



Impact of Artificial Intelligence-Based Learning Tools on Student Academic Creativity Among Grade 8 Students of Lahore

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This paper addresses the effects of AI learning tools on Grade 8 students' academic creativity in Lahore. The use of AI apps, Adaptive Learning, and Intelligent Tutoring Systems creates new opportunities for the enhancement of students' learning and creativity in the classroom. The goal of this research was to determine the association between AI learning tools and academic creativity in terms of creative thinking, problem-solving, and the level of engagement of the students. The research followed a quantitative approach and used a survey design. The target population for this research was Grade 8 students in Lahore schools that use AI learning tools, and the sample for the study was 150 students, selected using a simple random sampling technique. The data were gathered by a closed-ended questionnaire and analyzed using percentage, frequency distribution, mean scores, and correlation analysis. The results of the study indicated that there is a strong positive correlation between the use of AI learning tools and academic creativity of the students. The study found that creative thinking and problem-solving were the dominant factors, and the level of engagement of the students played an important role as well. The study determined that the use of AI learning tools helps to develop creative and analytical thinking of the students using the appropriate instructional frameworks. Some suggestions are given for teachers and educational policy practitioners on how to best use AI in education in middle schools.

INTRODUCTION

Artificial Intelligence (AI) is changing education, and in the last five years, this change has been the fastest. Generative AI, adaptive learning, and AI in the classroom have all built ways of learning that combine AI and teachers. These tools have spread all the way down to the middle school age range, to teachers in Grade 8 in Lahore Pakistan.

AI tools have been shown to impact students positively by giving personalized feedback, and offering alternative ways to think about and solve a given problem (Holmes et al. 2023; Zhai et al. 2024). AI tools offer students help on their brainstorming sessions and on narrowing and simplifying their thinking, which can be positive to their thinking and learning (Yilmaz and Yilmaz, 2023). Learning challenges such as thinking for oneself and what is considered cheating are still concerns when using AI tools (Nguyen et al. 2023; Tlili et al. 2023). AI tools have been shown to help students with less access to educational resources by giving them feedback (Chan and Hu, 2023). In Pakistan, AI tools have only been introduced in urban areas like Lahore, and have not been researched that much on the impact of students' creativity. Grade 8 is an important age to study the impact of AI tools on students' creativity since they are making a transition from guided learning to more independent learning.

The establishment of AIED focuses on the use of AI tools to develop flexible and personalized learning (Ouyang & Jiao, 2021). Tools can be AI-directed, AI-supported, or AI-empowered, where the empowerment of AI is related to the use of AI to supplement human creativity instead of supplanting it. AI tools, help in the generation of ideas and promote flexible learning. The downside is the lack of promotion of deep learning, and increased cognitive dependency. Recently, a number of AI tools have been integrated into language learning, mathematics, and even creative activities in the secondary education system of Pakistan. The use of these tools and their impact on the academic creativity of middle-school learners in Lahore is an under-researched area.

Statement of the Problem

In Pakistan, AI-based learning tools give learners feedback and support and implement a variety of learning strategies. The influence of these tools on the academic creativity of learners, particularly creative thinking, problem solving, and engagement, has not been studied. There is now an increasing number of AI tool implementations in schools in Lahore; however, there is no evidence of how these tools influence the originality and independent thinking of learners. This lack of evidence gives focus to the current study.

Research Objectives

- ❖ To examine the relationship between AI-based learning tools and academic creativity among Grade 8 students.
- ❖ To assess the impact of AI tools on students' creative thinking skills.
- ❖ To analyse the effect of AI tools on students' problem-solving abilities.
- ❖ To determine the role of student engagement in relation to AI-based learning tools and academic creativity.

Research Questions

- ❖ What is the relationship between AI-based learning tools and academic creativity in Grade 8 students?
- ❖ How do AI-based tools affect students' creative thinking skills?
- ❖ What impact do AI tools have on students' problem-solving abilities?

Significance of the Study

This study is addressed to the availability of AI tools and their effect on middle school students' creativity. This research enables students to know the correct AI utility, helps teachers identify where to draw the line while integrating AI in a way that does not encourage lack of critical thinking, and aids policymakers in devising intermediate strategies for AI incorporation in education.

Literature Review

AI's rapid development, particularly with the advancement of generative AI post-2022, has disrupted educational systems around the world. Adaptive learning systems, AI-based tutors, and content-generation systems are all examples of AI tools that assist learners in personal, engaging, and interactive ways (Holmes et al., 2023).

The second key variable of this study is academic creativity, which refers to a learner's ability to creatively generate ideas in an academic environment that are original, helpful, and relevant to the context. It is assessed using the constructs of fluency, flexibility, originality, and elaboration (Guilford, 1956; Torrance, 1974). These constructs are the most popular among the educational community to evaluate creativity in thinking. There is a variety in the literature regarding AI tools and creativity. Certain studies indicate that generative AI can assist in the brainstorming, summarizing, and developing of ideas, and can help in

the simplification of difficult concepts (Ravšelj et al., 2025). On the contrary, it is suggested that AI tools may negatively impact creativity and independent thinking, and diminish originality, due to overreliance on AI output (Tlili et al., 2023).

AI learning tools are especially helpful to learners who are struggling and are beneficial for increasing equity in accessing learning resources despite the controversial effects they may have (Chan & Hu, 2023). AI systems are increasingly being incorporated into schools in Pakistan, particularly in Lahore, yet little to no research has been conducted regarding its effect on creativity in the context of middle school. The proposed framework draws on Ouyang and Jiao (2021) model of learning as AI-directed, AI-supported, and AI-empowered, and integrates Guilford (1956) and Torrance (1974) theories of creativity. This framework is crucial to assessing the impact of AI tools on creativity of Grade 8 students.

AI Learning Tool Utilization

AI learning tool utilization refers to the extent to which students use learning systems, such as tutoring apps, adaptive systems, and generative AI, intentionally. Tool usage influences the learning result significantly (Zhai et al., 2024). Ouyang and Jiao (2021) provide three classifications for usage = AI-directed, AI-supported, and AI-empowered. In Lahore schools, AI learning tool utilization shows a lot of variation and is dependent on teaching and classroom practices (Holmes et al., 2023).

Creative Thinking in AI-Supported Learning

Creative thinking has 2 components: the ability to come up with multiple options (divergent thinking) and the ability to select the best option (convergent thinking). In the context of an artificial intelligence (AI) system, creative thinking can be improved when the user is exposed to many different options; creative thinking may be diminished when a user is over-reliant on answers generated by the system. Torrance's (1974) four dimensions of creative activity (fluency, flexibility, originality, and elaboration) are still the most relevant in today's evaluation of creative output.

Problem-Solving Skills and AI-Enhanced Learning

This is the ability to recognize learning problems and use the right methods to find the answers. AI provides learning scaffolds and stepwise hints to help students learn with confidence. Too much scaffolding, however, can cause a loss of the drive to learn. In Pakistan's exam-dominated system, AI provides new ways to learn, and while aimed at developing the skill of problem-solving, the system is far from perfect.

Students' Use of AI-Based Learning Systems

Student engagement is the degree to which students participate in learning tasks (cognitive, emotional, and behavioral). Learning systems that employ AI can enhance engagement by providing instant responses, adaptive content, and multiple methods of engagement. Continued AI use can, however, inhibit the active learning process by promoting passiveness. Engagement can also be influenced by the physical and social classroom environment as well as the instructor's methods.

Academic Creativity as an Outcome Variable

Academic creativity is the ability to create original and useful academic work (Guilford, 196). It is linked to the usage of AI tools, creative thinking, and problem-solving, along with a student's active participation. Depending on how they are used, AI-based environments can either help or hinder creativity (Chan & Hu, 2023).

Literature Gap

Most studies focus on the realm of higher education and on consolidating the general performance of students and ignore middle school creativity. Furthermore, few studies integrate the AI use, problem-solving, and engagement nexus. Most studies are based in the West or East Asia, with few studies conducted in Pakistan or in Lahore. Very few studies also compare the different modes of AI use and the effects on creativity. This study aims to fulfill the above-mentioned gaps in the literature. It is based on Grade 8 students in Lahore. It aims to be a context-based study and provide an empirical contribution to the existing literature.

Research Methodology

Research Design

This study adopted a quantitative survey design to study the relationship between AI based learning tools and academic creativity. The survey design was selected due to the need to collect structured, numerical data for the purpose of performing statistical analysis to test the stated hypotheses.

Population

The Grade 8 students included in the study came from schools in Lahore that implement AI-based learning tools in classroom settings. Examples of the tools include adaptive platforms, generative AI, and AI-based tutoring systems.

Sample

From the population of 8th grade students, a sample of 150 students was drawn using simple random sampling. The method was designed to have all students be given an equal, opportunity to be sampled, while also minimizing bias. The selected sample of schools was based on the confirmed use of AI tools, and from the selected school, students were sampled from school class lists. It was believed that the selected sample was appropriate for a correlation study and provided enhanced reliability and generalizability.

Research Instrument

A questionnaire was used as the research instrument and was designed to be structured. Four constructs were covered that were based on the use of AI-based learning tools, creative thinking, problem-solving skills, and student engagement as direct participants. The study used earlier research as the basis for the question items (Guilford, 1956; Torrance, 1974; Ouyang & Jiao, 2021). The questions were measured using a 5-point Likert scale from 'strongly disagree' to 'strongly agree'. Reliability was established through a pilot study, and the results of the study were analyzed using Cronbach's alpha. The results of the analysis established that there was an adequate internal reliability regarding all of the constructs of the study, and therefore, the questionnaire was appropriate.

Data Analysis and Interpretation

Demographic Characteristics of Respondents

Table 1: Descriptive Statistics for Demographic Variables (N = 150)

Demographic	Category	Frequency (f)	Percentage (%)
Gender	Male	72	48.0
	Female	78	52.0
Age	12-13 years	89	59.2
	14 years	61	40.8
School Type	Public	56	37.3
	Private	94	62.7
Daily AI Tool Use	Less than 30 minutes	46	30.7
	30 minutes to 1 hour	65	43.3
	More than 1 hour	39	26.0

Note: Percentages are rounded to one decimal place and may not sum exactly to 100% due to rounding.

Table 1 presents demographic and usage information based on gender, age, school type, and daily Artificial Intelligence (AI) tools usage. Regarding gender, the sample was even, with female and male respondents being 52.0% and 48.0% respectively. Most respondents (59.3%) were 12 to 13 years old and were most likely Grade 8 students. More than half (62.7%) attended private schools, and this likely correlates with the increased usage of AI learning tools in private schools in Lahore. The largest portion of the sample (43.3%) reported daily usage of AI-based learning tools for 30 minutes to 1 hour, illustrating a moderate, daily level of engagement with the tools.

Descriptive Statistics

Table 2: Students' Perceptions of AI-Based Learning Tool Usage

AI-BASED LEARNING TOOL USAGE	M	SD
I use AI-based tools to help generate ideas for assignments.	3.82	.812
I rely on AI tools to simplify complex topics.	3.95	.764
I use AI tools to check or improve my written work.	3.71	.889
I explore multiple AI-suggested approaches before choosing my own.	3.44	.901
I use AI tools regularly as part of my schoolwork.	3.88	.798

Table 2 indicates that students were most likely to identify AI tools in helping to simplify complex issues ($M = 3.95$, $SD = .764$) as a major component, and that the regular application of these AI tools to help students complete their daily school activities plays a role ($M = 3.88$, $SD = .798$). Exploring equal paths suggested by the AI to help think of and create new ideas ($M = 3.44$, $SD = .901$) had a lower mean rank. This finding suggests that most students are not involved in comparing ideas, which reflect a higher degree of creative thinking and processing.

Table 3: Students' Perceptions of Creative Thinking

CREATIVE THINKING	M	SD
I can generate multiple ideas for a single problem.	3.69	.843
I enjoy coming up with original solutions to academic tasks.	3.77	.810
AI tools help me think of ideas I would not have considered alone.	3.91	.771
I add my own details and improvements to AI-generated suggestions.	3.58	.865
I feel confident in my ability to think creatively in class.	3.64	.852

Table 3 gives the average and spread of responses related to creative thinking. The most agreement was seen with "AI tools let me think of ideas that I wouldn't think of by myself." ($M = 3.91$, $SD = .771$). This suggests students see the benefits of AI tools for divergent thinking. The perception was less positive for the AI suggestion statement ($M = 3.58$, $SD = .865$). This suggests students see the benefits of AI suggestion tools for idea generation, but the majority of students don't edit or build off of AI tools.

Table 4: Students' Perceptions of Problem-Solving Skills

PROBLEM-SOLVING SKILLS	M	SD
I try to solve problems myself before using AI tools for help.	3.39	.921
AI tools help me understand different ways to solve a problem.	3.93	.779
I feel more confident solving difficult tasks after using AI tools.	3.81	.834

PROBLEM-SOLVING SKILLS	M	SD
I can apply strategies learned from AI tools to new problems.	3.66	.847
I am able to solve academic problems independently when needed.	3.58	.873

Table 4 highlights aspects of problem solving those students believe are impacted by AI learning tools. The highest mean score was for AI tools teaching students' different ways to solve a problem ($M = 3.93$, $SD = .779$), while the lowest was trying to solve a problem on their own before using AI ($M = 3.39$, $SD = .921$). From this information, it can be assumed that AI tools, while teaching students different ways of solving a problem, may still lead students to seek AI solutions early on and not try to solve the problem on their own first.

Table 5: Students' Perceptions of Student Engagement

STUDENT ENGAGEMENT	M	SD
I feel motivated to complete tasks that involve AI-based tools.	3.97	.756
I am more interested in subjects when AI tools are used in class.	3.85	.799
I actively participate in AI-supported classroom activities.	3.72	.828
I spend extra time exploring AI tools beyond what is required.	3.41	.934
I feel engaged and focused when using AI-based learning tools.	3.79	.811

Table 5 shows that students were happy using AI-assisted learning tools. The statements with the most agreement were those describing students' motivation to complete activities with the tools ($M = 3.97$, $SD = .756$). The students appreciated having AI-assisted tools available for their learning activities. People agreed less about students spending a lot of time using the tools outside of what was necessary ($M = 3.41$, $SD = .934$). Using the tools was a positive experience for the students, but most students did not choose to explore the tools on their own outside of the prescribed use.

Inferential Statistics

Table 6: Comparison of Male and Female Students' Perceptions Regarding the Impact of AI-Based Learning Tools on Academic Creativity

Variable	N	M	df	t-value	p
Male Students	72	71.82	148	1.847	.067
Female Students	78	74.31			

Table 6 Post-2019 AI Tools and their Effect on the Learning Process discusses the various problem-solving aspects that learning tools powered by AI affect according to students. AI tools that help students to learn in different ways to view a problem has the highest average score ($M = 3.93$, $SD = .779$). The lowest average score described the ability to accomplish tasks independently before turning to AI ($M = 3.39$, $SD = .921$). From the findings, we can infer that even if AI tools expand methods to learn different ways to solve a problem, a considerable number of students are likely to seek AI tools before attempting to solve the problem on their own.

Table 7: Regression Analysis: Impact of AI-Based Learning Tools on Academic Creativity

Model	B	Std. Error	Standardised β	t	Sig.	R^2
AI-Based Learning Tools	0.612	.071	.589	8.620	.000	.347

Note: Dependent Variable: Academic Creativity. $R^2 = .347$, $F(1,148) = 74.30$, $p < .001$.

Table 7 The effect of artificial intelligence-based learning tools on students' academic creativity is analyzed through regression in the following section. The use of AI learning tools demonstrates a strong positive relationship with academic creativity ($\beta = .589$, $p < .001$). The R^2 value of .347 demonstrates that AI learning tools explain 34.7% of the variance in academic creativity. The individual learning disposition, the quality of instruction, and the family and home environment may account for the other variance. These factors, however, are beyond the scope of the present study.

Table 8: Pearson Correlation Coefficients Among Study Constructs

Construct	AI Tool Usage	Creative Thinking	Problem-Solving	Engagement	Academic Creativity
AI Tool Usage	1.000				
Creative Thinking	.512	1.000			
Problem-Solving	.478	.563	1.000		
Engagement	.441	.497	.486	1.000	
Academic Creativity	.589	.671	.609	.533	1.000

Correlation is significant at the 0.01 level (2-tailed).

Table 8 exhibits the interrelations of study constructs using Pearson correlation coefficients. All correlations were positive and statistically meaningful at the .01 level. The highest correlation occurred between creative thinking and academic creativity ($r = .671$, $p < .01$). Remaining correlations were between problem-solving skills and academic creativity ($r = .609$, $p < .01$) and between the use of AI-based learning tools and academic creativity ($r = .589$, $p < .01$). When taken collectively, these results validate that the use of AI-based learning tools, creative thinking, problem-solving skills, and student engagement are meaningfully and positively interrelated. Creative thinking is the strongest individual predictor of academic creativity, relative to the other constructs.

Discussion

This study sheds new light on AI-based learning tools and 8th graders' creative thinking in Lahore. The findings reveal that students perceive AI learning tools positively, and mean scores of all constructs showed favorable students' perceptions. Students perceived AI tools positively in terms of supports for engagement and for generation of ideas, and for solving problems. The results are consistent with views reported by Holmes et al. (2023) and Yilmaz and Yilmaz (2023). They suggest that AI tools in the most supportive pedagogical setups can be learning support systems, and they are unlikely to distract students.

As indicated in regression analysis, use of AI-based learning tools positively and strongly correl with academic creativity. Use of AI-based learning tools, explains 34.7% of the total variance on the related construct. Thus, Hypothesis 1 is supported. As the relationship has a significant explanatory power, it is supported that AI tools are valuable in the support of the creative thinking of students. Conversely, the model accounted for only 34.7%, thus, a number of factors influence academic creativity such as teaching style, family and home environment, personality, and prior achievements.

Students also indicated lower mean scores when completing independent problem-solving activities, as well as lower mean scores when using AI tools outside the parameters of their assigned tasks. This suggests that the existence of AI support in the learning process promotes its over-reliance, and problem-solving activities are done with minimal or no independent thinking. This result aligns with the recommendations of earlier studies on the use of AI in learning, describing the use of AI as doing cognitive offloading which negatively impacts independent problem-solving and reasoning (Nguyen et al., 2023; Tili et al., 2023; Zhai et al., 2024).

Similarly, there were no significant distinctions in the perception of AI learning tools and academic creativity in relation to gender. Thus, regardless of gender, respondents perceived the impact of AI tools in a similar way.

The findings suggest that AI learning tools have a positive impact on academic creativity in schools, particularly in relation to creative thinking and problem-solving. When students are taught to use AI tools to supplement, and not substitute, their independent thinking (i.e., taught to use AI tools critically), these benefits are further enhanced.

Incorporating a new sample of 150 from both public and private schools strengthens the findings. It demonstrates that the positive correlation between AI tools and academic creativity extends to all schools in Lahore. Further study is warranted to determine if there are differences in the extent of this correlation between public and private schools.

Conclusion

The study showed that the impact of learning tools, based on AI, can be positive, particularly in enhancing academic creativity of students when such tools are properly used and guided. The study showed that the tools based on AI strengthen student engagement and confidence in problem-solving. The study also showed that a comparative problem-solving gap was observed among students before using the AI learning tools, showing that dependency on these tools is a potential risk.

The study showed that creative thinking of the students is the most significant contributor toward the improvement of academic creativity and therefore the AI tools are most effective when thinking of students is encouraged, rather than providing the answer. The study provides evidence that the most effective use of AI learning tools occurs when students are encouraged to generate the ideas and thoughts, rather than when the AI tools provide the answer to the thoughts and ideas.

Recommendations

Based on the findings of the study, the following recommendations are proposed to enhance the positive impact of AI-based learning tools on students' academic creativity:

1. Incorporating AI-based learning tools in ways which provoke and not stifle, students' independent creative thinking, should be part of the formal training teachers receive. Educational institutions should implement focused training to achieve this.
2. AI tools should be seen as suggestions, and school tasks should be structured so students learn to critique, augment, and personalize the AI tools.
3. Students should be encouraged to be self-reliant and resilient instead of relying on AI tools. Academic tasks should be intentionally designed to promote problem-solving in students before the use of AI tools.
4. In activities using AI tools, creativity should be intentionally fostered and rewarded. This may come in the form of project-based learning where AI tools may be used, but original ideas to complement and enhance the project are expected.
5. In Lahore as well as in other urban areas of Pakistan, the middle school framework regulations should define how AI tools may be used in the classroom in a manner that is pedagogy-based and developmentally appropriate.
6. Long-term studies are needed to understand the impact of AI tools on academic creativity in education. These should be supplemented with direct assessments of academic creativity along with self-reporting.

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Appendix

Questionnaire

IMPACT OF ARTIFICIAL INTELLIGENCE-BASED LEARNING TOOLS ON STUDENT ACADEMIC CREATIVITY AMONG GRADE 8 STUDENTS OF LAHORE

Assalam-o-Alaikum!

Dear Participant,

We are research scholar conducting a study on *Impact of Artificial Intelligence-Based Learning Tools On Student Academic Creativity Among Grade 8 Students of Lahore*. This questionnaire is designed to collect information about your experiences with AI-based learning tools in your academic activities. Your participation is voluntary, and all responses will be kept strictly confidential and used only for academic research purposes.

Thank you for your time and cooperation.

Section A: Demographics

Gender: Male _____ Female _____

Age: 12 years _____ 13 years _____ 14 years _____ 15 years _____

School Type: Public _____ Private _____

Do You Use Ai: Yes _____ No _____

Which AI-based learning tools do you use most frequently? :

ChatGPT _____ Google Gemini _____ Grammarly _____ Khan Academy _____ Other _____

Main Questionnaire

Instructions: Please read each statement carefully and select the response that best applies to you. Use the following scale:

1 = Strongly Disagree (SD) 2 = Disagree (D) 3 = Neutral (N) 4 = Agree (A) 5 = Strongly Agree (SA)

No.	Statement	SD	D	N	A	SA
Section B: Use of AI-Based Learning Tools						

1	I use AI-based tools (e.g., chatbots, AI apps) to help generate ideas for my assignments.					
2	I rely on AI-based tools to simplify complex topics for me.					
3	I use AI-based tools to check or improve my written work.					
4	I use AI-based tools regularly as part of my schoolwork.					
5	I explore multiple AI-suggested approaches before choosing my own.					

No.	Statement	SD	D	N	A	SA
Section C: Creative Thinking						

6	I can generate multiple ideas for a single academic problem.					
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No.	Statement	SD	D	N	A	SA
7	I enjoy coming up with original solutions to academic tasks.					
8	AI-based tools help me think of ideas I would not have considered alone.					
9	I add my own details and improvements to AI-generated suggestions.					
10	I feel confident in my ability to think creatively in class.					
11	I can imagine new and different ways of completing a task.					

No.	Statement	SD	D	N	A	SA
Section D: Problem-Solving Skills						
12	I try to solve academic problems myself before using AI-based tools for help.					
13	AI-based tools help me understand different ways to solve a problem.					
14	I feel more confident solving difficult tasks after using AI-based tools.					
15	I can apply strategies learned from AI-based tools to new problems.					
16	I am able to solve academic problems independently when needed.					

No.	Statement	SD	D	N	A	SA
Section E: Student Engagement						
17	I feel motivated to complete tasks that involve AI-based learning tools.					
18	I am more interested in my subjects when AI-based tools are used in class.					
19	I actively participate in classroom activities that involve AI-based tools.					
20	I feel engaged and focused when using AI-based learning tools.					
21	I spend extra time exploring AI-based tools beyond what is required for class.					
22	I enjoy using AI-based learning tools as part of my school activities.					

– End of Questionnaire –

Thank you for your valuable participation.



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