

Article

Generative AI Use and Academic Engagement among University Students in Algeria

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Abstract: The use of generative artificial intelligence (AI) is becoming more prevalent in the context of university learning, but its connection to students' engagement in learning is still not fully understood. This research aimed to explore the relationship between the academic use of generative AI and academic engagement among university students in Algeria. The study adopted a quantitative cross sectional survey design based on Student Engagement Theory and Technology Acceptance Model. A total of 217 students from public and private universities were used to collect data. Academic use of generative AI and academic engagement were measured using a structured questionnaire with multi-item scales. Data was analysed with descriptive statistics, Pearson correlation and regression analysis in SPSS. The mean scores for academic use of generative AI ($M = 3.76$, $SD = 0.67$) and academic engagement ($M = 3.64$, $SD = 0.71$) were high. Academic engagement was highly correlated with academic use of generative AI ($r = .491$, $p < .001$). Simple linear regression revealed that AI use was a significant predictor of engagement, accounting for 24.1% of the variance in engagement ($\beta = .491$, $p < .001$). Academic AI use was the strongest predictor regardless of demographic characteristics, frequency of AI use, or prior AI experience ($\beta = .432$, $p < .001$), accounting for 34.5% of variance. The results indicate that generative AI can be a learning aid and not a replacement to independent learning to support engagement. AI literacy, critical evaluation and responsible use should be encouraged at universities. Causality cannot be inferred from the data as they were cross-sectional and self-reported.

Keywords: *Generative artificial intelligence, academic engagement, university students, higher education, digital learning, sociology of AI.*

Introduction

Artificial Intelligence (AI) has revolutionized the way people learn, communicate, and engage with digital technologies. Generative artificial intelligence is one of the most impactful recent innovations in AI for higher education. Tools like ChatGPT, Google Gemini, Microsoft Copilot, and Claude can create text, summarise content, explain complex ideas, and assist with academic writing in mere seconds. The growing availability of these technologies is changing how learning is traditionally done and presenting new opportunities and challenges for university students (Dwivedi et al., 2023; Kasneci et al., 2023; Tlili et al., 2023).

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Generative AI is not just about accessing information, but is also actively involved in knowledge production, providing human-like responses and tailored learning assistance. This has led to significant academic research on the educational potential of generative AI, including its impact on students' learning processes, motivation, engagement, and involvement (Grassini, 2023; Rudolph et al., 2023). On the one hand, supporters of generative AI claim that it can improve learning efficiency, offer personalised feedback, and boost academic productivity, while on the other, critics raise concerns about overreliance, the lack of critical thinking, academic integrity, and superficial learning (UNESCO, 2023; Crawford, 2021; Selwyn, 2019).

Academic engagement is one of the most significant factors in student achievement in higher education. It encompasses students' behaviours in participation, their mental effort in learning activities and their feelings in learning activities (Fredricks et al., 2004; Kahu, 2013). Students who are highly engaged are more likely to have higher academic achievement, persistence, learning outcomes, and satisfaction with their learning experiences. Thus, the factors that affect academic engagement have become a significant research interest in the fields of education and sociology, especially in a digitally transformed learning environment (Bond et al., 2020).

The educational implications of generative AI have been a focus of recent studies. Current research indicates that students have been using AI tools to brainstorm ideas, problem-solve, write academic papers, learn languages, help with coding, and prepare for exams (Kasneci et al., 2023; Lo, 2023; Sallam, 2023). However, the results of empirical studies are inconclusive about the positive or negative impact of such use on academic engagement. While some research suggests that AI-powered learning fosters active participation, self-directed learning, and collaborative knowledge building (Chan & Hu, 2023; Kong et al., 2021), other studies have raised concerns about the potential for overreliance on AI

technology, which could diminish independent learning, cognitive effort, and meaningful interaction with academic content (Baidoo-Anu & Ansah, 2023; Rudolph et al., 2023). The opposing results highlight the need for further research and understanding of the educational impacts of generative AI. Although digital transformation is a reality in higher education, empirical studies on the use of generative AI are still limited in the Arab region. While there has been a significant amount of research that has examined the acceptance of AI technologies, ethical concerns, or intentions to use AI applications, there has been relatively little research to examine the impact of the use of generative AI on students' academic engagement. This restriction is especially noticeable in North African countries such as Algeria, where universities have been incorporating digital technologies into their educational and learning processes, yet there is limited empirical evidence on the impact of generative AI on education and society. The role of digital technologies in shaping students' educational experiences, digital participation and academic outcomes has been previously highlighted in the region (Alhrahsheh & Ivanova, 2022; Alhrahsheh & Almajali, 2023), indicating that generative AI can have a similar impact on students' learning engagement.

In this context, the current study aims to explore the correlation between the use of Generative AI and academic engagement among Algerian university students. The study's findings can inform the developing sociology of generative AI and digital education, by exploring the relationship between academic use of generative AI and engagement. It also builds upon existing knowledge by offering empirical evidence from an under-researched Arab context, and thus, supporting the ongoing debate on the social implications of AI in higher education and student learning.

Literature Review

Generative AI and Changing Learning Practices in Higher Education

The use of Generative AI and Changing Learning Practices in Higher Education. Generative AI and Changing Learning Practices in Higher Education. Generative AI is reshaping higher education by transforming the way students access, structure and create academic knowledge. Generative AI tools can create explanations, summaries, arguments, translations, and written products that can directly impact students' learning processes, unlike traditional digital tools, which simply provide information (Kasneci et al., 2023; Tlili et al., 2023). This has led to new forms of academic support, especially for those students who need assistance in writing, language, revision, problem solving and idea generation (Lo, 2023; Sallam, 2023). In this context, generative AI can enhance students' engagement by making

academic tasks more accessible, personalised, and interactive. Despite this, the literature also cautions against the quality of student engagement in learning that is heavily mediated by AI. Generative AI can help with productivity but can also foster dependency, diminish independent thinking and lessen students' direct interaction with academic content (Rudolph et al., 2023; Baidoo-Anu & Ansah, 2023). This concern is sociologically significant as engagement is not just about being active or participating, but about making an effort, paying attention, taking responsibility, and interacting with learning. Past regional studies of student technology use have also revealed both positive and negative impacts. For instance, Alhrahshah and Almajali (2023) discovered that overuse of social networking negatively affected academic performance, suggesting that the educational benefit of technology is not simply being available, but how the technology is used.

Academic Engagement as a Social and Educational Construct

Academic engagement is known to have three dimensions: behavioural, cognitive and emotional (Fredricks et al., 2004; Kahu, 2013). Behavioural engagement is defined as involvement in learning activities, attendance, task completion and academic effort. Cognitive engagement relates to the investment of understanding, critical thinking, self-regulation and deep learning by students. Emotional engagement is the interest, belonging, motivation and positive attachment to the learning environment that students have. These dimensions are closely related to academic achievement, persistence and student satisfaction (Bond et al., 2020). Academic engagement is more complex in digitally mediated learning environments. Digital tools can enhance engagement by providing flexibility, real-time feedback, and interactive learning opportunities. They can also break up focus, promote shallow engagement, or lead students to passive consumption of created content, however. The study by Alhrahshah and Ivanova (2022) on digital access as a social determinant among students in the UAE revealed that digital access can impact participation in essential services and educational experiences, and Alhrahshah (2023) found that digitalisation has an impact on wellbeing and social outcomes. The results confirm the idea that technology use is socially consequential and that its effect is contingent on the skills, purposes and institutional settings of the technology users.

Generative AI Use and Academic Engagement

There is still an ongoing debate on the correlation between the use of generative AI and academic engagement. Generative AI has the potential to improve engagement by facilitating self-directed learning, alleviating academic stress, and improving how students access knowledge (Kasneci et al.,

2023; Chan & Hu, 2023). Students can leverage generative AI to help them understand complex concepts, create study questions, get feedback on their writing, or structure their ideas when they are studying. Generative AI can enhance cognitive and behavioural engagement when students use it to clarify difficult concepts, generate study questions, receive feedback on their writing, or organise their ideas when they are studying. In this context, AI could be viewed as a learning tool that can facilitate active learning.

Other research suggests that generative AI could have a negative impact on engagement, as students might rely on it to avoid effort, to delegate thinking tasks, or to generate content without any meaningful learning taking place (Rudolph et al., 2023; UNESCO, 2023). This implies that generative AI can have a positive or negative impact depending on how students utilize it as a learning assistant or as a substitute for academic work. The difference is important: generative AI can help with reflection, revision, and inquiry, but it can detract from reflection, revision, and inquiry when it replaces reading, analysis, and independent writing. While there is a growing body of international research on the use of generative AI in education, there is not yet enough empirical research on the use of generative AI in education in Algeria or in the North African context in general. The majority of studies have been on issues of acceptance, ethical issues, and academic integrity, and less have been done on academic engagement as a measurable outcome. This study thus adds to the literature by testing the relationship between academic use of generative AI and academic engagement among Algerian university students.

Problem Statement

Generative AI has revolutionized the learning landscape in higher education by offering students instant access to personalized academic support, content creation, and intelligent problem-solving tools. While these technologies provide a great deal of learning opportunities, the impact on students' learning engagement is not well understood. Most of the previous studies have been on technology acceptance, perceived usefulness, academic integrity or students' intention to use generative AI (Kasneci et al., 2023; Lo, 2023; Sallam, 2023), and comparatively little attention has been devoted to examining whether the academic use of generative AI enhances or diminishes students' engagement with learning. In addition, there is an inconsistent empirical evidence. While some research indicates that generative AI can enhance active learning, independent study, and meaningful engagement with learning activities (Chan & Hu, 2023; Kong et al., 2021), others suggest that overrelying on AI-generated content could stifle critical thinking, academic effort, and meaningful participation in learning activities (Baidoo-Anu

& Ansah, 2023; Rudolph et al., 2023). The conflicting results suggest that the connection between the use of generative AI and academic engagement is still a matter of debate, both theoretically and empirically.

This is especially true in the Arab region where there is a lack of research. Although universities are experiencing a fast pace of digital transition, empirical research on the educational and sociological consequences of generative AI is still scarce, particularly in North African countries. In Algeria, there is limited knowledge regarding the relationship between the academic use of generative AI and the behavioural, cognitive and emotional aspects of learning. As a result, it is important to have quantitative evidence that can explain how generative AI can be a tool that can support students' active participation in higher education or how it can be a tool that can inadvertently diminish students' active participation in higher education.

In light of this, the present study tries to fill this gap by investigating the link between the use of generative AI and academic involvement among Algerian university students. The results will shed light on the emerging sociology of AI, particularly in an under-researched context in the Arab world, and will guide universities and policymakers on the educational implications of the use of generative AI in higher education.

Research Objectives

1. To examine the level of academic use of generative AI among university students in Algeria.
2. To assess the level of academic engagement among university students in Algeria.
3. To investigate the relationship between academic use of generative AI and academic engagement.
4. To determine whether academic use of generative AI significantly predicts academic engagement among university students.

Research Questions

- RQ1. How frequently do university students in Algeria use generative AI tools for academic purposes?
- RQ2. What patterns of academic engagement are reported by university students in Algeria?
- RQ3. How is academic use of generative AI associated with students' academic engagement?
- RQ4. To what extent does academic use of generative AI contribute to variations in academic engagement among university students in Algeria?

Hypotheses

H1: Academic use of generative AI is significantly associated with academic engagement among university students in Algeria.

H2: Academic use of generative AI significantly predicts academic engagement among university students in Algeria.

Theoretical Framework

The study is based on the theories of Student Engagement Theory and the Technology Acceptance Model. Student Engagement Theory defines engagement as a multi-dimensional phenomenon of behavioural, cognitive and emotional involvement in learning (Fredricks et al., 2004; Kahu, 2013). The framework is suitable, as academic engagement is not defined as mere attendance or task completion, but rather as a more comprehensive social and educational process that is influenced by the interactions that students have with learning environments. For generative AI, engagement can be shaped by how students leverage AI for academic activities, to enhance learning, and to stay motivated.

The TAM offers a complementary explanation. According to TAM, the perceived usefulness and perceived ease of use (Davis, 1989) of technology influence students' use of technology. If students believe that generative AI can help them explain concepts, enhance their writing, organise their ideas or undertake independent study, they are more likely to use it in their studies. This integration can then impact their involvement with learning. But TAM is not enough as it explains technology use more than educational outcomes. Thus, the study can explore both the motivations behind students' use of generative AI and the relationship between students' use of generative AI and their academic engagement when using it, by using both theories in tandem.

Academic use of generative AI can be used as a learning tool, but not as a crutch. Theoretically, this study assumes that academic use of generative AI can be used as a learning tool, but not as a crutch. Generative AI can enhance behavioural engagement by assisting students in their academic tasks, cognitive engagement by aiding understanding and reflection, and emotional engagement by alleviating anxiety and boosting confidence. Meanwhile, overuse and/or lack of critical thinking can undermine engagement by decreasing independent thinking and meaningful academic work. The relationship is not technologically determinate but is of a sociological nature because of this dual possibility. While the international literature on the use of generative AI in higher education is growing exponentially, there is still limited empirical research in Algeria. Previous research has primarily centered on the

adoption, ethics, academic integrity, and overall attitudes toward AI, with limited attention to academic engagement as a quantifiable outcome. To tackle this, this study aims to investigate the relationship between the use of generative AI in academics and academic engagement among university students in Algeria.

Conceptual Framework

Independent Variable: Academic Use of Generative AI

Dependent Variable: Academic Engagement

Control Variables: Gender, age, academic year, field of study, university type, frequency of generative AI use, and prior experience with AI tools.

The model proposed assumes that students using generative AI for academic purposes are more likely to report high levels of engagement in academic activities. Generative AI is anticipated to help students engage in learning, invest their cognitive effort, and connect emotionally with their learning through instant academic support, personalised explanations, and task-specific assistance. The study thus investigates the potential of academic use of generative AI to significantly predict academic engagement among university students in Algeria.

Methodology

Research Design

The study used a quantitative cross sectional survey design to investigate the relationship between the use of generative AI and academic engagement of university students in Algeria. A quantitative approach was used because it allowed the study variables to be measured, tested hypotheses, and used statistical methods to examine the strength and direction of the relationship between the use of generative AI and academic engagement. The cross sectional design enabled data to be gathered from the participants at one time.

Population and Sample

The subjects of this study were undergraduate students from public and private universities in Algeria. The university students were chosen as one of the most active groups of users of generative AI technologies for academic purposes. The final sample of students included 217 undergraduate students from various academic disciplines and years of study, ensuring diversity in educational backgrounds and experience with generative AI applications.

Sampling Method

The sampling technique used was a non-probability convenience sampling technique, which was applied to recruit students in the Algerian universities, public and private. The online questionnaire was sent via university communication channels, student organisations and academic social media groups to students from various academic disciplines, academic year, and demographic backgrounds. The findings were not generalisable due to the use of convenience sampling, but this was considered appropriate for this type of quantitative survey research with university students, and has been commonly used in higher education research.

Table 1
Demographic Characteristics of the Study Sample

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	96	44.2
	Female	121	55.8
Age	18–20 years	68	31.3
	21–23 years	104	47.9
	24 years and above	45	20.7
Academic Year	First	39	18.0
	Second	55	25.3
	Third	63	29.0
	Fourth or above	60	27.7
Field of Study	Humanities and Social Sciences	74	34.1
	Business and Economics	48	22.1
	Engineering and Information Technology	57	26.3
	Medical and Health Sciences	38	17.5
University Type	Public	149	68.7
	Private	68	31.3
Frequency of Generative AI Use	Daily	74	34.1
	Several times a week	71	32.7
	Once a week	39	18.0
	Rarely	33	15.2

Research Instrument

A structured questionnaire with four parts was used to gather data. The first section collected demographic data such as gender, age, academic year, field of study, type of university, how often they

use generative AI, and prior experience with AI technologies. The second part assessed academic use of the generative AI by adapting items from recent validated research on AI use in higher education (Kasneci et al., 2023; Lo, 2023; Sallam, 2023). The tools evaluated the extent of academic writing, idea generation, summarising learning materials, problem-solving, language support and exam preparation using AI. Academic engagement was assessed in the third section with measures adapted from the Utrecht Work Engagement Scale – Student Version (UWES-S) and the Student Course Engagement Questionnaire (SCEQ) that included behavioural, cognitive and emotional engagement (Fredricks et al., 2004; Kahu, 2013). The last part featured questions of a general nature about students' experiences with generative AI in higher education.

Each of the study constructs were rated on a 5-point Likert scale from 1 (Strongly disagree) to 5 (Strongly agree). The higher the score, the more academic use of generative AI and academic engagement.

Validity and Reliability

Table 2

Reliability Coefficients of the Study Instrument

Scale	Number of Items	Cronbach's Alpha
Academic Use of Generative AI	10	.88
Academic Engagement	12	.90
Overall Instrument	22	.92

Cronbach's alpha coefficients ranged from .88 to .90 and the overall reliability coefficient was .92, which is excellent for internal consistency and the instrument is appropriate for statistical analysis.

Construct Validity

The questionnaire was face and content validated by experts in the fields of Sociology, Educational Technology and Quantitative Research. The item clarity, wording and questionnaire completion time were evaluated in a pilot study with 30 university students. Cronbach's alpha coefficient was used to determine the internal consistency.

Table 3

KMO and Bartlett's Test of Construct Validity

Test	Value
Kaiser–Meyer–Olkin (KMO) Measure	.887
Bartlett's Test of Sphericity (Approx. Chi-Square)	1834.62
df	231
Sig.	< .001

The KMO value exceeded the recommended threshold of .60, while Bartlett's Test of Sphericity was statistically significant ($p < .001$), indicating that the data were suitable for exploratory factor analysis.

Table 4

Rotated Factor Loadings of the Measurement Items

Construct	Item	Factor Loading
Academic Use of Generative AI	GAI1	.791
	GAI2	.824
	GAI3	.768
	GAI4	.809
	GAI5	.835
	GAI6	.782
	GAI7	.816
	GAI8	.773
	GAI9	.801
	GAI10	.789
Academic Engagement	AE1	.815
	AE2	.842
	AE3	.793
	AE4	.818
	AE5	.781
	AE6	.826
	AE7	.799
	AE8	.837
	AE9	.804
	AE10	.812
	AE11	.785
	AE12	.821

Note. All factor loadings exceeded the recommended threshold of .60, confirming satisfactory construct validity.

Data Collection Procedures

The data were gathered by an online questionnaire sent to university students in Algeria. The purpose of the study, voluntary participation, confidentiality, anonymity, and estimated time were explained to participants. Completed questionnaires were used only if they were completely filled. The data collection took place within about four weeks.

Ethical Considerations

The research was conducted in accordance with the ethical standards in social science research. It was a voluntary participation, informed consent was obtained from all respondents and anonymity and confidentiality were guaranteed. No personally identifiable information was gathered, and participants had the option to not complete their responses.

Statistical Analysis

IBM SPSS Statistics was used to analyse the data. The study sample and the key variables were described using descriptive statistics such as frequencies, percentages, means and standard deviations. Internal consistency was determined by Cronbach's alpha and construct validity was determined by exploratory factor analysis. The Pearson's correlation coefficient was used to analyze the correlation between the use of generative AI in the academic context and academic engagement. Simple linear regression was used to assess the significance of the academic use of generative AI predicting academic engagement. Multiple regression analysis was then performed to account for the factors of gender, age, academic year, field of study, type of university, frequency of generative AI use, and previous experience with AI.

Results

Results Descriptive Statistics

The descriptive statistics were computed to identify the extent of academic use of generative AI and academic engagement of Algerian university students. The means and standard deviations of the two study variables were calculated. The outcomes of this are shown in Table 5.

Table 5

Descriptive Statistics of the Main Study Variables

Variable	N	Mean	Standard Deviation	Level
Academic Use of Generative AI	217	3.76	0.67	High
Academic Engagement	217	3.64	0.71	Moderate to High

As shown in the results in Table 5, the academic use of generative AI was high among the university students ($M = 3.76$, $SD = 0.67$). Academic engagement also had a moderate to high score ($M = 3.64$, $SD = 0.71$), indicating that students generally exhibited positive engagement with academic activities, and that they often used generative AI in their academic work.

Correlation Analysis

Pearson's correlation coefficient analysis was used to explore the correlation between academic use of generative AI and academic engagement. The results are reported in Table 6.

Table 6

Pearson Correlation Matrix

Variables	1	2
1. Academic Use of Generative AI	1	
2. Academic Engagement	.491**	1

Note. $p < .001$.

The results suggest a statistically significant positive relationship between academic use of generative AI and academic engagement ($r = .491$, $p < .001$). The findings indicate that the more students reported using generative AI for academic purposes, the higher their level of academic engagement was. Thus, Hypothesis 1 was confirmed.

Regression Analysis

Simple linear regression analysis was performed to determine whether academic use of generative AI significantly predicted academic engagement.

Table 7

Simple Linear Regression Predicting Academic Engagement

Predictor	B	SE	β	t	p
Constant	1.582	.228	—	6.94	< .001
Academic Use of Generative AI	.548	.062	.491	8.82	< .001

The regression analysis showed that academic use of generative AI was a significant predictor of academic engagement ($\beta = .491$, $t = 8.82$, $p < .001$). The model accounted for 24.1% of the variance in academic engagement ($R^2 = .241$), suggesting that academic use of generative AI was an important predictor of students' academic engagement. Thus, Hypothesis 2 was confirmed.

Multiple Regression Analysis

A multiple regression analysis was performed to assess whether academic use of generative AI continued to be a significant predictor after controlling for demographic characteristics (gender, age, academic year, field of study, university type, frequency of AI use, and previous AI experience).

Table 8*Multiple Regression Analysis Predicting Academic Engagement*

Predictor	β	t	p
Academic Use of Generative AI	.432	7.41	< .001
Gender	.041	0.78	.437
Age	.052	0.94	.349
Academic Year	.073	1.29	.198
Field of Study	.081	1.47	.143
University Type	.036	0.66	.512
Frequency of AI Use	.164	2.81	.005
Previous AI Experience	.117	2.06	.041

The multiple regression results showed that, even when controlling for demographic characteristics, academic use of generative AI was the strongest predictor of academic engagement ($\beta = .432$, $p < .001$). The frequency of AI usage and prior experience with AI were also statistically significantly positively related, while gender, age, academic year, field of study and university type did not significantly predict academic engagement. The last model accounted for 34.5% of the variance in academic engagement which is considered as satisfactory. The results of this study further confirm that students' academic use of generative AI is a meaningful factor in their learning engagement, beyond the effects of demographic factors.

Discussion

The present study aimed to investigate the correlation between academic use of generative artificial intelligence and academic engagement of university students in Algeria. The results indicated that students' academic use of generative AI was high and their academic engagement was moderate to high. More importantly, the findings indicated that academic use of generative AI was positively correlated with academic engagement, and it significantly explained students' academic engagement beyond the effects of demographic factors. The results indicate that generative AI is now a part of students' academic lives and can positively impact their engagement with higher education, if applied correctly. This relatively high academic use of generative AI is indicative of the speed of diffusion of AI-powered applications in higher education. The use of tools like ChatGPT, Gemini, Copilot and other generative AI tools is becoming more common among students to explain complex concepts, summarise learning content, brainstorm ideas, enhance academic writing and prepare for exams. This is in line with Kasneci et al. (2023), Lo (2023), and Sallam (2023), who found that university students are using generative AI in their learning processes at an unprecedented pace. It also aligns with the recent findings that digital

technologies have become an integral part of students' learning experiences and practices (Alhrahsheh & Ivanova, 2022; Alhrahsheh & Almajali, 2023). The results obtained from Algeria indicate, however, that the use of AI by students is more of an individual adaptation to the new technologies, as opposed to a formal curricular integration, which is the case in technologically advanced educational systems where AI integration is supported by institutional policies and formal AI training.

Despite the rise of AI-powered academic assistance, students' academic engagement was found to be moderate to high, suggesting that they continued to be deeply engaged in their studies. The results reveal that the adoption of generative AI did not supplant students' engagement in learning, but rather supported their learning processes. This finding is in line with Bond et al. (2020) and Kahu (2013) who believe that engagement is created when students interact with learning resources that enable them to participate, motivate and invest cognitively. However, this is contrary to research that has raised concerns about overreliance on generative AI tools leading to passive learning and diminished meaningful academic work (Rudolph et al., 2023; UNESCO, 2023). This may be because Algerian students mainly employed generative AI as a learning aid, not as a replacement for learning, which kept them engaged in learning tasks.

The results of the correlation analysis showed that there was a statistically significant positive correlation between academic use of generative AI and academic engagement. The results indicated that the more students used generative AI tools for academic tasks, the more they engaged in behavioural, cognitive, and emotional aspects of learning. The findings align with previous studies that found that AI tools can enhance self-directed learning, access to academic content, and active participation in learning (Chan & Hu, 2023; Kong et al., 2021). This connection can be understood from a sociological point of view as an extension of possibilities for students to participate in the production of knowledge, not as an increase in access to information.

The findings in this study do not imply that the use of all types of generative AI increases academic engagement. There are several scholars who have indicated that AI could hinder engagement if students use the generated content without critical analysis and independent learning (Baidoo-Anu & Ansah, 2023; Crawford, 2021). The results of the present study indicate that the educational value of generative AI is not only related to the technology itself, but also to the way students use it in their learning process. Students who employed AI for reflection, ideation, and problem-solving seemed to be more engaged than those who relied on AI for academic work without much cognitive engagement.

The regression analysis also revealed that academic use of generative AI was a significant predictor of academic engagement, accounting for about 24% of the variance. Demographic controls were applied and generative AI use was the strongest predictor of academic engagement. This discovery suggests that the impact of generative AI is not limited to gender, age, academic year or subject area. However, the regression model also revealed that there was a significant amount of variance that was not explained, indicating that other factors, including learning motivation, self-efficacy, digital competence, teaching quality, institutional support and students' socioeconomic status, play a role in academic engagement. Therefore, generative AI should be considered one factor among many in the context of a broader educational and social setting, not the end-all, be-all solution to student engagement.

The results validate the Technology Acceptance Model (TAM) (Davis, 1989). Students who felt that generative AI was helpful for academic work seemed to be more willing to use these tools as part of their academic work, leading to greater academic engagement. The findings also align with the theory of student engagement (Fredricks et al., 2004; Kahu, 2013) that views engagement as a dynamic relationship between the student and the learning context. Generative AI can then be seen as a modern tool for education, which can help engage learners in their behaviour, thinking and feelings, if used properly. AI does not replace the learning process but seems to transform how students engage with learning, teachers and learning activities.

The results show that generative AI is emerging as a significant part of the digital transformation of Higher Education in Algeria from a sociological point of view. The use of intelligent technologies is changing the ways in which students search for information, build knowledge, and are involved in learning communities. Therefore, universities need to go beyond considering generative AI as a threat to academic integrity and embrace it as a tool that can enhance educational experiences and facilitate meaningful learning. Higher education institutions can enhance the learning value of generative AI and mitigate potential risks of dependence and superficial learning by developing students' AI literacy, ethical understanding, and critical evaluation skills.

Limitations

There are a number of caveats to be noted. First, the cross-sectional design did not allow for causal relationships between academic use of generative AI and academic engagement to be established. Second, this study used self-reported data and may have been subject to response bias or social

desirability. Third, the study was limited to the Algerian university context, which may not be generalisable to other contexts or age groups. Lastly, the study did not explore other psychological, institutional, and technological factors that may affect academic engagement, but were not accounted for.

Future Research Directions

Longitudinal study designs are needed to examine the longitudinal effects of generative AI use on academic engagement. Comparative studies between universities in various Arab countries would give a larger picture of the differences in cultural and institutional aspects of AI-supported learning. Further research is needed to explore the mediating and moderating factors like academic motivation, AI literacy, self-efficacy, digital competence, perceived usefulness, and institutional support. Lastly, mixed methods research that integrates quantitative survey data with qualitative interviews would yield more context for understanding students' experiences and meanings of using generative AI in their academic lives.

Conclusion

The aim of this study was to explore the link between the academic use of generative AI and academic engagement among university students in Algeria. The results showed that students' academic engagement was moderate to high and their use of generative AI was high. The results further demonstrated that academic use of generative AI was positively associated with academic engagement and significantly predicted students' engagement with learning.

The study helps to advance the nascent sociology of AI by showing that generative AI is an important part of modern higher education. Generative AI is not just a technological advancement; it is a social and educational tool that impacts students' learning experiences, knowledge-building processes, and engagement with digital learning spaces. The results indicate that generative AI, if applied responsibly, can enhance the educational experience by promoting active learning, cognitive investment, and educational participation.

The study underscores the need to incorporate generative AI into higher education by establishing policies and educational approaches that foster critical thinking, responsible AI usage, and ethical academic conduct. The ability to enhance students' skills in leveraging generative AI as a learning companion and not a replacement for learning could play a role in improving educational quality and facilitating the digital transformation of higher education in Algeria.

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Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this paper.

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