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RESEARCH ARTICLE

Artificial intelligence utilization: A determinant of academic self-efficacy, engagement, and satisfaction of university students

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ABSTRACT

The study determined the utilisation of artificial intelligence as a determinant of university students' academic self-efficacy, engagement, and satisfaction. The study adopted a descriptive-correlational research design guided by three research questions and hypotheses. A sample size of 631 respondents was drawn through a multi-stage sampling procedure. Four sets of instruments, titled Artificial Intelligence Utilization Questionnaire (AIUQ), Academic Self-Efficacy Questionnaire (ASEQ), Academic Engagement Questionnaire (AEQ), and Academic Satisfaction Questionnaire (ASQ), validated by experts in the field of education, were used for data collection. The study's findings showed that the undergraduates' utilisation of artificial intelligence positively correlates with their academic self-efficacy, engagement, and satisfaction. The study concluded that artificial intelligence usage boosts the students' self-efficacy, level of academic engagement, and satisfaction with their learning. Based on these findings, it was recommended that students should be encouraged to utilise and leverage artificial intelligence tools for academic purposes appropriately but with caution against plagiarism and total dependence that could be detrimental to their critical thinking skills.

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1. Introduction

Education is a crucial foundation for societal progress and is widely recognised as a key driver of national development. At the university level, students gain advanced academic knowledge and practical skills essential for success in diverse professional fields. Universities are esteemed institutions that creatively and innovatively strengthen a nation's foundations, acting as the starting point for the growth and stability of future generations. At this stage, students must develop critical skills to manage the rapid physical, emotional, mental, and social changes they encounter [1,2]. As they transition into university life, they face numerous challenges, such as demanding coursework, diverse social interactions, and increased responsibilities. These pressures can influence their social well-being, shaping their academic satisfaction [3].

Academic satisfaction is the level of contentment and fulfilment a student feels regarding their academic experiences, achievements, and learning environment. This is often influenced by course quality, teaching effectiveness, student support, and whether their education meets their personal goals. Satisfaction is often linked to how well educational experiences meet students' expectations and needs [4]. When students feel supported and can access resources tailored to their needs, their satisfaction with their educational experience increases. When students experience a sense of achievement and believe they are progressing toward their academic goals, their satisfaction increases. Additionally, positive interactions with peers and faculty and a stimulating learning environment increase satisfaction and academic engagement [3].

Engagement is the active participation, interest, and involvement in activities, which helps enhance understanding and overall success. A study reported that students engaging actively in diverse academic and co-curricular activities are strongly dedicated to meeting learning objectives and ensuring student success [5]. Those keen on learning are more inclined to invest time and effort in accomplishing their goals. The extent of students' engagement in learning can be assessed by their level of attention, curiosity, interest, enthusiasm, and motivation to progress in their studies. According to a study, student engagement is multidimensional, encompassing behavioural, emotional, and cognitive aspects [6]. Researchers view the characteristics that influence student involvement differently. The researchers identified motivation, attention, attitudes, personality, drive, effort, and self-efficacy as factors impacting students' academic engagement. This implies that self-efficacy is important to a student's success [7].

Self-efficacy is a person's belief in their ability to achieve specific goals. It is a fundamental component of self-confidence that influences how students approach challenges, set goals, and persevere in academic difficulties. Another study claimed that academic self-efficacy is the student's belief in their ability to successfully perform and complete academic tasks, such as studying for exams, solving problems, or managing coursework [8]. Self-efficacy, a concept introduced by Albert Bandura, is a key element of social cognitive theory that emphasises the role of personal beliefs in shaping behaviour and achievement. Research indicates that higher levels of self-efficacy are associated with greater motivation and improved student performance [9]. Therefore, to help students continue to perform at their best, it becomes imperative to integrate artificial intelligence to enhance their self-efficacy and support their learning process.

Artificial intelligence is the ability of machines to think, learn, and perform tasks that usually require human intelligence, such as understanding language, recognising patterns, solving problems, and making decisions. AI systems learn from data, adapt to new inputs, and perform tasks independently to imitate human thinking [10]. Another study noted that the future of higher education is intrinsically linked with developments in new technologies and the computing capacities of new intelligent machines. With the rise of

artificial intelligence, educational institutions must adapt and integrate them effectively and encourage students to utilise AI properly to scale up their academic performances [11]. Artificial intelligence (AI) improves the tools and devices used daily on campuses worldwide [12].

With the integration of AI in education, students may experience enhanced self-efficacy, engagement, and satisfaction through personalised feedback and adaptive learning technologies, which can tailor educational experiences to meet individual needs. For instance, AI-driven platforms can help students identify areas for improvement and provide resources that bolster their confidence in their capabilities [13]. Moreover, a study revealed that introducing mobile chatbots to learning can boost students' performance and self-efficacy. The potential benefits of artificial intelligence tools in education extend beyond mere academic performance; they also involve critical psychological factors such as self-efficacy, student engagement, and overall satisfaction. For instance, their study examined the influence of AI-powered chatbots on university students' academic self-efficacy and self-regulation [14]. A study reported that AI chatbots predicted students' self-efficacy in writing academic tasks more confidently [15]. Similarly, another study showed that integrating artificial intelligence into education promotes enhanced academic self-efficacy among students [16]. A study also showed that AI usage is associated with self-efficacy and that students with high self-efficacy depend less on AI to carry out their academic tasks [17].

Previous studies have shown that applying artificial intelligence in education is crucial in promoting user academic engagement. A study reported that artificial intelligence-driven learning promotes engagement and student performance, given its potential in prompt feedback and the resources available to students [18]. A study revealed that most students were more academically engaged due to the influence of artificial intelligence tools [19]. Artificial intelligence tools provide interactive experiences to students, making learning more flexible and engaging [20]. AI-driven learning provides room for individualised learning through which learners explore knowledge according to their pace. A study reported that AI automates learning and facilitates personalised and collaborative learning [21]. Moreover, it has also been revealed that artificial intelligence usage significantly influences students' engagement and academic performance. This is given that the use of artificial intelligence for education has become a trend among students, and it is used to facilitate students' engagement in learning sessions and exploration of knowledge [22,23].

Studies on artificial intelligence and academic satisfaction showed inconsistent findings. Several studies have shown that content quality regarding academic satisfaction with future generative AI tools would be crucial for adoption and user satisfaction [24,25]. Its impact highlights the complex relationship between quality, user experience, and adoption rates. The study found that student satisfaction with AI tools depends on content quality, confidence in their abilities, and emotional well-being. Emotional well-being is the most important factor, followed by content quality, confidence and the perceived utility of text generated by AI. In a study, it was found that while there is no significant correlation between grades and learner satisfaction, using a high-quality AI science suite in the classroom improves learner satisfaction; however, increased interaction with the AI suite shows a negative correlation with satisfaction, teaching adaptability has a strong positive correlation with learner satisfaction. [26]

Understanding the relationships between artificial intelligence utilisation and the outcome variables (academic self-efficacy, engagement, and satisfaction) is essential for improving educational outcomes and ensuring students feel empowered and satisfied in their academic journeys. However, some undergraduate students still struggle to improve their academic performance [23].

The study hinges on the Self-Determination Theory (SDT), which posits that human behaviour is driven by three innate psychological needs: autonomy, competence, and relatedness [27]. These needs are essential

for fostering intrinsic motivation and boosting academic self-efficacy, engagement, and student satisfaction. Artificial intelligence undoubtedly provides personalised feedback, interactive learning environments, and flexible academic paths for building autonomy, competence, and relatedness. It is necessary for boosting academic self-efficacy, engagement, and satisfaction among students.

Despite the potential benefits of utilising artificial intelligence tools in education, including improvements in self-efficacy, student engagement, and overall satisfaction, some undergraduate students of Nnamdi Azikiwe University, Awka, still struggle to improve their academic performance. AI tools provide personalised learning experiences and shape the learning environment by influencing students' motivation, cognitive load, and adaptability to digital education. However, the psychological impact of these tools varies, as some students may experience anxiety or over-reliance on AI-generated feedback, affecting their confidence in independent learning. This raises concerns about whether these students fully benefit from the AI tools available or if other factors, such as lack of proper guidance or insufficient familiarity with these technologies, hinder their progress. It could be that the management of Nnamdi Azikiwe University has yet to provide the students with the necessary artificial intelligence tools to help boost their academic progress. Ensuring students can effectively integrate and utilise these tools into their learning process is essential for addressing these performance challenges. Against this background, the study examined how artificial intelligence utilisation shapes the learning environment and its role as a determinant of academic self-efficacy, engagement, and satisfaction among undergraduates in Nnamdi Azikiwe University, Awka.

2. Research questions

The following research question guided the study:

1. What is the relationship between artificial intelligence utilisation and the academic self-efficacy of undergraduates at Nnamdi Azikiwe University?
2. What is the relationship between artificial intelligence utilisation and the academic engagement of undergraduates at Nnamdi Azikiwe University?
3. What is the relationship between artificial intelligence utilisation and the academic satisfaction of undergraduates at Nnamdi Azikiwe University?

3. Hypotheses

The following null hypotheses were tested at a 0.05 level of significance:

1. There is no significant relationship between artificial intelligence utilisation and the academic self-efficacy of undergraduates at Nnamdi Azikiwe University.
2. There is no significant relationship between artificial intelligence use and undergraduate academic engagement at Nnamdi Azikiwe University.
3. There is no significant relationship between artificial intelligence utilisation and the academic satisfaction of undergraduates at Nnamdi Azikiwe University.

4. Methods

The study used a descriptive-correlation research design. The population included all undergraduate students across 14 faculties, with a sample size 631 selected through a multi-stage sampling process. First, a simple random sampling technique was used to draw three faculties from the university. Second, a self-selection sampling technique was used to draw a sample size of 631 people willing to participate in the

exercise by filling out the online Google form questionnaire. While self-selection sampling facilitated access to participants willing to complete the online questionnaire, it may have introduced self-selection bias. This could mean that the sample disproportionately included students who are more motivated, tech-savvy, or have stronger opinions about the topic, potentially limiting the generalizability of the findings to the broader undergraduate population. Four sets of instruments were used to elicit responses from the respondents on the variables under study. Artificial Intelligence Utilization Questionnaire (AIUQ) is a 9-item questionnaire developed by researchers to elicit information from the students on their rate of artificial intelligence usage for academic purposes such as "In daily school life, Artificial Intelligence helps me streamline my academic tasks", "I use artificial intelligence most times for my assignments". To establish content validity, the initial items were reviewed by a panel of three experts in educational technology and psychometrics, who evaluated each item's relevance, clarity, and representativeness. Based on their feedback, minor modifications were made to improve clarity and alignment with the construct. Furthermore, construct validity was assessed using exploratory factor analysis (EFA), which confirmed a single-factor structure consistent with the theoretical construct of AI utilisation for academic purposes.

Academic Self-Efficacy Questionnaire (ASEQ) is a 5-item questionnaire adopted from a study, which elicited information from the students on their confidence in their ability to carry out academic tasks such as "I know I can stick to my aims and accomplish my goals in field of study, "The motto 'if other people can, I can too' applies to me when it comes to my field of study"; Academic Engagement Questionnaire (AEQ) [28], a 15-item questionnaire adopted from a study, which was used to elicit information from the respondents on how involved they are in their studies such as "When I am in class, I do the best I can", I feel nervous when we start learning something new"; and Academic Satisfaction Questionnaire (ASQ), a 16-item questionnaire adopted from the work of LIU [29]. A tool used in gathering information on students' satisfaction with the school and the learning experiences they acquire in their school, such as "You are satisfied with teachers' teaching methods," You are satisfied with the speed of updating teaching knowledge offered by the school." The items on the four sets of questionnaires were structured on a four-point response pattern and weight of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). The reliability of the instruments was determined using the Cronbach Alpha method, and alpha coefficients of 0.89, 0.64, 0.68 and 0.94 were obtained for AIUQ, ASEQ, AEQ, and ASQ, respectively. The reliability indexes were high and considered reliable for use. Data were collected by sharing Google form links of the questionnaires to the students through online platforms. The 631 students who willingly filled out the questionnaires formed the study sample. Data were analysed using simple correlation to answer the research questions and linear regression to test the hypotheses at a 0.05 significance level. The decision rule for accepting or rejecting the null hypothesis is that any data that is less or equal to 0.05 is insignificant. In contrast, any data greater than 0.50 is significant [30].

5. Results

Table 1. Students' socio-demographic characteristics.

	Frequency	**Percentage (%)**
Field	-	-
Humanities	275	43.6
Technology/ICT	45	7.1
Science	100	15.8
Management	211	33.4
Level		
100	48	7.6
200	107	17.0

	Frequency	Percentage (%)
300	152	24.1
400	324	51.3
Age		
15-17		1.1
18-20	7	26.3
21-23	166	46.1
24>	291	26.5
	167	
Residence		
In Campus		14.6
Off-Campus	92	85.4
	539	
Gender		
Male	270	42.8
Female	361	57.2
Total	631	100.0

Table 1. (*Continued*)

Table 1 revealed that more females (361, 57.2 %) than males (270, 42.8 %) participated in the study. 7, representing 1.1 % of the respondents, are within the age range of 15-17 years; 166, representing 26.3 %, are between 18-20 years; 291, representing 46.1 %, fall within the age bracket of 21-23 years; while 167 respondents representing 26.5 % are 24 years and above. A more significant number of respondents reside outside the campus (539, 85.4 %), while only 92 (14.6 %) reside within the campus. The academic level shows that many students are in the 400 level (324, 51.3 %), while the 100 level has the least respondents (48, 7.6 %). Humanities have the most respondents (275, 43.6 %), while Technology/ICT has the least respondents (45, 7.1 %).

Research Question 1: What is the relationship between artificial intelligence utilisation and academic self-efficacy among undergraduate students at Nnamdi Azikiwe University?

Table 2. Simple correlation showing the relationship between artificial intelligence utilization (AI Utilization) and academic self-efficacy among undergraduate students in Nnamdi Azikiwe university.

S/N	Variables	N	M	SD	1	2
1.	AI Utilization	631	26.7	4.9	1	.090
2.	Self-Efficacy	631	17.4	1.9	.090	1

N = Number of participants, M = Mean score, SD = Standard deviation

Table 2 revealed that artificial intelligence utilisation with a mean (26.7) and standard deviation (4.9) has a low and positive relationship $r = .090$ with university students' academic self-efficacy ($M = 17.4$; $SD = 1.9$). This implies a low and positive relationship between artificial intelligence utilisation and academic self-efficacy among undergraduate students at Nnamdi Azikiwe University.

Research Question 2: What is the relationship between artificial intelligence utilisation and academic engagement among undergraduate students at Nnamdi Azikiwe University?

Table 3. Simple correlation showing the relationship between artificial intelligence utilization and academic engagement among undergraduate students in Anambra state.

S/N	Variables	N	M	SD	1	2
1.	AI Utilization	631	26.70	4.86	1	.122
2.	Academic Engagement	631	43.21	4.78	.122	1

Table 3 revealed that artificial Intelligence utilisation with a mean (26.70) and standard deviation (4.86) has a low and positive relationship $r = .122$ with university students' academic engagement ($M = 43.21$; $SD = 4.78$). This implies a low and positive relationship between artificial intelligence utilisation and academic engagement among undergraduate students at Nnamdi Azikiwe University.

Research Question 3: What is the relationship between artificial intelligence utilisation and academic satisfaction among undergraduate students at Nnamdi Azikiwe University?

Table 4. Simple correlation showing the relationship between artificial intelligence utilization and academic satisfaction among undergraduate students in Nnamdi Azikiwe university.

S/N	Variables	N	M	SD	1	2
1.	AI Utilization	631	26.70	4.86	1	.058
2.	Academic Satisfaction	631	45.82	10.00	.058	1

Table 4 shows that artificial intelligence utilisation, with a mean of 26.70 and a standard deviation of 4.86, has a low and positive relationship ($r = .058$) with university students' academic satisfaction ($M = 45.82$; $SD = 10.00$). This implies a low and positive relationship between artificial intelligence utilisation and academic satisfaction among undergraduate students at Nnamdi Azikiwe University.

Hypothesis 1: The relationship between artificial intelligence utilisation and academic self-efficacy of undergraduates at Nnamdi Azikiwe University is insignificant.

Table 5. Linear regression analysis for artificial intelligence utilization and academic self-efficacy.

Model		Unstandardised Coefficients		Standardised Coefficients	*t*	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	16.477	.421		39.096	.000
	AI Utilization	.035	.016	.090	2.273	.023
	R	.090[a]				.023
	R^2	.008				.023
	F	5.168				.023[b]

a. Dependent Variable: Self-Efficacy

Table 5 revealed an F-ratio ($F = 5.168$, $N = 631$*); R (β = .090)* with associated probability value *($p < .05$, 0.023).* The p-value ($p \leq .000$) is less than 0.05 and, therefore, found significant. Thus, the research hypothesis was not accepted. Inference drawn was, therefore, that there is a significant relationship between artificial intelligence utilisation and academic self-efficacy of undergraduates at Nnamdi Azikiwe University.

Hypothesis 2: There is no significant relationship between artificial intelligence utilisation and academic engagement of undergraduates in Nnamdi Azikiwe University

Table 6. Linear regression analysis for artificial intelligence utilization and academic engagement.

Model		Unstandardised Coefficients		Standardised Coefficients	*t*	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	40.016	1.057		37.874	.000
	AI Utilization	.120	.039	.122	3.073	.002
	R	.122[a]				.002
	R^2	.015				.002
	F	9.456				.002[b]

a. Dependent Variable: Academic Engagement

Table 6 showed an F-ratio (*F = 9.456, N =* 631*); R (β = .122)* with associated probability value *(p < .05, .002)*. The *p*-value ($p \leq .000$) is less than 0.05 and, therefore, found significant. Thus, the research hypothesis was rejected. Inference drawn was, therefore, that there is a significant relationship between artificial intelligence utilisation and academic engagement of undergraduates at Nnamdi Azikiwe University.

Hypothesis 3: Artificial intelligence utilisation has no significant relationship with the academic satisfaction of undergraduates at Nnamdi Azikiwe University

Table 7. Linear regression analysis for artificial intelligence utilization and university students' academic satisfaction.

Model		Unstandardised Coefficients		Standardised Coefficients	*t*	Sig.
		B	**Std. Error**	**Beta**		
1	(Constant)	42.758	2.136		20.021	.000
	AI Utilization	.115	.079	.058	1.457	.146
	R	.058[a]				.146
	R^2	.003				.146
	F	2.122				.146[b]

a. Dependent Variable: Academic Satisfaction

Table 7 showed an F-ratio (*F = 2.122, N =* 631*); R (β = .058)* with associated probability value *(p < .05, .146)*. The p-value ($p > .000$) is greater than 0.05 and, therefore, is insignificant. Thus, the research hypothesis was not rejected. The inference drawn was, therefore, that there is no significant relationship between the academic satisfaction of undergraduates at Nnamdi Azikiwe University.

6. Discussion

The study determined the relationship between artificial intelligence utilisation and the following outcome variables: academic self-efficacy, engagement, and satisfaction among undergraduates of Nnamdi Azikiwe University, Awka. It adopted a descriptive-correlational research design to achieve its aim. Socio-demographic information about the respondents showed that more females (361, 57.2 %) than males (270, 42.8 %) participated in the study. 7, representing 1.1 % of the respondents, are within the age range of 15-17 years; 166, representing 26.3 %, are between 18-20 years; 291, representing 46.1 %, fall within the age bracket of 21-23 years, while 167 respondents representing 26.5 % are 24 years and above. A more significant number of respondents reside outside the campus (539, 85.4 %), while only 92 (14.6 %) reside within the campus. The academic level shows that many students are in the 400 level (324, 51.3 %), while the 100 level has the least respondents (48, 7.6 %). Humanities have the most respondents (275, 43.6 %), while Technology/ICT has the least respondents (45, 7.1 %).

The study found a low and positive relationship between artificial intelligence utilisation and students' academic self-efficacy. When further subjected to statistical analysis, it was found that artificial intelligence utilisation among the students significantly relates to their academic self-efficacy. This implies that artificial intelligence boosted students' confidence in their ability to start and accomplish an academic task. Though the relationship between the two variables is low, it is evident that using artificial intelligence is a factor in promoting students' academic self-efficacy. Another study supported this finding, which reported that AI-driven platforms can help students identify areas for improvement and provide resources that bolster their confidence in their capabilities [13]. By providing resources for students to tackle their assignments, students build confidence in their ability to complete them. The finding also agrees with a study, which revealed that introducing mobile chat-bots to learning can boost students' performance and self-efficacy [14]. The finding

validates the results of another study, which observed that AI chatbots predicted students' self-efficacy in academic writing [15]. Similarly, it aligns with a study that showed that integrating artificial intelligence into education promotes enhanced academic self-efficacy among students [16]. The finding also affirms that AI usage is associated with self-efficacy [17]. However, they differ in asserting that students with high self-efficacy depend less on AI to carry out their academic tasks.

The study examined the relationship between AI utilisation and academic engagement and found a low and positive relationship between the two variables in undergraduates of Nnamdi Azikiwe University. When subjected further to statistical analysis, the relationship was significant. Artificial intelligence in education is crucial in promoting academic engagement among users. Beyond engagement, AI also plays a vital role in fostering sustainable learning practices by personalising learning experiences, promoting self-regulated learning, and encouraging continuous skill development. AI-driven learning environments support long-term behavioural change by enhancing students' adaptability, critical thinking, and problem-solving skills, ensuring that they develop lifelong learning habits.

This is given that the use of artificial intelligence for education has become a trend among students, and it is used to facilitate students' engagement in learning sessions and exploration of knowledge. This finding supports the results of a study, which showed that artificial intelligence-driven learning promotes student engagement and performance [18]. Artificial intelligence tools have the potential to provide prompt feedback and varied resources to assist students in their academic tasks. These findings validate another study, which revealed in their studies that most students were more academically engaged due to the influence of artificial intelligence tools [19]. Artificial intelligence tools provide interactive experiences to students, making learning more flexible and engaging [20]. Additionally, AI supports sustainable learning by enabling adaptive feedback, fostering independent learning behaviours, and promoting cognitive endurance. These features contribute to long-term behavioural change, helping students develop a growth mindset and resilience in academic settings.

AI-driven learning provides room for individualised learning, through which learners explore knowledge according to their pace. This finding also agrees with a previous study that AI not only automates learning but facilitates personalised and collaborative learning, resulting in active student engagement [21]. It also aligns with a previous study, which observed that Artificial Intelligence usage significantly influences students' engagement and academic performance [23].

The study examined the relationship between artificial intelligence use and students' academic satisfaction. It revealed that AI use has a very low and positive relationship with the academic satisfaction of the undergraduates at Nnamdi Azikiwe University. When further subjected to statistical analysis, the relation was not significant.

This non-significant relationship contrasts with several existing studies that emphasise the positive influence of AI on students' satisfaction levels. For example, studies [26] and [31] highlighted the potential of AI to enhance satisfaction when high-quality, user-centered AI tools are employed. A possible explanation for this divergence could be contextual and infrastructural limitations within the university environment, such as limited exposure to advanced AI tools, lack of training in AI usage, or unrealistic student expectations of these technologies. It is also plausible that while AI tools help support learning, they may fall short in meeting students' emotional, social, or human-interaction needs that contribute to holistic academic satisfaction. This discrepancy underscores the importance of integrating AI in ways that complement, rather than replace, pedagogical and interpersonal components of teaching and learning.

This implies that although the students utilise artificial intelligence for academic purposes, they did not get the satisfaction they desired from the teaching and learning they were exposed to. Understandably,

artificial intelligence is there to augment but not to take over the school's duty to ensure that the students get the best teaching and learning experiences, materials, and facilities. The findings align with another study that found that content quality and satisfaction will be crucial for adopting and satisfying future generative AI tools [31]. It asserts that AI text quality has a complex impact on user satisfaction and adoption rates in generative AI systems. The finding also agrees with a study that observed that using a high-quality AI science suite in the classroom enhances learner satisfaction but disagrees that increased interaction with the AI suite shows a negative correlation with satisfaction [26].

7. Conclusion

Based on the study's findings, it was concluded that artificial intelligence utilisation among undergraduates is positively associated with their academic self-efficacy and engagement. However, its impact on academic satisfaction was statistically insignificant, suggesting that AI alone may not strongly predict students' academic satisfaction. This indicates the need for a more detailed interpretation of AI's role in enhancing student outcomes, particularly regarding emotional or satisfaction-based constructs that may depend on broader contextual or pedagogical factors. However, it further concluded that based on the relationship between artificial intelligence and academic satisfaction among the students, which is not significant, there is a need to improve the teaching and learning environment the students are exposed to facilitate their academic satisfaction. The study validates the existing theory of SDT that the competence, autonomy, and motivation that artificial intelligence provides are necessary boosters of academic self-efficacy, engagement, and satisfaction. The findings of the study have some implications for learning. Artificial intelligence, revolutionising education, should be inculcated in teaching and learning among university students. However, caution should be taken to ensure the appropriate use of AI to avoid abuse, ghostwriting using AI, and plagiarism. Moreover, while AI tools offer several academic benefits, their impact on students' mental health, coping mechanisms, and emotional well-being should not be overlooked. The ease of access to AI-generated content may lead to increased academic pressure, anxiety, or over-reliance, potentially affecting students' confidence and problem-solving abilities. Therefore, future research should explore the psychological effects of AI utilisation in academic settings to ensure a balanced and supportive learning environment. Proper use of AI tools would be adopted to augment the efforts of teachers in the classroom while allowing students to experience individualised and collaborative learning and immediate feedback toward improved academic self-efficacy, engagement, and satisfaction among the learners.

8. Limitations of the study/suggestions for further studies

The study utilised only the questionnaire method for data collection, which could have been filled out with responder bias. Moreover, the sample size used for the study is not large enough to represent the opinion of the entire or more significant number of undergraduates in the university. Google Forms questionnaire does not prevent a respondent from submitting double responses. Based on these limitations, caution should be taken while generalising the findings to the entire university. Based on these limitations, further studies on the same focus area should consider adopting a mixed method in the same study. Sampling should consider a more significant number of students, while other means of data collection could be adopted.

9. Implications

Incorporating AI into academic settings has significant social implications, particularly in peer collaboration, academic norms, and interpersonal dynamics. AI-generated content may reduce direct student

interaction, potentially weakening collaborative learning experiences. Over-reliance on AI tools could also challenge academic integrity norms, necessitating more straightforward guidelines on ethical AI use. Additionally, AI's role in personalised learning might shift traditional student-teacher relationships, altering how students seek feedback and support. Understanding these changes is crucial for balancing AI's benefits with its impact on academic and social development. Educators should consider designing collaborative assignments that limit AI use to preserve interpersonal engagement and critical thinking. Institutions can also implement targeted workshops or modules on ethical AI usage to foster responsible digital literacy. Furthermore, teacher training programs should address the evolving nature of student-teacher interactions to ensure support systems adapt alongside AI integration.

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Conflict of Interest

No conflict of interest exists among the researchers.

Ethical Considerations

By adhering to established ethical standards, the researchers ensured that social science and educational research complied with ethical standards. The respondents were sent a link to the shared Google Form questionnaire and written study explanations. They were also informed of their freedom to participate or withdraw from it entirely if they felt it was appropriate. An anonymous data collection method was employed, as no private student data was collected, and the researchers avoided using any identifying markers when collecting data.

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