliloquy. After giving some information [prompts], ChatGPT gave me so many[various] interpretations. It had [included] modern critical angles that I had not even known about before." Interviewee-F (English, Female) also shared her sentiment by stating, "AI tools are improving my learning experience. Before using AI, I was more dependent on my lecturers. However, now, I know I have something that can help me even an hour before my exam." Interviewee-D (English, Female), who belongs to the department of English Literature, also stated, "ChatGPT helped me summarize [key points] in literally 30 or 40 minutes. So, I was able to structure[organize] my ideas more clearly. I still read the text, of course, but it made the whole process feel less overwhelming." Similarly, Interviewee-F (English, Female), who studies Applied Linguistics and TESOL, shared her learning process, saying, "I use AI tools to summarize long texts when I have little time. They save me time by giving me simple, short answers as per my request." Nevertheless, students in the English study area expressed concern about overreliance on AI tools. BBA students expressed somewhat similar sentiments about AI tools being the perfect option for simplifying large datasets but still recognized the over-dependence that has been occurring in this discipline.

Discussion

Disciplinary Variations in AI Acceptance

The results of this study provide convincing evidence that academic discipline plays a crucial role in shaping students' perceptions of AI tools in their learning experiences. Statistically significant one-way ANOVA results were observed across all five learning experience dimensions (all $p < .05$). This indicates that disciplinary background is an essential moderating factor in how students perceive AI tools in increasing their educational process. The analysis reveals that acceptance of AI is cohesive. With STEM students showing the strongest support ($F(3,403) = 6.42$, $p < .001$, $\eta^2 = .08$ for overall experience), Humanities students expressing more skepticism towards AI tools and Business and Social Science students falling between with slightly different opinions. Post-hoc Tukey HSD tests show that STEM students reported significantly more positive experiences with AI tools than their peers in the Humanities, with mean differences (ΔM) ranging from +0.22 to +0.51. From interviews, the findings suggest that STEM students also rely on AI tools to simplify their daily tasks, helping them focus more on the advanced and meaningful aspects of their field of study (29).

On the contrary, representatives of English literature and TESOL students from the Humanities (Interviewee-F, English, Female; Interviewee-D, English, Female) reported that, in the context of research projects, they use ChatGPT to address queries. This demonstrates that while humanities students value AI tools for their ability to assist with intensive research and writing tasks, they still rely on their own in-depth research to validate their writing, even when sourcing their references. They still believe that the interpretive depth required in their disciplines is beyond the reach of AI tools. It shows that students in Humanities, especially those in English Literature or Applied Linguistics, use AI tools but still believe that, because of their excessive use, they might miss out on deeper thinking or creativity, findings that align with the past study (29).

In addition, the ANOVA results revealed that Business students also expressed positive

attitudes towards AI tools, especially for their ability to assist with tasks such as summarizing articles and simplifying complex financial calculations and concepts. This illustrates how Business students appreciate the utility of AI tools for distilling complex material into simple, easily digestible points, thereby improving their learning efficiency. In contrast, STEM students showed a more balanced perspective on AI tools. They stated how even after writing the given task on their own, AI detectors consider those writings to be generated by AI. The participant also reflected on his own experience on how using 'too much of the AI' tools was giving him a hard time with a project, so he needed to find alternatives by using his critical thinking more than using AI tools (Interviewee-C, EEE, Male), which contrasts with the past study (14). This statement reflects a key theme among Social Science and some STEM students, who value the support AI tools give in organizing data. Still, they remain cautious about spending too much on it for every interpretation (30).

STEM Students' Engagement with AI Tools

The strong positive opinions among STEM students (with means consistently above 4.1 across all measured dimensions) align well with the existing literature on technology acceptance in quantitative fields (43, 44). The most substantial effects come from interactive engagement ($F(3,403) = 5.87$, $p < .001$, $\eta^2 = .07$; $\Delta M = +0.51$ versus humanities) and conceptual understanding ($F(3,403) = 4.76$, $p = .003$, $\eta^2 = .05$; $\Delta M = +0.44$). From the interviews, STEM students described how AI tools have improved their understanding of 'complex subjects' and given them confidence to work on assignments as well as 'big research projects' (Interviewee-E, CSE, Female). The statement illustrates how STEM students view AI tools as an important means of simplifying complex tasks. They allow students to focus on more intellectual and in-depth aspects of their field of study. They also noted that their field of study is competition-oriented, requiring them to 'make and display images.' So, they use AI tools to generate essential pictures too (Interviewee-A CSE, Male). This echoes with previous research (30) on visualization tools in STEM education. This pattern stems from several interrelated factors, primarily AI tools, as noted in a previous study (31). First, the introduction of solving problems in STEM areas naturally complements the capabilities of AI tools in pattern recognition, interactive optimization and data processing (writing and visual). Second, many educational AI tools have been designed specifically for STEM disciplines.

From the interviews, it was indicated that with ChatGPT, Grammarly and Quillbot, STEM students also use tools like 'Wolfram Alpha and MATLAB' (Interviewee-A, CSE, Male). This statement is supported by another STEM student, who talked about using 'Google Colab and SciKit-Learn for Python learning' (Interviewee-E CSE, Female). All these named tools are made explicitly for STEM students. Third, STEM pedagogy is traditionally lean towards efficiency and precision. It values AI tools' contributions more than those of other disciplines (30). The aspect STEM students valued most was AI tools' ability to make complex concepts simple ($M = 4.42$), which supports this interpretation because it aligns with the field's emphasis on simplifying complex problems into manageable content. Similarly, participants reported using ChatGPT more frequently in regular classes. However, they also made sure to double-check things before starting their primary assignment (Interviewee-C, EEE, Male). These remarks reflect a balanced approach in which STEM students use AI tools while maintaining crucial control over interpretation, a key aspect of their academic approach (31).

Business Students' Practical Applications

Business students' strong positive responses suggest opinions about AI tools. Especially about personalization ($F(3,403) = 5.23$, $p = .001$, $\eta^2 = .06$; $\Delta M = +0.39$ versus humanities) and collaboration ($F(3,403) = 4.12$, $p = .007$, $\eta^2 = .05$; $\Delta M = +0.40$). The response from this area of study shows traction in management education, building on the previous work (32) on technology in business pedagogy. Participants shared how, in situations like studying a lesson about "Microeconomics' it became 'too hard to remember,' they used ChatGPT for 'short explanations' with real-life analogies. As a result, the study process did not stress them much and the lesson was completed on time. Just like STEM students, Business students also use extra AI tools like 'Notion AI' to process their 'disorganized thoughts' and create a proper outline instantly (Interviewee-C, BBA, Male). This

impact highlights the practical application of AI tools in business education, particularly in creating structured outlines that facilitate data-driven decision-making and support real-world scenarios, something also shown by the past study (33).

Furthermore, the ability of AI tools to increase collaborative learning in business contexts was asserted by the same Business student (Interviewee-C, BBA, Male), who stated how a group project on consumer behavior and market segmentation was successful because they used ChatGPT to simplify terms such as 'cultural influences and demographics affect'. This statement demonstrates how AI tools are used in team-based learning scenarios, which are nowadays common in business education. This also shows how AI tools in recent times have helped students simplify complex business theories, contributing to increased understanding and learning experiences, aligning with the study (12).

Social Sciences' Balanced Approach

The moderate and consistent approval from Social Science students, such as those in journalism, shows a more refined perspective. While their ratings were moderately positive about AI tools, they were typically 0.1- 0.2 points lower than STEM and business students across most dimensions. This negotiated position may reflect the dual nature of Social Science methodologies, which combine qualitative and quantitative approaches. Participants describe using AI tools in various areas of their study. Their statement drew attention to AI tools like ChatGPT and Grammarly, noting that they had become their 'life saver' for 'writing larger essays or correcting basic grammar' (Interviewee-G, Journalism, Female). This demonstrates the practicality of AI tools for making complex concepts simpler in writing tasks for Social Science students, especially in areas like journalism, where communication is the key ingredient. However, even with these advantages, Social Sciences students acknowledged that these tools can easily 'distract them from critical thinking' (Interviewee-G, Journalism, Female). This reveals the balancing act many Social Science students experience with AI tools. They recognize that AI tools can enhance clarity and efficiency but may also compromise the critical thinking skills necessary in their area of expertise. This balanced approach aligns with the study (34), which highlights a critical connection between AI tools and higher education in Social Sciences by demonstrating that they help generate ideas and organize thoughts. So, while AI tools deliver an important supporting role in Social Science, their use remains balanced. Because students still want to rely on critical thinking and human judgment for deeper learning and analysis.

Humanities' Critical Perspective

The students of Humanities, especially from the department of English Literature and TESOL, have the most cautious responses even in the interviews. They raise important questions about the current state of AI tools development and their implications. Their arguments are supported by a study (35), which discusses algorithmic limitations in qualitative domains. Their consistently lower ratings across all dimensions, especially for frequency of use (M = 3.65) and motivational impact (M = 3.67), suggest that the existing AI tools may not accurately capture the core learning experiences of humanities students. Students from this area, especially those in English, express a cautious stance toward the use of AI tools in their learning. Students in English Literature acknowledge both the advantages and limitations of AI tools.

However, they soon realized that AI tools cannot replace the deeper engagement with critical thinking required to understand complex texts. They expressed particular concern about the risk of over-reliance on AI tools, sharing insights that 'originality and critical insights' in English literary studies are the most important aspects. So, if they let AI 'do their study', there is no way of 'learning' (Interviewee-D, English, Female). This critical view is shared by Applied Linguistics and TESOL students as well, who although accepts that AI tools are improving their 'learning experiences' and how AI tools are excellent for 'polishing ideas', they also expressed equal concern about depending on them too much and how this practice can ruin 'critical thinking and creativity', thus bringing 'negative consequences' to their study area (Interviewee-F, English, Female). These insights pinpointed the tension in English literature and in TESOL education to some extent. While AI tools can help improve writing skills in the English department, they can also pose the risk of undermining intellectual engagement and

critical thinking, which are the main components of this discipline.

Conclusion

Using a mixed-methods approach that included quantitative data from 407 students and qualitative insights from interviews, the study reveals that the academic value of AI tools is neither uniform nor context-neutral. Quantitative data is incorporated with qualitative findings, which reveal diverse opinions toward AI across different academic areas. For example, while STEM students see AI as a significant and valuable tool for their academic work, Humanities students express some skepticism and concern about the loss of creativity and human touch in their critical engagement with texts.

Notably, the research provides extensive evidence of disciplinary variations in student perceptions of AI tools. It challenges assumptions about uniform technology adoption across academic fields. It also identifies fairness and inclusion as shared concerns among students across various disciplines. The study demonstrates the importance of addressing algorithmic bias and ensuring transparency in AI tools, regardless of academic discipline. Most importantly, the results call for the implementation of specific field strategies that acknowledge the unique pedagogical traditions and epistemologies of each discipline. These concerns about fairness call for broader educational research for more transparent and inclusive AI practices in Academia. Findings are limited to the specific academic disciplines and institutional culture studied; further research is needed to explore how these AI perception patterns manifest globally. Although findings reflect a single context, the study's credibility lies in its granular, context-specific insights; the integration of statistical data with personal narratives provides a trustworthy foundation for understanding disciplinary divides in AI adoption.

Ultimately, this study's findings highlight the need for a personalized approach to incorporating AI tools in higher education. As AI tools continue to evolve across higher education, the findings from this study can serve as guidance for both practice and research. It can also guide institutions and educators in adopting more effective and equitable approaches to incorporating AI tools that are sensitive to disciplinary differences.

Abbreviations

AI: Artificial Intelligence, AR: Augmented Reality, EFL: English as a Foreign Language, VR: Virtual Reality.

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Author Contributions

Md Mahadhi Hasan: Development of the research idea, methodology, quantitative data analysis, review, Anika Binta Nazrul: data collection, data reporting, Antura Akter: qualitative data analysis, Shahida Afrin: literature review, manuscript preparation, Mohammad Abu Nayeem: pilot testing, Zaheed Alam Munna: editing, discussion, referencing.

Conflict of Interest

The authors declare no conflict of interest. All authors read and approved the final manuscript and agreed to submit the work to IRJMS.

Data Availability

Data are available on request from the first author.

Declaration Of Generative AI And AI Assisted Technologies in the Writing Process

The authors used AI tools in searching for articles for the literature review.

Ethics Approval

Ethical approval was obtained from the university's Institutional Review Board (IRB).

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