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Artificial Intelligence Usage and Creativity Among Medical Students: A Cross-Sectional Study

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ABSTRACT:

Background: AI is being used more in medical schools and may change how students think up new ways of thinking about things, create new ways of thinking about things, and put those new ways of thinking about things to use. Therefore, knowing if AI use affects creativity will be important, particularly because there is such a great focus now on having students be innovative and solve problems in medical education.

Objective: The objective of this study was to determine how medical students utilize AI, as well as to evaluate the innovative ways in which they complete their academic assignments, and finally, to explore the correlation between using AI and completing innovative work.

Methods: This was a cross-sectional study that included 205 medical students from Mutah University. Data was collected through a self-administered that consists of the modified version of Runco Ideation Behavior Scale (RIBS) to assess the creativity and a developed scale that assess the AI usage. Responses to both scales were recorded on five Likert scales. P value < 0.05 considered statically significant.

Results: AI use and creativity scores showed broadly comparable patterns across the different demographic and academic groups. AI usage did not vary significantly by gender, academic year, cumulative GPA, previous training in creativity or design thinking, or access to internet-enabled devices (all $p > 0.05$). Likewise, creativity scores were not significantly associated with gender, academic year, cumulative GPA, or access to internet-enabled devices. In contrast, students who had previously received training in creativity or design thinking had higher mean creativity scores than those without such training (3.91 ± 0.60 vs. 3.64 ± 0.71 , $p = 0.021$).

Conclusion: AI use and creativity levels were generally comparable across demographic and academic groups of medical students. Prior training in creativity or design thinking

was associated with higher creativity scores, suggesting that structured educational experiences may play a significant role in fostering creative behavior.

INTRODUCTION

University students face complex challenges, including heavy academic workloads and financial pressures, and frequently suffer from high levels of stress, depression, and burnout. This is particularly true for medical students, who bear some of the heaviest academic burdens. Generative AI (GenAI) has rapidly emerged as a significant educational technology; its ability to generate, summarize, translate, and reorganize information has created new opportunities to support teaching and learning processes in higher education institutions. (1).

In the field of medical education, these tools can assist students with information retrieval, explaining complex concepts, exam preparation, writing, and other academic tasks. Recent systematic reviews indicate an increasing integration of generative AI into higher education—along with potential benefits for learning outcomes and higher-order thinking skills—though its impact varies depending on the context, the nature of the task, and the mode of use (2).

Creativity has been defined as a blend of various ideas aimed at generating unique and unconventional ideas. (3). Boden (1998) defined creativity as an intrinsic trait of human intelligence and an inevitable challenge for artificial intelligence. Moreover, creativity is not limited to the cognitive dimension of generating new ideas; it also encompasses emotional and motivational aspects that are closely linked to personality traits and cultural contexts. Beyond its applications in education, the potential relationship between generative artificial intelligence and human creativity has garnered increasing attention. (4).

Creativity is a crucial high-level cognitive ability that involves generating, connecting, and developing ideas in innovative and useful ways. A recent systematic review on artificial intelligence in education identified brainstorming, creative writing, and adaptive learning as key methods through which AI can support creativity—particularly when students remain actively engaged in the creative process. Previous empirical studies and review findings indicate that AI may support some aspects of creative performance. At the same time, concerns have been raised about excessive reliance on AI and whether frequent use may reduce individuals' ability to generate ideas independently. Taken together, these findings suggest that the link between AI use and creativity is not straightforward and may vary depending on how the technology is used and the purpose for which it is used (5)(6).

Most of the available research has examined medical students' knowledge, attitudes, perceptions, academic performance, and general use of artificial intelligence. Comparatively less attention has been given to creative academic behavior and how it may relate to AI use. The evidence linking AI with creativity is also not consistent, with studies reporting both possible benefits and concerns. These differences may reflect variations in how frequently AI is used, as well as how and for what purposes students use the technology.

Consequently, examining the relationship between AI usage and creativity among medical students could provide valuable insights into the educational role of these tools. The present study aimed to identify patterns of AI usage among medical students, assess their creative academic behaviors, and examine the relationship between AI usage and creativity.

METHODOLOGY

A cross-sectional study was conducted to investigate the relationship between artificial intelligence (AI) use and creativity among medical students at Mutah University. A total of 205 medical students were recruited using convenience sampling. Data was collected using an online, self-administered questionnaire. Before completing the questionnaire, participants were provided with information about the study and were required to provide informed consent. Participation was voluntary, and all collected data were handled anonymously and confidentially.

Study tools

The questionnaire consisted of two main instruments. The first was a researcher-developed AI Frequency Scale designed to assess the frequency and patterns of students' AI use in academic activities. The scale included 10 items covering different applications of AI, including general academic activities, searching for or summarizing medical information, checking and

correcting academic writing projects, generating ideas or topics for academic or papers, translating or simplifying complex medical texts, clinical reasoning or medical decision-making, examination preparation, group projects, exploring new AI tools, and evaluating or improving academic performance. The second instrument was a modified version of the Runco Ideational Behavior Scale (RIBS) (7), it was adapted to suit the context of medical education and the objectives of the current study. The modified scale assessed various aspects of students' creative academic behavior, including generating and connecting ideas, developing innovative solutions, reorganizing information, improving study or research methods, independent thinking, and adopting new topics or perspectives. An overall creativity score was calculated based on the modified RIBS scale, with higher scores indicating higher levels of reported creative academic behavior. The creativity score was calculated as the sum of the ten creativity items (ranging from 10 to 50 points), and the data were categorized based on the median (37 points) into two groups: low creativity (≤ 37) and high creativity (> 37).

Statistical Analysis

Research on artificial intelligence among medical students has mainly explored knowledge, attitudes, perceptions, academic performance, and patterns of use. In contrast, relatively little attention has been paid to students' creative academic behavior and its possible relationship with AI use. Findings on the connection between AI and creativity have also been inconsistent, with studies pointing to both potential advantages and possible concerns. This variation may partly depend on how often students use AI and, more importantly, how they use it and the purposes for which it is used.

Ethical Considerations

The study was carried out following ethical guidelines. All participants provided written informed consent before being included in the study. They were informed about the purpose of the study, their right to withdraw at any time without penalty, and the confidentiality of their personal information. The study protocol was reviewed and approved by the Ethics Committee of "Mutah University", "Karak, Jordan", Jordan (Reference No. 526).

RESULTS

As shown in Table 1, 205 students participated in the study. Males represented 71.7% of the sample, and the mean age was 20.11 ± 2.34 years. First- and second-year students was the largest groups, accounting for 40.5% and 29.8% of the participants, respectively. Most students reported very good or excellent academic performance (83.0%), whereas previous training in creativity or design thinking was reported by only 17.6%. Almost all participants (98.5%) had access to the internet and personal devices for their studies. AI was commonly used for academic purposes. Overall, 82.5% of the students reported frequent or continuous use. The most reported uses were searching for or summarizing medical information (75.6%) and translating or simplifying complex medical texts (76.1%). Exam preparation was another common application (60.5%), as was assessing or improving academic performance (63.9%). In addition, 46.1% of students reported frequently or continuously using AI to generate ideas or topics for projects or academic papers. Its use was less frequent for clinical reasoning or medical decision-making (33.8%) and for collaboration on group projects (39.0%). These findings show that students mainly relied on AI for academic support, particularly when working with information, studying, and developing ideas. Table 2 summarizes the reported creative behaviors. Developing or improving study and research methods was the most frequently reported behavior (73.0%), followed by rephrasing or reorganizing information in new ways to improve understanding (67.7%) and preferring independent thinking over imitating others (66.7%). Connecting ideas from different course materials to generate new concepts was reported by 65.7% of students, while 64.7% reported selecting novel or diverse topics and perspectives for academic papers. The least frequently reported behavior was the use of uncommon or unique sources (31.7%). Overall, the reported creative behaviors were more evident in the ways students approached learning, reorganized information, and developed or connected ideas. According to Table 3, AI usage was generally comparable across the demographic and academic subgroups. There was no statistically significant differences were found according to gender, academic year, GPA, prior training in creativity or design thinking, or access to the internet and devices. Creativity scores were also generally similar across these groups. An exception was previous training in creativity or design thinking, where students with such training had significantly higher average creativity scores than those without previous training. Table 4 illustrates a statistically significant positive correlation between AI usage and creativity scores. Students reporting higher levels of AI use also tended to have higher creativity scores.

The relationship between demographic characteristics and creativity categories is presented in Table 5. Prior training in creativity or design thinking was strongly associated with creativity category, with a greater proportion of trained students classified in the high-creativity group. Finally, Table 6 shows a statistically significant association between AI usage categories and creativity categories.

Table 1. Demographic characteristics of the study participants

Variable	Category / Summary	Frequency (n)	Percentage (%)
Gender	Female	58	28.3
	Male	147	71.7
Age (years)	Mean $\pm$ SD	20.11 $\pm$ 2.34	—
Current academic year in medical school	1. First	83	40.5
	2. Second	61	29.8
	3. Third	30	14.6
	4. Fourth	9	4.4
	5. Fifth	4	2.0
	6. Sixth / Internship	18	8.8
Academic performance (GPA)	Fair	6	2.9
	Good	29	14.1
	Very Good	86	42.0
	Excellent	84	41.0
Previous training in creativity or design thinking skills	No	169	82.4
	Yes	36	17.6
Availability of internet and personal study devices	No	3	1.5
	Yes	202	98.5

Table 2. Creativity Behavior Scale (Modified RIBS)

Question / Factor	Never	Rarely	Sometimes	Often	Always
1. When preparing a report or project, I look for new or unconventional ways to present it.	6 (2.9%)	21 (10.2%)	52 (25.4%)	71 (34.6%)	55 (26.8%)
2. I can connect ideas from different subjects to produce a new idea.	3 (1.5%)	13 (6.4%)	54 (26.5%)	89 (43.6%)	45 (22.1%)
3. I provide innovative solutions when I face academic or research problems.	1 (0.5%)	21 (10.3%)	77 (37.7%)	63 (30.9%)	42 (20.6%)

4. I use uncommon or unique sources while working on academic assignments.	18 (8.8%)	46 (22.4%)	76 (37.1%)	41 (20.0%)	24 (11.7%)
5. I rephrase or reorganize information in new ways that make it easier to understand.	2 (1.0%)	11 (5.4%)	53 (26.0%)	64 (31.4%)	74 (36.3%)
6. I always try to develop or improve the methods I use for studying or research.	3 (1.5%)	6 (2.9%)	46 (22.5%)	58 (28.4%)	91 (44.6%)
7. I can generate more than one idea when planning an academic project.	5 (2.5%)	20 (9.9%)	71 (35.0%)	67 (33.0%)	40 (19.7%)
8. I prefer to think independently rather than copy what others do in similar academic situations.	2 (1.0%)	13 (6.4%)	53 (26.0%)	72 (35.3%)	64 (31.4%)
9. I create new ideas or methods when participating in classroom or research discussions.	9 (4.4%)	26 (12.7%)	77 (37.7%)	61 (29.9%)	31 (15.2%)
10. When asked to write a paper, I try to choose a topic or perspective that is new or different from common ones.	5 (2.5%)	17 (8.3%)	50 (24.5%)	67 (32.8%)	65 (31.9%)

Table 3 Comparison of AI Use and Creativity Scores According to Demographic Characteristics

Demographic variable	Category	AI use score Mean $\pm$ SD	p-value AI use	Creativity score Mean $\pm$ SD	p-value Creativity
Gender	Female	3.60 $\pm$ 0.76	0.356	3.76 $\pm$ 0.75	0.394
	Male	3.67 $\pm$ 0.90		3.66 $\pm$ 0.68	
Current academic year in medical school	First	3.71 $\pm$ 0.82	0.139	3.68 $\pm$ 0.67	0.067
	Second	3.79 $\pm$ 0.76		3.81 $\pm$ 0.69	
	Third	3.50 $\pm$ 0.80		3.73 $\pm$ 0.65	
	Fourth	3.82 $\pm$ 0.78		3.56 $\pm$ 0.87	
	Fifth	2.88 $\pm$ 0.72		2.70 $\pm$ 0.79	
	Sixth / Internship	3.22 $\pm$ 1.30		3.58 $\pm$ 0.76	
GPA :	Fair	3.33 $\pm$ 0.54	0.555	3.40 $\pm$ 0.64	0.326
	Good	3.67 $\pm$ 1.01		3.59 $\pm$ 0.80	
	Very Good	3.71 $\pm$ 0.82		3.77 $\pm$ 0.63	

	Excellent	3.61 ± 0.88		3.67 ± 0.74	
Previous training in creativity or design thinking skills	No	3.65 ± 0.90	0.908	3.64 ± 0.71	0.021*
	Yes	3.66 ± 0.68		3.91 ± 0.60	
Availability of internet and personal study devices	No	2.90 ± 0.56	0.092	3.47 ± 0.50	0.492
	Yes	3.66 ± 0.86		3.69 ± 0.70	
Age (years)	Spearman correlation (ρ)	$\rho = -0.013$	0.853	$\rho = -0.030$	0.670

Note: AI use and creativity scores were calculated as the mean of the corresponding 10 Likert-scale items (1–5).

Mann–Whitney U test was used for binary demographic variables, Kruskal–Wallis test for variables with more than two categories, and Spearman correlation for age.

Table 4. Correlation Between AI Use and Creativity Scores

Variables	n	Spearman's ρ	p-value
AI use score vs. Creativity score	205	0.445	<0.001

Note: Spearman rank correlation was used because the underlying measures were derived from Likert-scale responses.

Table 5. Association between demographic characteristics and creativity category (median split)

Parameter	Category	Creativity Low, n (%)	Creativity High, n (%)	χ^2	df	P-value
Gender	Female	28 (25.7%)	30 (31.2%)	0.528	1	0.467
	Male	81 (74.3%)	66 (68.8%)			0.467
Age	≤20 years	78 (71.6%)	75 (78.1%)	0.841	1	0.359
	>20 years	31 (28.4%)	21 (21.9%)			0.359
Academic year	First	43 (39.4%)	40 (41.7%)	7.127	5	0.211
Academic year	Second	29 (26.6%)	32 (33.3%)			
	Third	15 (13.8%)	15 (15.6%)			
	Fourth	7 (6.4%)	2 (2.1%)			
	Fifth	4 (3.7%)	0 (0.0%)			
	Sixth / Internship	11 (10.1%)	7 (7.3%)			
GPA	Fair	4 (3.7%)	2 (2.1%)	1.519	3	0.678
	Good	17 (15.6%)	12 (12.5%)			
	Very Good	42 (38.5%)	44 (45.8%)			

	Excellent	46 (42.2%)	38 (39.6%)			
Previous training	No	98 (89.9%)	71 (74.0%)	7.902	1	0.005
	Yes	11 (10.1%)	25 (26.0%)			
Internet/device	No	2 (1.8%)	1 (1.0%)	0.000	1	1.000
	Yes	107 (98.2%)	95 (99.0%)			

Table 6. Association between AI usage category and creativity category

AI usage category	Low creativity, n (%)	High creativity, n (%)	χ^2	P-value
Low (≤ 37)	70 (64.2%)	39 (35.8%)	10.485	0.001*
High (> 37)	39 (40.6%)	57 (59.4%)		

DISCUSSION

This study demonstrates a high level of AI use among medical students, particularly in general academic activities, researching and summarizing medical information, and translating or simplifying complex medical texts. These findings are generally consistent with Abdelhafiz et al. (2025) (8), who reported that 78.5% of Egyptian medical students had previously used ChatGPT, and that 71.8% used it to support their studies. In our study, artificial intelligence was also frequently used for exam preparation and improving academic performance, while 46.1% of students reported using it to generate ideas. This pattern indicates that medical students primarily use artificial intelligence as a tool for academic support, while also utilizing it to generate creative ideas. Our results were partially consistent with the findings of the study by Ghanem et al (2025) (9), who studied the use of generative AI among 423 Egyptian medical students. They reported that 29.8% of the students used AI for idea generation and brainstorming and found a positive correlation between AI knowledge and AI usage. In the current study, however, no statistically significant relationship was found between AI usage and gender, age, academic year, GPA, prior training in creativity or design thinking, or access to the internet and devices. This suggests that the generation of creative ideas does not necessarily correlate with traditional academic performance or demographic characteristics; creativity and academic achievement may represent partially distinct domains, as creative behavior involves idea generation, flexibility, and the innovation of new approaches—aspects not fully captured by traditional academic performance metrics. Similar findings regarding gender and age were also recorded in a study of medical students conducted in the United States. (10), which found no significant differences in ChatGPT use by gender or age. However, that study found a significant difference according to medical school year, which was not observed in our study. It is noteworthy that students who had received prior training in creativity or design thinking achieved significantly higher creativity scores compared to their peers who had not undergone such training; this suggests that systematic training in creativity may be associated with higher levels of creative behavior among medical students. However, the cross-sectional nature of the study precludes the determination of a causal relationship. Our results revealed a statistically significant positive correlation between the use of artificial intelligence and creativity, indicating that students who utilized artificial intelligence more frequently tended to exhibit higher levels of creative academic behavior. In contrast, a recent study involving 722 medical students in India (11) found that higher AI dependence was negatively associated with critical thinking. This apparent difference may be related to the different constructs assessed: our study examined creativity, whereas the Indian study assessed critical thinking and AI dependence. Therefore, AI use may support creative idea generation when used as a tool, while excessive dependence on AI may negatively affect independent cognitive processes. However, both studies were cross-sectional, so causal relationships cannot be established. Our results revealed a strong positive correlation between the use of artificial intelligence and creativity, indicating that students who frequently used artificial intelligence tended to report higher levels of creative academic behavior.

The present finding is consistent with the study by Urban et al. (2024) (12) which reported improvements in the quality, depth, and originality of creative problem-solving among university students who used artificial intelligence in an experimental setting. Differences in the type of task, the way and purpose for which AI is used, students' baseline characteristics, and the methods used to measure creativity may partly explain these variations.

CONCLUSION

AI use and creativity were generally comparable across the different demographic and academic groups of medical students. Students with previous training in creativity or design thinking had higher creativity scores than those without such training. This finding detects the possible role for structured educational experiences in supporting creative behavior.

RECOMMENDATIONS

Creativity and design thinking could be included in medical education through structured workshops and practical problem-solving activities. Students may also benefit from guidance on using AI as a supportive academic tool while continuing to develop and apply their own ideas. Future studies should include larger and more diverse student populations and use longitudinal or interventional designs to examine the longer-term effects of creativity training and to better understand the relationship between AI use and creative behavior.

Limitations: This study has some limitations that should be considered when interpreting the findings. The cross-sectional design prevents conclusions about cause and effect. In addition, participants were recruited using convenience sampling from a single university, which may limit the generalizability of the findings. Another limitation is that the study focused on the frequency of AI use rather than the specific ways in which students used these tools. The manner and purpose of use may provide a more informative perspective on the relationship between AI and creativity.

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