Journal of Informatics Education and Research
ISSN: 1526-4726
Vol 4 Issue 3 (2024)

AI as a Contrivance in Education Sector: Exploring Its Impending Impact on Students' Performance

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ABSTRACT
With artificial intelligence (AI) acting as a moderator, the study's goal was to determine the factors impacting students' academic achievement in the education sector and predict their impact on students' academic performance. An analysis of descriptive statistics was applied to the data gathered for this investigation. Data was collected for this purpose during university opening day office hours using a questionnaire survey, and SPSS-20 was used for analysis. According to the coefficient summary, all factors' effects on students' performance are accurately reflected by the beta values of 5.340 and 2.603. The findings suggest that students' critical thinking abilities are considerably impacted by the employment of AI technologies in higher education. It also demonstrates how these tools help students reflect, analyze, and evaluate the material, which validates proposed hypothesis of this study. The findings bolster the study's validity and point future research efforts in the direction of a more comprehensive and equitable understanding of the potential applications of AI technology in educational settings.

Keywords*: Optimism and Readiness, Innovativeness, Creativity, Critical Thinking, Problem Solving attribute, Artificial Intelligence*

1. INTRODUCTION

Artificial intelligence (AI) refers to efforts undertaken to construct computer programs that can simulate human behavior and thought. It is the capacity of robots or computers to think and behave like humans (Wartman & Combs, 2018). Therefore, the ability of instruments or programs The fundamental goal of artificial intelligence is to accurately mimic human thought and behavior. (Mohammed & Watson, 2019). Ng (2017) asserts that Artificial intelligence is analogous to electricity in modern times. Given its ability to ensure economic growth, artificial intelligence is a strong contender to be positioned as the fundamental component of the Fifth Industrial Revolution (Golic, 2019). The use of artificial intelligence (AI) in daily life is growing, particularly in the field of education. (Yang et al., 2019). According to Zhang et al. (2022), this technology confers sentient properties to buildings, robots, and other machinery and infrastructure, surpassing basic automation. By providing each student with individualized learning experiences that are tailored to their specific needs, artificial intelligence (AI) has the power to drastically alter traditional teaching methods in educational settings (Ahmad et al., 2021; Chen et al., 2022). These AI-powered adaptive educational models seek to satisfy students' various needs and learning preferences with customized training and feedback (Sun & Gu, 2021). But there are a lot of issues with issues with data privacy, intellectual property rights, and potential biases in algorithmic learning when utilizing AI in education decisions and data (Masters, 2023).

Artificial intelligence (AI) possesses the capacity to change schooling by identifying students' needs and modifying learning tactics accordingly, perhaps reducing achievement gaps and promoting fairness (Lu, 2019). Artificial intelligence's capacity quick feedback delivery has the ability to greatly boost student engagement and participation in the

educational process (Cope et al., 2021). Artificial intelligence adapts to each learner's distinct learning style and speed to foster a more welcoming and inclusive classroom. Each student will be able to absorb material in a manner that best fits their needs thanks to this personalized approach, which is meant to connect with a variety of learning styles. learning habits and areas of strength. Furthermore, AI is being used in settings outside of conventional classrooms (Srinivasa et al., 2022). By utilizing AI technology, remote and online learning systems may provide students with individualized training, resources, and feedback, enabling them to pursue an education regardless of their location. Additionally, according to Kim et al. (2022) AI technology will alter the different learning procedures used in higher education. This encompasses the viewpoints of administrators (Leoste et al., 2021), learners (Zawacki-Richter et al., 2019), and educators (Kim et al., 2022). Despite the positive effects of research, there is a dearth of study AI-robots in postsecondary education, mostly due to the infrequent adoption of various applications by these institutions (Lim et al., 2023).

The development of legitimate and trustworthy instruments or assessment tools for enabling pertinent investigations is necessary to progress AI education and AI-related research. There is currently little information on factors that could affect a student's growth of AI preparation as well as the viability of preparing young students for AI (Brusilovsky, 2023). It is challenging to advance a fresh approach to theoretical research that incorporates the previously described elements into the processes of teaching and learning in the absence of a reliable tool for analyzing the construct of student preparation (Chan, 2023). This study's goal was to develop a survey questionnaire to gauge how prepared elementary school pupils felt for a world enhanced by artificial intelligence.

2. Literature Review

2.1 Optimism and Readiness (OPTR)

Preparing students for the workforce of the future is one of the objectives of education. Several studies have looked into the concept of student optimism and readiness; however, these studies have characterized the same term in different ways, with differing emphasis on the psychological states, skill sets, and socioeconomic resources of students (Gherhes& Obrad, 2018). According to psychological theory, students who feel they have the information and abilities needed for upcoming events and circumstances are said to be optimistic and ready (Chai et al., 2020). Numerous educational contexts have examined the idea of psychological optimism and preparation (Knox, 2020; Chai et al., 2019). Studies on online learning have shown that students' use of technology and personal qualities like initiative and self-direction have a significant impact on their readiness and optimism. Students' success in online learning is determined by their personality traits and level of engagement (Qin et al., 2019; Amit-Aharon et al., 2020). According to the previously mentioned research, student optimism and readiness include their views Their self-assessment of an occurrence, which is shaped by their past encounters, as well as their self-concept or self-efficacy (Jong et al., 2020). One of the long-standing learning objectives of technology-relevant education has been to attain student optimism and readiness. According to So et al. (2020), in particular, education centered on The information economy of the twenty-first century is meant to equip students with the skills, knowledge, and mindset necessary for the workplace. From the above point of view, courses on artificial intelligence (AI) ought to give students more than just topic knowledge; they should also give them the tools they need to feel empowered and confident enough to engage in the workforce. But The advancement of AI instruction in classrooms is still in its infancy. There is little empirical support for the claim that educational opportunities pertaining to AI will improve students' preparedness for a world where AI is pervasive (Wang and Wang, 2019).

H1: Students performance (STUPER) is sanguinely impacted by Optimism and Readiness (OPTR)

2.2 Innovativeness (INNO)

One important factor influencing the decision to employ technology is innovativeness. Innovativeness is characterized by students' readiness to try out new technology, which greatly influences their intention to use it for instruction. Other aspects that are related to the learners' personal traits or the nature of the accepted technology regulate the concept of willingness (So et al., 2020). In addition, innovation stresses the use of novel concepts (Lu et al., 2021). According to Keller-Bell and Short (2019), innovative thinking is a cognitive process that results in creativity. It encourages the development and execution of novel concepts (Barak and Usher, 2019). It takes a supportive environment and ideal circumstances to foster creative thinking. By bridging the creative environment of schools with the inventive environment of businesses and society, an effective mechanism of industry-university partnerships may be established, which is essential to nurturing innovative skills. (Lin, 2018; Mei et al., 2022).

H2: Students performance (STUPER) is sanguinely impacted by Innovativeness (INNO)

2.3 Students AI Competency (SAIC)

In the context of AI education, the operational definition of learners' competencies was developed based on a prior study that looked at many competences for AI education (Sanusi et al., 2022). Competencies in the AI Era, their report, Guenole et al. (2018) categorized knowledge, experience, cognitive abilities, and other qualities as essential competences

for learners of AI today. The primary skills in this research are categorized using the three concepts of learning, knowledge, and team capabilities. Team competence includes human-tool collaboration and teamwork; Skill and cultural competence are included in knowledge competence, and cognitive and self-learning are included in learning competence. competence.

It can be challenging to comprehend the ideas underlying AI algorithms, particularly for newcomers and students (Wong et al., 2020). Therefore, Investigating human characteristics such as cognitive competence and how it interacts with other important elements might affect how kids pick up AI concepts. According to popular perception, a person's competency is determined by his or her capacity to utilize a variety of techniques—many of which are unusual but yet effective—to accomplish tasks (Chen et al., 2022).

A study conducted recently during the Covid-19 Pandemic investigated how students' cognitive capacity and infrastructure (Garad et al., 2021). These authors claim that, particularly during a pandemic, cognitive competency and other characteristics have a good impact on distance learning. Even though similar studies have been done before, it is still imperative to investigate the relationships that exist between cognitive capacity and other aspects when it comes to artificial intelligence in the classroom. Furthermore, This research is essential to illustrating the dynamics of cognitive competency in AI education and learning in an era of extremely advanced technological development propelled by artificial intelligence (AI), human-computer connections and the Internet of Things (IoT) (Kassymova et al., 2019).

H3: Students performance (STUPER) is sanguinely impacted by Students AI Competency (SAIC)

2.4 Critical Thinking (CTHINK)

As stated by Thornhill-Miller et al. (2023), Critical thinking requires considering, evaluating, and synthesizing information while challenging presumptions, looking closely at the data, seeing biases, and drawing well-informed conclusions. By giving students access to a variety of resources and viewpoints, generative AI tools enhance their capacity for critical analysis, evaluation, and synthesis of information (Halaweh, 2023).

Within the framework of AI-driven environments, critical thinking in education refers to the ability to evaluate other points of view, analyze information, and develop well-reasoned arguments. This skill becomes increasingly important as AI permeates more areas of daily life and the business. In addition to providing content, Artificial intelligence (AI) holds promise as a useful instrument. in educational contexts for encouraging students' questioning, critical thinking and analysis of the material they are exposed to (van den Berg & du Plessis, 2023). The use of AI in education offers unique opportunities to foster critical thinking abilities. With their massive databases and analytical powers, AI systems can pose challenging scenarios and issues to pupils that call for more than rote learning or comprehension of the fundamentals. These systems may force students to solve problems by applying higher-order thinking abilities like analysis, synthesis, and assessment. Additionally, With AI, learning experiences may be customized to meet the needs of individual students. unique learning preferences and skill level. By personalizing the content, teachers can make sure that students are pushing the boundaries of their cognitive abilities in addition to being engaged with the topic at a level that suits them. By giving students assignments that fall inside AI is able to efficiently structure learning events in order to improve critical thinking within their zone of proximal development. (Muthmainnah et al., 2022).

Therefore, it is crucial to take critical thinking into account while designing AI literacy training. Students are urged to consider the technology critically as they study AI, its potential, and its constraints. This means understanding how artificial intelligence (AI) impacts societythe potential for prejudice in AI systems, and the ethical ramifications of AI. Instructors may guarantee that their students are not only technically skilled but also ethically and critically informed by incorporating these talks into their AI literacy lessons. (Ng et al., 2021).

Numerous research have examined how AI affects critical thinking, with varying degrees of success. Deng and Yu (2023), for instance, looked into how chatbot-assisted learning affected a number of different areas, including critical thinking. After reviewing numerous empirical investigations, the study concluded that AI technology's effect on overall learning outcomes was medium to high. In their investigation into the effects of various AI-delivered question formats on student engagement and critical thinking, Bailey and Almusharraf (2021) discovered that while certain question formats promoted memorization and content evaluation, they necessitated minimal critical thinking (Musi et al., 2023).

H4: Students performance (STUPER) is sanguinely impacted by Critical Thinking (CTHINK)

2.5 Problem solving attribute (PROSOL)

In certain academic studies, the application of AI and its effects on problem-solving abilities have been examined. One looks at how AI can improve the authenticity and significance of online tests, which could improve students' ability to

solve problems (Ifelebuegu, 2023). Another article highlights the creation of an AI assistant called ChatGPT, which is integrated with a learning management system, and shows how AI can accelerate learning and enhance problem-solving abilities (S. R et al., 2023). Peng (2021) thinks that chatbots and other intelligent agents can help with higher order thinking and issue solving. It was discovered by others that students who were taught programming with robotics assistance possessed superior problem-solving abilities. Understanding how AI and chatbots, which are frequently essential to robotics education, can affect problem-solving skills is pertinent (Emre Ç and Kiyici M, 2022).

H5: Students performance (STUPER) is sanguinely impacted by Problem solving attribute (PROSOL)

2.6 Creativity (CREATE)

In order to be creative, one must come up with original concepts, viewpoints, or fixes for challenging issues. According to Cropley et al. (2021), attention, grit, tenacity, and curiosity are among the traits that are frequently linked to creativity. New research demonstrates how AI might enhance these traits (Belpaeme et al. 2018). Additionally being investigated is AI's potential to foster innovation. As per a report conducted by Markauskaite et al. (2022), the goal of AI in education is to collaborate with AI to foster and support creative and problem-solving skills, rather than just imparting knowledge about a particular subject. The study argues that artificial intelligence (AI) can foster creativity and has a relationship to the creative process. Furthermore, Ryu and Han (2018) looked into how Korean teachers saw artificial intelligence (AI) in the classroom and discovered that teachers with leadership background agreed that AI will promote more innovation. Consequently, there is a suggestion that integrating AI into education could assist in addressing a few of the primary issues connected to the creative doldrums, specifically with regard to emphasizing the creative process. This could successfully educate students for admission into the modern workforce and improve their comfort level and capacity for creative thought when applying AI. To properly combine and integrate the two concepts, we need to understand more about how students see the relationship between creativity and AI (Tubb et al., 2020).

H6: Students performance (STUPER) is sanguinely impacted by Creativity (CREATE)

2.7 Artificial Intelligence (AI)

Education's future is strongly tied to the creation of new technologies and the ever-increasing processing capability of intelligent machines. The advancement of artificial intelligence in this field offers higher education faculty members both new opportunities and challenges. They might significantly affect how today's educational institutions are set up and run. (Hwang et al., 2020). According to Munir et al. (2022), According to the 2018 Horizon poll, using AI and adaptive learning technology will take the typical school two to three years. (Arias et al., 2022; Mamani et al., 2022). The extent to which AI can improve learning, whether it raises ethical or privacy issues, and if it can be incorporated into educational institutions in a way that maximizes its benefits while minimizing its risks are all questions that need to be answered through research on the subject. Artificial intelligence (AI) has the power to fundamentally alter the way that education environment by improving student performance and engagement, personalizing the learning process for each student, and automating administrative duties. However, there are concerns that AI would exacerbate already-existing educational disparities and upend the roles of educators and students (Schiff, 2021).

The main research challenge with AI's application in education is figuring out how effective it is at improving academic results. Another innovative tool that could completely transform schooling is artificial intelligence, or AI. Politicians and academics can't agree on whether it increases student learning. AI has been shown in numerous studies to improve academic attainment, tailored education, and student interest (Xing & Zhang, 2019).

In order to enable students to securely apply experimental procedures to learn new things, artificial intelligence (AI) supports and enhances student learning. Using AI frameworks will result in significant changes to student recruitment, instruction, and support. In some contexts, it could take the place of teachers. It now functions as a learning aid for students (Zawacki-Richter et al., 2019; Claudino et al., 2019). The environment that artificial intelligence (AI) creates is encouraging, which is particularly beneficial for kids' learning processes and attributes. Artificial intelligence encompasses any techniques that improve learning, processing, and training through electronic means. According to Murphy et al. (2022), students can customize their experience in these environments driven by AI to meet their requirements and preferences. Thus, by offering a flexible schedule, chances for collaboration, choices, and control over the learning process, artificial intelligence (AI) is a cleverly created technology that makes it possible for teachers and students to effectively continue the learning process.

H7: Artificial Intelligence (AI) sanguinely moderates the relationship between Optimism and Readiness (OPTR) and Students Performance (STUPER)

H8: Artificial Intelligence (AI) sanguinely moderates the relationship between Innovativeness (INNO) and Students Performance (STUPER)

H9: Artificial Intelligence (AI) sanguinely moderates the relationship between Students AI Competency (SAIC) and Students Performance (STUPER)

H10: Artificial Intelligence (AI) sanguinely moderates the relationship between Critical Thinking (CTHINK) and Students Performance (STUPER)

H11: Artificial Intelligence (AI) sanguinely moderates the relationship between Problem solving attribute (PROSOL) and Students Performance (STUPER)

H12: Artificial Intelligence (AI) sanguinely moderates the relationship between Creativity (CREATE) and Students Performance (STUPER)

3. RESEARCH OBJECTIVES

Identifying the aspects influencing students' academic performance in the education sector and predicting their impact on students' academic performance, with artificial intelligence (AI) serving as a moderator

4. CONCEPTUAL MODEL

Optimism and Readiness (OPTR), Innovativeness (INNO), Creativity (CREATE), Students AI Competency (SAIC), Critical Thinking (CTHINK), Problem Solving attribute (PROSOL), Students Performance (STUPER), Artificial Intelligence (AI)

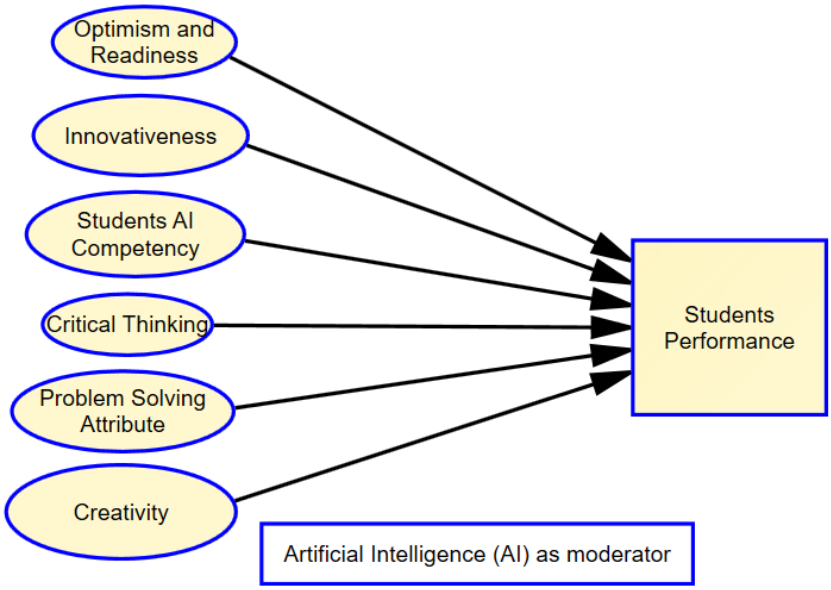

Figure 1: Conceptual Model showing

5. RESEARCH METHODOLOGY

5.1 Research Design: For this research, a numerical descriptive survey was used as the research tool. This design was selected due to its capacity to facilitate the collection of data from a wide range of participants and give a comprehensive picture of students' opinions regarding the use of artificial intelligence in the classroom.

5.2 Participants: About 385 university students from the second, fourth, sixth, and eighth semesters were chosen for the survey in order to get a more complete understanding of the opinions of students at different levels of study. Participants were chosen through the use of the purposive sample technique, and data was gathered gradually. Prior to the study, consent was sought from each participant and they were informed about the procedures and goal.

5.3 Instrument: A questionnaire about students' perceptions of adaptation of artificial intelligence served as the research tool. The questionnaire was subjected to a back-translation process before to its usage in this study to ensure that the translation is accurate and pertinent, as well as the suitability of the questionnaire for the setting and goals of our investigation.

The questionnaire's reliability and validity have been examined. The student perception scale's A Cronbach's Alpha of 0.7

indicates a reasonable level of reliability. Cronbach's Alpha coefficient indicating the effect of AI in education is 0.5, which also indicates adequate dependability and further regression analysis was also done to test the hypotheses.

5.4 Data Collection Procedure: An online survey was completed by participants in order to collect data. Participants were provided the questionnaire using Google Forms, and they had a deadline to finish it. To protect the privacy of the data, the researcher received an email with the results once participants had finished the questionnaire.

5.5 Data Analysis: An analysis of descriptive statistics was applied to the data gathered for this investigation. To clarify students' opinions and how artificial intelligence affects schooling student performance, methods like relative frequencies and percentages were used. This method made it easier to spot data's patterns and trends, which enabled the researchers to appropriately address the study questions that were given. All research protocols were designed with full adherence to known research ethics norms. All participants were fully informed about the study's procedures and goals prior to its commencement, and their informed consent was obtained. In order to preserve participant privacy, all of the data gathered for this study are also kept secret and anonymous.

6. RESULTS AND ANALYSIS

6.1 Demographic profile

Descriptive demographic statistics represented as a percentage, proportion, and frequency of occurrence were used to evaluate the respondent's demographic features. (Table 1). After a careful examination, 89.53% of the comments are found to be of high quality. Among the 385 respondents, men made up 321 (83.4%) and women 64 (16.6%); most of the men (116, 30.1%) were between the ages of 30 and 39, and 165 (42.9%) had a professional degree.

Table1.DescriptiveStatisticsofDemographicProfile

		Frequency	Valid %		385/430	Frequency	Valid %
Age profile	20-29 years	53	13.8	**Gender profile**	Male	321	83.4
	30-39 years	116	30.1		Female	64	16.6
	40-49 years	73	19.0	**Highest education level**	Bachelor Degree	49	12.7
	50-59 years	90	23.4		Masters Degree	96	24.9
	60 years and above	53	13.8		Prof. Education	165	42.9
					Other	75	19.5

6.2 Exploratory Factor and Reliability Analysis

The significance of the conforming components was assessed using the EFA. The threshold in this experiment is set at a factor loading of 0.50. These results suggest that factor analysis is a suitable technique to collect this information. Four things were taken out of the final analysis. due to loadings less than 0.5 were eliminated. A scale is generally accepted to be internally consistent if it satisfies the Chronbach's Alpha threshold of 0.70. 0.7 as the Cronbach's alpha threshold was used in this study.

Table2.ResultsofExploratoryFactorandReliabilityAnalysis

Variable	Cronbach alpha	Statement	Factor loadings	KMO Measure ofSampleAdequacy (>0.5)	Bartlett's Test ofSphericity		Itemsconfirmed	Items dropped	Cum % ofloading
					Chi Square	Sig. (<.10)			
Optimism and Readiness (OPTR)	0.954	OPTR-1	0.162	0.836	1700.838	0.000	4	1	70.766
		OPTR-2	0.930						
		OPTR-3	0.943						
		OPTR-4	0.950						
		OPTR-5	0.925						
Innovativeness (INNO)	0.893	INNO-1	0.882	0.818	1285.283	0.000	5	0	70.210
		INNO-2	0.899						
		INNO-3	0.885						
		INNO-4	0.802						
		INNO-5	0.706						

Students AI Competency (SAIC)	0.898	SAIC-1	0.890	0.828	1326.450	0.000	5	0	71.243
		SAIC-2	0.905						
		SAIC-3	0.888						
		SAIC-4	0.806						
		SAIC-5	0.717						
Critical Thinking (CTHINK)	0.954	CTHINK-1	0.181	0.846	1702.207	0.000	4	1	70.848
		CTHINK-2	0.933						
		CTHINK-3	0.943						
		CTHINK-4	0.955						
		CTHINK-5	0.915						
Problem Solving attribute (PROSOL)	0.709	PROSOL-1	0.772	0.715	283.120	0.000	5	0	42.939
		PROSOL-2	0.777						
		PROSOL-3	0.092						
		PROSOL-4	0.703						
		PROSOL-5	0.666						
Creativity (CREATE)	0.722	CREATE-1	0.680	0.728	300.768	0.000	4	1	43.923
		CREATE-2	0.774						
		CREATE-3	0.774						
		CREATE-4	0.133						
		CREATE-5	0.720						
Students Performance (STUPER)	0.956	STUPER-1	0.186	0.844	1730.865	0.000	4	1	71.204
		STUPER-2	0.932						
		STUPER-3	0.945						
		STUPER-4	0.951						
		STUPER-5	0.926						
Artificial Intelligence (AI)	0.896	AI-1	0.886	0.822	1308.031	0.000	5	0	70.797
		AI-2	0.901						
		AI-3	0.886						
		AI-4	0.806						
		AI-5	0.713						

6.3 Correlation Analysis

Every variable that was taken into consideration has a substantial association with every other variable (Table 3). The most degree of connection (0.997) was discovered between Optimism and Readiness (OPTR) and Critical Thinking (CTHINK), while the least significant connections (0.727) were observed between Innovativeness (INNO) and Creativity (CREATE).

Table 3: Correlations

	OPTR	INNO	SAIC	CTHINK	PROSOL	CREATE	STUPER	AI
OPTR	1							
INNO	.924**	1						
SAIC	.925**	.986**	1					
CTHINK	.997**	.918**	.929**	1				
PROSOL	.813**	.795**	.802**	.817**	1			
CREATE	.795**	.765**	.781**	.801**	.980**	1		
STUPER	.987**	.902**	.909**	.987**	.807**	.819**	1	
AI	.920**	.980**	.981**	.920**	.797**	.805**	.929**	1

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

6.4 Regression Analysis

Using The relationship between the independent and dependent variables using stepwise regression analysis was ascertained. In order to ascertain how these factors affected students' performance. The main goals of the study were to evaluate the importance of artificial intelligence (AI) and the impact of using AI on students' AI competency, critical thinking, creativity, and optimism and readiness.

6.4.1 Student Performance as dependent factor: According to Table 4.1's regression analysis, each element significantly affects students' performance. The R square score of 0.998 indicates the full explanation (100%) of Students

Performance (STUPER) by all predictors. The regression model's table of ANOVA results shows that, with a 95% confidence level, the validation is valid. The beta values of 0.769 and 0.601 correctly reflect the influence of all factors on Students Performance (STUPER), according to the coefficient summary displayed in the Table.

Table 4.1 : Regression analysis

Independent Variable	Dependent Variable	Model Summary		ANOVA			Coefficients		
		R	R square	Mean square	f	Sig.	Standardized Coefficients Beta	t	Sig.
OPTR	STUPER	0.999	0.998	63.757	25671.945	0.000	0.601	10.072	0.000
INNO							0.160	5.926	0.000
SAIC							-0.176	-6.359	0.000
CTHINK							0.397	6.546	0.000
PROSOL							-0.746	-53.623	0.000
CREATE							0.769	57.825	0.000

6.4.2 Moderating impact of Artificial Intelligence (AI) between selected influencing variables and Students Performance: The Z score Artificial Intelligence values (ZAI) were developed to look into how students' performance was affected by the use of AI. The interaction between all independent factors and Artificial Intelligence values (ZAI) is then computed, yielding a new variable designated as interactions IA1 through IA6.

Students Performance (STUPER), the dependent variable, and the interacting independent variables (IA1–IA6) were used in a regression study. Based on the outcomes of step-wise regression analysis, Tables 4.2 show how these interacting variables are a strong predictor Imagine how implementing artificial intelligence would impact student performance. The table shows that 79.4% of the impact of installing artificial intelligence on students' performance can be explained by variable factors, with R2 values of 0.794. With a 95% confidence level and beta coefficient values of 5.340 and 2.603, it displays the ANOVA validation and accurately illustrates their effect on students' performance. The ways in which they control the relationship between AI and student achievement are appropriately reflected in these principles.

Table 4.2: Regression analysis

Independent Variable	Dependent Variable	Model Summary		ANOVA			Coefficients		
		R	R square	Mean square	f	Sig.	Standardized Coefficients Beta	t	Sig.
Interaction 1 = ZAI*OPTR	Students Performance (STUPER)	0.891	0.794	50.720	242.198	0.000	5.340	2.403	0.017
Interaction 2 =ZAI*INNO							-3.466	-2.851	0.005
Interaction 3 =ZAI*SAIC							2.603	2.076	0.039
Interaction 4 =ZAI*CTHINK							-4.595	-2.047	0.041
Interaction 5 =ZAI*PROSOL							0.342	0.536	0.592
Interaction 6 =ZAI*CREATE							0.663	1.074	0.283

7. Results of Hypotheses Testing

The conceptual study framework (table 5) contained twelve hypotheses; two of them, hypotheses 11 and 12, were rejected, while the remaining hypotheses were accepted.

Table 5: Summary of Hypotheses Testing

Hy. No.	IndependentVariables	DependentVariables	R-Square	Beta Coefficient	t-value	SigValue	Status ofHypotheses
H1	OPTR	STUPER	0.998	0.601	10.072	0.000	Accepted
H2	INNO			0.160	5.926	0.000	Accepted
H3	SAIC			-0.176	-6.359	0.000	Accepted
H4	CTHINK			0.397	6.546	0.000	Accepted
H5	PROSOL			-0.746	-53.623	0.000	Accepted
H6	CREATE			0.769	57.825	0.000	Accepted
H7	IA1= ZAI*OPTR	STUPER	0.794	5.340	2.403	0.017	Accepted
H8	IA2= ZAI*INNO			-3.466	-2.851	0.005	Accepted
H9	IA3= ZAI*SAIC			2.603	2.076	0.039	Accepted
H10	IA4= ZAI*CTHINK			-4.595	-2.047	0.041	Accepted
H11	IA5= ZAI*PROSOL			0.342	0.536	0.592	Rejected
H12	IA6= ZAI*CREATE			0.663	1.074	0.283	Rejected

8. DISCUSSION

The study's conclusions, which supported the existence of a significant positive relationship as a moderating factor between artificial intelligence (AI) and students' performance (STUPER) and optimism and readiness (OPTR) (H1 and H7; beta coefficient = 0.601 and 5.340). Numerous educators have stressed the significance of encouraging students' optimism and preparation for a future with AI in the current context (Chai et al., 2020; Chiu and Chai, 2020). To educate mentally fit students for a future with AI, AI education programs must achieve relevance, lessen students' apprehension regarding AI, and foster learners' confidence (Gherhes& Obrad, 2018). One way to become ready for AI is to promote AI knowledge. Various types of digital literacy include becoming more and more important at this time (Seldon and Abidoye, 2018). By examining the new element of AI literacy The current study contributes to the body of literature in this regard. Students' opinions of their preparedness for AI are therefore shaped by their belief in their own ability to learn and use AI expertise as well as by assessing how applicable AI knowledge is to their day-to-day existence. The aforementioned result is consistent with that published by Amit-Aharon et al. (2020), who suggested that optimism and openness to embracing new practices involving the application of newly acquired knowledge can be influenced by literacy-based efficacy. The structural model highlights how crucial it is to create an excellent AI education program that gives students more confidence in their capacity to understand AI and in helping them see its importance knowledge.

The results of the empirical inquiry into hypotheses 2 and 8 showed that, with artificial intelligence (AI) acting as a moderating factor, there is a substantial association (beta coefficient = 0.160 and -3.466) between students' performance (STUPER) and innovativeness (INNO). In both professional and academic contexts, novel experiences are essential. Memorable encounters have been shown to increase loyalty in people (Hasan et al., 2021). But in order to make an event unforgettable, one must be aware of the mental processes that take place at different points in a person's experience as well as the conditions that precede and follow (Skavronskaya et al., 2020). This study also emphasizes how more inventiveness in identifying AI solutions may result in more engagement utilizing modern technology, which is linked to the application of this technology going forward. In this area, creativity can improve student engagement; however, AI solutions that reduce obstacles to technology use may encourage more students from different backgrounds to adopt these tools (Hoy, 2018). According to Bose (2019), students play an important part in the broad acceptance of intelligent virtual assistants, and their innovative nature draws them to connect with AI.

An independent analysis demonstrated a strong positive relationship between the two dimensions, Students Performance (STUPER) and Students AI Competency (SAIC). This result validates Hypothesis 3 and 9 (beta coefficient = -0.176 and 2.603), with Artificial Intelligence (AI) as moderating factor. Future AI and ML developers and researchers may be better prepared if the AI concept is introduced at the foundational levels of school, as this has been shown to enhance AI literacy (Williams et al., 2019) and assist in the development of Kids' mental models (Hitron et al., 2019). Keeping that as the cornerstone of our work and the necessity of giving students the skills they need to get ready for jobs where working with humans and AI is commonplace, we must offer some of the most recent perspectives on AI education, particularly with regard to the importance of learners' abilities. The results showed that cultural competence, human-tool collaboration competence, skill, or self-learning competence were significantly positively correlated with AI content. This finding highlights the interdependence of these skills and their respective significance in creating comprehensive and reliable educational content for AI literacy. This indicates that learners were more likely to comprehend the AI content than learners without strong proficiency in the relevant competencies. According to past research, student AI competency has a positive impact on AI content (Huang, 2021; Kim et al., 2021). A higher likelihood of comprehending AI content may result from students demonstrating their mastery of pertinent information and techniques, including how such techniques interact with technology tools, as well as their capacity for independent analysis. For example, a variety of learning activities that support the growth of pupils' analytical, logical, critical, and observational skills skills could be used to include competency into AI curriculum. More recently, it has been suggested that AI-related competences play an important part in deciding the performance of students and retention (Bates et al., 2020; Ng et al., 2023).

With artificial intelligence (AI) acting as a moderating factor, Hypotheses 4 and 10's empirical analysis produced a statistically significant positive connection (beta coefficient = 0.397 and -4.595) between students' performance (STUPER) and critical thinking (CTHINK). According to one, artificial intelligence (AI) may improve academic procedures, which may involve critical thinking (Vargas-Murillo et al., 2023). AI created to immunize against false information is presented by Musi (2023), which may tangentially improve critical thinking abilities. According to Haspari& Wu (2022), AI can promote critical thinking while teaching language. Gonzalez-Cacho and Abbas (2022) discovered that critical thinking is positively impacted by interaction and collaborative learning, which may be pertinent in learning settings that use artificial intelligence. Lastly, Adhikari (2023) points out that the process-aware education of computer programming or writing might benefit from the use of visualizations, which may strengthen critical thinking. Research indicates that while AI-assisted tools may affect a range Considering learning objectives, their impact on critical thinking is nuanced and can change based on the AI's architecture, the environment in which it is used, and the particular training or educational program. While some research point to advantages, others point to drawbacks or consequences that rely on the circumstance. One could argue that, particularly in circumstances related to education, work, and information (Musi, 2023). AI use Having the capacity to significantly affect critical thinking, a critical skill that involves objectively analyzing and evaluating a situation in order to make a decision. Depending on a number of variables, such the AI's design and the environment in which it is being used, this effect may have both beneficial and harmful effects.

In the empirical examination of hypothesis 5, there was a substantial positive connection (p1=0.000) between Students Performance (STUPER) and Problem Solving attribute (PROSOL). However, this was not the case for hypothesis 11, which had Artificial Intelligence (AI) as a moderating factor (p2 < 0.592). Even though this study did not yield these kinds of outcomes, a number of other studies collectively suggest that AI-assisted technologies, particularly when integrated into learning management systems and educational systems, can positively improve problem-solving skills.

The study's results on the association between students' performance (STUPER) and creativity (CREATE) (H6; p1 = 0.000) supported a substantial positive relationship; however, hypothesis 12 (p2 < 0.283), which held that artificial intelligence (AI) was a moderating element, did not. Marrone et al. (2022) questioned students about their experiences with AI to learn more about the relationship between creativity and the technology. They discovered that students' attitudes toward using artificial intelligence (AI) were more positive when they believed they understood AI better. in the classroom. As a result, they proposed that students should be motivated to employ AI in educational contexts and that AI applications should be permitted. However, no such results were found in this study.

9. CONCLUSION

By use of intelligent systems designed to monitor, control, optimize, analyze, assess, and evaluate learners or students, artificial intelligence (AI) significantly contributes to education. AI technology fulfills every task that educators and pupils must accomplish. User-generated information, like language that is understandable, must be capable of interacting with the system in a way that makes sense. AI plays a significant part in education and learning. It updates the processes and technologies used in teaching and learning. It attracts academics from diverse disciplines to explore a wider array of educational issues. It is clear that artificial intelligence (AI) can play has a cross-disciplinary function in education and can be used to a variety of problems that conventional education is unable to solve. is unable to address.

According to our research, using generative AI technologies have a significant impact on how well students are able to think critically. The findings corroborate our initial theory by demonstrating how these tools help students reflect on, analyze, and evaluate material. Our second prediction is validated by the data, which demonstrate how these technologies help students communicate, coordinate, and work as a team. The ability to use tools like content generators, chatbots, and collaborative platforms has increased student involvement and promoted teamwork on assignments and cooperative problem solving. When these resources are used in conjunction with conventional educational methods, students are effectively motivated, active involvement is encouraged, and learning quality is enhanced. These findings validate our third hypothesis and imply that students' educational experiences can be enhanced by the successful incorporation of generative AI technologies in academia. In higher education, the application of generative AI techniques has the potential to revolutionize teaching methods and greatly enhance student performance. In order to fully realize these advantages, rules that encourage the moral and responsible use of new technologies must be developed, together with continuous essential training and sufficient technical assistance. In order to ensure that these resources are employed to improve instruction and equip pupils for the difficulties of the twenty-first century, educators and legislators play a critical role in their proper implementation.

10. RECOMMENDATIONS

We propose many ways to be used in future studies. Initially, the sample ought to be enlarged to encompass a more equitable representation of genders as well as a wider range of academic backgrounds and specializations. Secondly, Further investigation is needed to determine the long-term impacts of generative AI technologies on critical thinking and teamwork. Third, to ensure that AI is applied effectively and morally technology, instructors and students should get continuing technical support as well as training. Fourth, in order to promote fairness and transparency, regular reviews should be carried out to detect and reduce any potential biases in AI systems. Last but not least, generative AI technologies ought to be methodically included into the curriculum, with an emphasis on exercises that encourage critical thinking, idea development, and clear communication. By taking these steps and taking these factors into account, this scientific article provides a more detailed examination of how generative AI technologies affect higher education, strengthening the validity and usefulness of the findings. These suggestions strengthen the study's robustness and direct future investigations toward a more thorough and equitable comprehension of the applications of artificial intelligence (AI) in the classroom.

11. LIMITATIONS

This study has certain drawbacks. First, in order to maximize the statistical results, there should be at least 10–20 participants for each latent variable. Although our sample size met the minimal criterion as stated in the methods section, both samples were around the lower bound of the necessary minimum number of participants. To solve this issue, larger sample sizes should be used in future study. Second, because the study's participants were young, it's possible that they weren't fully aware of all the ramifications of AI technology. It is recommended that senior students participate in a repeat of the study.

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