Discover the Effects of Artificial Intelligence on Learning in Higher Education

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Abstract:

The study investigates how artificial intelligence (AI) affects learning in higher education. The objectives of this research paper: O1. To explore AI Enhances and optimizes on student learning, O2. To Identify the impact of AI on critical thinking, creativity and teacher student relationship, O3. To predict the future of AI in education.

Adopting a qualitative, empirical methodology, it assesses the views, attitudes, and experiences of students across undergraduate, postgraduate, and doctoral levels regarding AI-integrated learning tools. The results suggest that AI is largely perceived as a beneficial resource for improving educational experiences, facilitating self-directed learning, and aiding in the understanding of intricate concepts. Nonetheless, research also emphasizes the dual function of AI in critical thinking, where it offers organized solutions but might also foster passive engagement. Additionally, the findings delve into AI's influence on creativity, indicating that while it can inspire innovative ideas, there are apprehensions about its ability to diminish originality and independent thought. The research also looks into the effect of AI on teacher-student interactions, revealing a variety of perspectives. Lastly, it considers the future role of AI in education, highlighting the potential for enhanced personalization and the necessity for greater student readiness.

Keywords: Artificial Intelligence, Creativity, Critical Thinking, Higher Education, Future Trends of AI

Introduction

Artificial intelligence represents a pivotal advancement in technology that significantly

enhances human life. This rapidly evolving field has the potential to transform various dimensions of our social interactions (Bostrum, 2017). In the field of education, artificial intelligence is already making strides by introducing innovative teaching and learning solutions that are presently being tested and restructured across various contexts (Bostrum, 2017). The integration of Artificial Intelligence (AI) into educational environments has grown rapidly, leading to extensive research evaluating its impact on student learning outcomes. A systematic literature review published in Expert Systems with Applications examined various AI applications in education, including adaptive learning systems and intelligent tutoring systems. The study found that AI-driven adaptive learning improved student test scores by 62%, demonstrating AI's potential to enhance academic performance (Shan Wang et al., 2024). A separate study in Education Sciences explored AI's role in personalizing learning experiences, results highlighted several advantages, such as personalized learning pathways, improved academic performance, and increased student engagement. The adoption of AI in higher education has significantly increased in recent years, benefiting both students and educators. AI adapts instructional content to suit different learner needs, provides personalized feedback, and enhances student engagement (Verdú et al., 2017; Dever et al., 2020). Universities are utilizing AI for personalized learning, administrative functions, and research, while colleges primarily focus on AI-driven support and management tasks. To ensure ethical AI implementation, institutions must develop clear policies and provide comprehensive teacher training (Zawacki-Richter et al., 2019).

Review of Literature

Stepen et al. (2017) Exploring the impact of artificial intelligence on teaching and learning in higher education. The objectives of this paper to examines the integration of artificial intelligence (AI) in higher education, focusing on its impact on teaching, learning, and institutional adaptation. The researchers explore how AI is becoming an integral part of educational practices, offering both opportunities and challenges for students and educators. As AI continues to evolve, its role in enhancing learning processes is growing, but it also brings potential ethical concerns. One significant issue highlighted is the risk of AI limiting the depth of human knowledge and perspectives. The authors stress that universities should carefully address these concerns to ensure a sustainable future for education. The paper underlines the need for higher education institutions to balance technological advancements with ethical considerations as AI continues to shape the educational landscape.

Gocen and Aydemir (2020) Conducted a research paper on Artificial Intelligence in Education and Schools. The Objective of this paper to explore potential scenarios associated with the introduction of AI in education and its possible implications for the future of schools. The research methodology followed a phenomenological approach, a qualitative method that analyzed the perspectives of participants from various sectors. The findings indicate that AI will introduce new products and benefits to schools and educators, but it will also bring certain challenges.

Collins et al. (2021) Conducted research paper on Artificial intelligence in information systems research: A systematic literature review and research agenda. The Objective of this study to explore various characteristics of AI within the field of Information Systems (IS), examine its practical implications, and identify future research opportunities. The methodology section details the systematic review process used in the study. A Systematic Literature Review is defined as a

method for identifying, evaluating, and interpreting all relevant research related to a specific question, topic, or phenomenon. The search process resulted in 1,877 studies, with 98 selected as primary sources, from which key themes were synthesized. The study presents an overview of the latest AI research, highlighting its business value, contributions, and definitions. This is followed by a discussion on implications and a proposed research agenda. The paper concludes by summarizing key findings and suggesting directions for future studies.

Seo et al. (2021) Conducted a study based on discussed on AI-enhanced education: exploring the impact of AI literacy on academic performance in Northern India. The Objective of this research paper to examine the impact of AI systems on the culture, norms, and expectations surrounding interactions between students and instructors, which remain unclear. The research follows a methodological approach that includes the use of storyboards to collect data, detailing the participants, study procedures, and qualitative analysis conducted. The study analyzes the perspectives of 12 students and 11 instructors on various AI use cases in online learning. The findings have significant implications for AI system design, emphasizing the need for explainability, human-in-the-loop approaches, and careful data collection and presentation. Key contributions of this study include the creation of technically feasible AI system storyboards that enhance learner-instructor interaction, capturing concerns about AI systems through Speed Dating, and providing practical insights to maximize AI's positive impact while mitigating potential drawbacks.

Seo et al. (2021) Conducted a study on the impact of artificial intelligence (AI) on learner–instructor interaction in online education. The objective of this study is to enhance online learning and teaching by personalizing learning experiences for students, automating routine tasks for instructors, and enabling adaptive assessments. For the methodology, the researchers designed storyboards to facilitate further exploration of AI's role in online education. Additionally, the study highlights both the potential benefits and challenges of AI in online learning, as perceived by students and instructors in higher education. The "Materials and Methods" section outlines the methodological approach of the research, detailing the use of storyboards for data collection, the participants involved, the study procedure, and the qualitative analysis performed. The researchers employed the "Speed Dating" method with storyboards to capture the perspectives of 12 students and 11 instructors on various AI use cases. The "Findings" section presents the results and key insights related to the research question. Finally, the "Discussion and Conclusion" section summarizes the study's findings, discusses its limitations, and suggests directions for future research.

Slimi (2023) Explored the Impacts of Artificial Intelligence on Higher Education: An Empirical Study. The objectives of this study to analyze the impact of AI on higher education, examining its influence on teaching and learning, assessment and grading, and predicting its effects on graduates' future careers. To achieve this, the study employs a qualitative methodology, utilizing a survey targeting the higher education audience. The research follows an objective philosophy, as the data collected are based on perceptions, emotions, and experiences. The Objective emphasizes realism and, from an ontological perspective, views social entities as independent physical realities (Saunders et al., 2009). Therefore, the study applies a qualitative method to explore the subject in depth. This approach focuses on gathering insights from individuals' experiences, opinions, and perspectives regarding AI in higher education and its

broader societal implications (Hammersley, 2012). A qualitative survey was conducted to ensure the reliability and authenticity of the collected data. The findings indicate that AI should be more deeply integrated into higher education curricula, and institutions must address the ethical considerations associated with AI in program development and implementation. By doing so, they can better equip graduates for the challenges of the evolving job market.

Miguel et al. (2023) Conducted a study on Artificial intelligence and the future of Teaching and learning. This study with the objective of enhancing teaching and learning while fostering innovation across educational systems. The methodology employed is quantitative, relying on numerical data. Additionally, the Department utilized its internal educational policy expertise and collaborated with AI policy experts to shape the findings and recommendations presented in this report. This report aims to engage teachers, educational leaders, policymakers, researchers, and educational technology innovators and providers in addressing critical policy issues emerging from the integration of Artificial Intelligence (AI) in education. It outlines opportunities for leveraging AI to enhance education, acknowledges the challenges that may arise, and provides recommendations to guide future policy development.

Kaledio et al. (2024) Discover in this paper The Impact of Artificial Intelligence on Students' Learning Experience carried out. The study to examine the impact of AI on students' learning experiences, focusing on its advantages and potential challenges. The study employs qualitative methods, emphasizing how AI technologies facilitate personalized and adaptive learning experiences by delivering tailored content and feedback based on individual learning needs and styles. Looking ahead, the study highlights a possible risk of students becoming overly dependent on AI, leading to passive learning. If AI can be leveraged to engage students actively, further research will be conducted to address this concern.

Ali et al. (2024) The tittle of this research paper: The effects of artificial intelligence applications in educational settings: Challenges and strategies. The Objective of this paper to assess the key challenges influencing the adoption of AI models in the education sector. The study follows a quantitative methodology. The insights provided in this review serve as a reference for policymakers, teachers, technology experts, and stakeholders. A total of 69 articles were selected from a pool of 618 academic journal publications spanning from 2018 to 2023. After thoroughly reviewing the selected articles, the study identifies several research gaps and challenges that must be addressed before users can fully trust the knowledge generated by ChatGPT. The findings also underscore the need for further exploration before ChatGPT can be widely adopted in the education sector. Additionally, this review establishes a critical foundation for future research.

Almasri (2024) In this paper Exploring the Impact of Artificial Intelligence in Teaching and Learning of Science: A Systematic Review of Empirical Research. The objective of this study to provide insights that guide future research efforts and promote evidence-based practices to enhance science education through AI. The study highlights the potential benefits of AI in science subjects while also identifying disparities that could arise due to gaps in infrastructure, regional preparedness, or accessibility. The objective is to equip educators, learners, policymakers, and curriculum designers with a deeper understanding of AI's role in scence education. The methodology follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (Page et al., 2021), involving multiple stages such as defining research questions, formulating a protocol, conducting a literature review, systematically screening studies, extracting data, and

synthesizing findings. The study examines 74 empirical studies on AI in science education, incorporating mixed, qualitative, and quantitative research methods. Research interest in AI applications in science education peaked in 2023 with 27 studies, followed by 10 in 2022, 8 in 2021, and 9 in 2020.

Sasikala and Ravichandran (2024) Conducted the Study on the Impact of Artificial Intelligence on Student Learning Outcomes. The objectives of this study to explored AI's transformation potential in education by analyzing its impact on student learning outcomes. The study employs a literature review methodology, systematically identifying, selecting, and critically evaluating relevant academic sources to understand AI's role in education. This approach synthesizes existing knowledge, identifies research gaps, and examines both theoretical and practical implications. The findings indicate that AI enhances engagement and personalized learning but also raises ethical concerns and implementation challenges. The synthesis further addresses AI's broader educational impact, including its influence on teaching practices, teacher roles, and educational assessment. The study integrates diverse research findings to provide a comprehensive perspective on AI's role in education, identifying opportunities and challenges.

Abdulrahman et al. (2024), In this paper Exploring the impact of artificial intelligence on higher education: The dynamics of ethical, social, and educational. The Objective of this paper to examine AI's impact on higher education in Saudi Arabia, focusing on stakeholders' attitudes, perceptions, and expectations. Using a quantitative methodology, the study collected data through an online survey with 1,113 participants. The results indicate a generally positive perception of AI in higher education, with stakeholders recognizing its ability to enhance teaching, streamline administrative processes, and promote innovation. The study also emphasizes ethical considerations such as privacy, security, and bias. Respondents envision AI-driven personalized learning, ethical integration, and ongoing collaboration in education. Future research is recommended to address current limitations through cross-cultural comparisons, interdisciplinary research, and broader analyses of AI's societal and educational implications.

Antony and Muhammed (2024). This paper Exploring the Implementation of AI-Driven Personalized Learning Techniques among the Research Scholars in Kerala . The study to assess AI-driven personalized learning adoption among research scholars in Kerala. The study focuses on understanding scholars' familiarity with AI-based learning tools, their satisfaction with AI-driven techniques, and AI's effectiveness in enhancing engagement, motivation, and academic performance. A mixed-methods approach, including surveys, interviews, and observations, was used to examine adoption rates, benefits, challenges, and outcomes. The study also considers contextual factors affecting AI implementation in Kerala's educational landscape. The findings aim to offer insights into AI-enhanced learning and contribute to future educational technology advancements.

Gidiotis and Hrastinki (2024). The topic of this paper Imagining the future of artificial intelligence in education: a review of social science fiction. The Objective of this paper to explore how social science fiction can serve as a creative and critical method for imagining AI's future role in education. The study analyzes 100 social science fiction stories written by researchers, focusing on how AI is depicted in teaching and learning. The methodology includes thematic analysis and keyword searches in academic databases. The study identifies overarching themes in AI-related fiction and examines how such narratives reflect real-world educational challenges.

These fictional scenarios help anticipate potential issues in AI's educational integration and contribute to discussions on the future of AI in learning environments.

Ashwini et al. (2024). In this paper The Role and Impact of Open AI Tools in Higher Education: A Bibliometric and Content Analysis Study conducted this study to examine the role and impact of OpenAI tools in higher education. The research objectives include understanding the scope of OpenAI tools on GitHub, analyzing their functionalities for education, comparing their academic relevance, and identifying areas for improvement. The study reviews empirical research on AI in education from 1993 to 2020, sourced from the Web of Science database and specialized AI education journals. A total of 40 studies were selected and analyzed using bibliometrics, content analysis, and meta-trend categorization. The study identifies gaps such as a lack of research on OpenAI's role in higher education, uncertainties about AI's function in academia, and limited teacher familiarity with OpenAI tools. The findings are presented through case studies featuring student outputs, analyzing their use of AI in academic settings.

Research Gap

Previous research has explored various aspects of AI in education, including its impact on teaching and learning, the opportunities and challenges faced by students and educators, AI implications for future schools, the characteristics of AI, and the influence of AI systems on culture, norms, and expectations between students and instructors. Studies have also examined AI's role in personalizing online teaching and learning experiences, AI applications in assessment and grading systems, key challenges in AI adoption, and the impact of AI in specific regions, such as Saudi Arabia, Northern India and Kerala. However, a notable gap exists in the literature regarding the enhancement and optimization of student learning through AI, particularly in relation to its impact on critical thinking, creativity, teacher-student relationships, and the future role of AI in higher education.

Objectives of the Study

1. To explores AI Enhances and optimizes on student learning.
2. To Identify the impact of AI on critical thinking, creativity and teacher student relationship.
3. To predicts the future of AI in education.

Research Questions

1. How does AI driven personalization improve individual learning outcomes for students?
2. What impact does AI have on critical thinking, creativity, and teacher student relationship among learners?
3. How might predicting the future of AI from learners' perspectives?

Methodology of the Study

The Research adopts a qualitative research approach, empirical study to discover the impact of artificial intelligence (AI) on learning in higher education. The research specifically aims to understand the perceptions, attitudes, and experiences of students towards AI-powered learning tools at the undergraduate (UG), postgraduate (PG), and Ph.D. levels. The qualitative approach, empirical study makes it possible to conduct a thorough examination of the subjective experiences and perceptions of participants concerning how AI's influence on their learning process in higher

education. In this research data was collected from primary and secondary source. Primary Data for this research were gathered using an online questionnaire. The questionnaire was set to obtain qualitative answers about the experiences, attitudes, and perceptions of students about AI in learning. 180 participants were randomly chosen for this study, who were students enrolled in UG, PG, and Ph.D. programs. The sample was selected based on a purposive sampling method so that diverse points of view are obtained from different levels of academic programs. The qualitative data obtained were themed through thematic analysis.
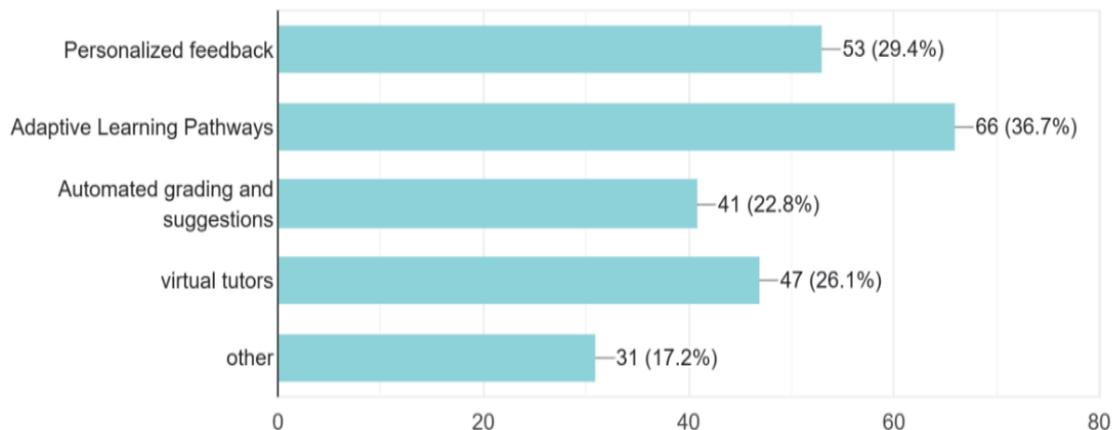
Data visualization
Sample size and representation of classification of Group
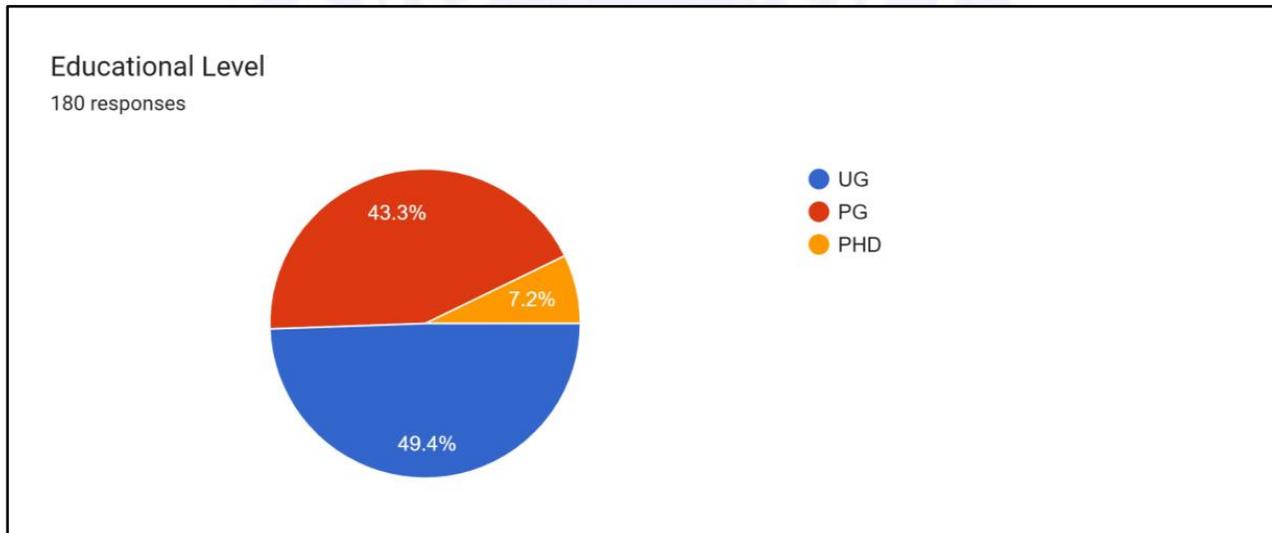
The Researchers collected the total 180 responses from different levels of academic programme.
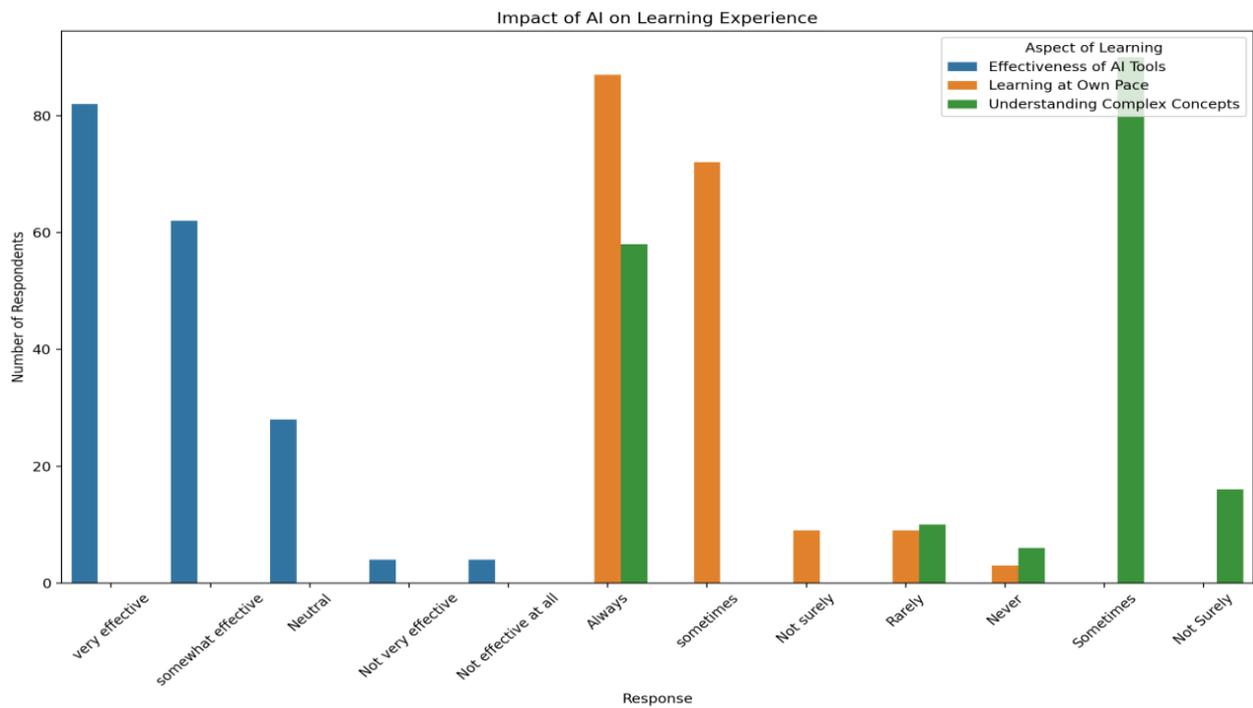

Objective 1: To explore AI Enhances and optimizes on student learning

Figure 1:

Impact of AI on Learning Experience

Figure 2:

Impact of AI on Academic Performance
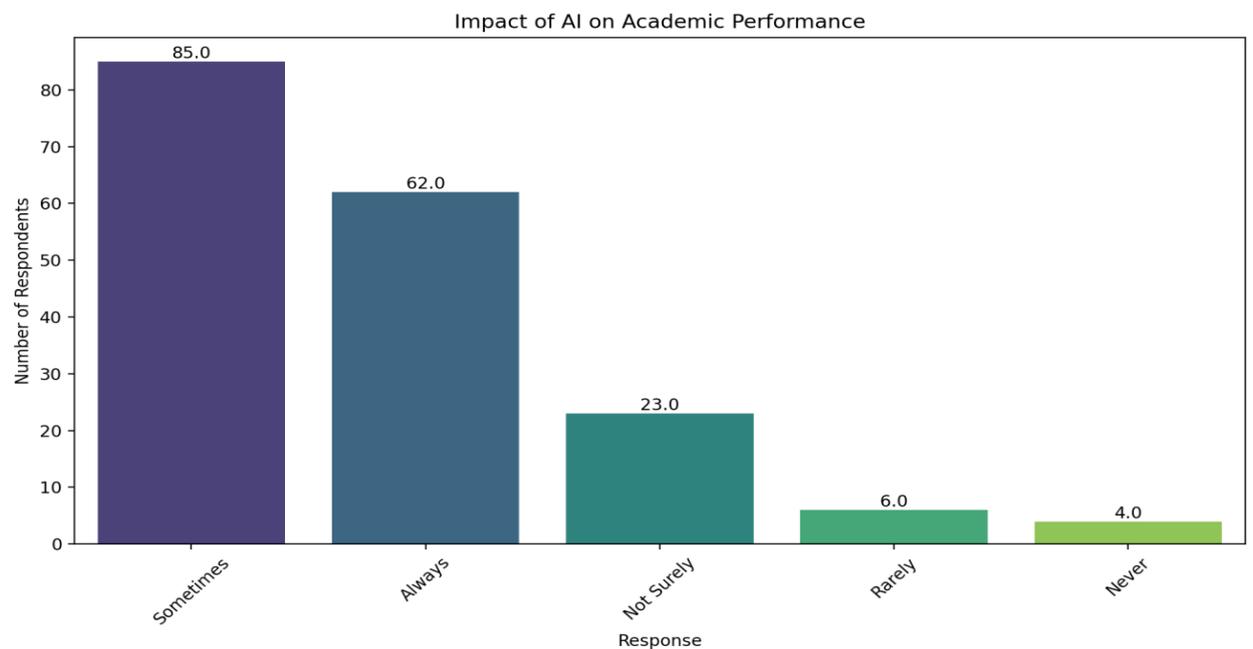
Objective 2: *To Identify the impact of AI on critical thinking, creativity and teacher student*

relationship

Figure 3:

Figure 4:
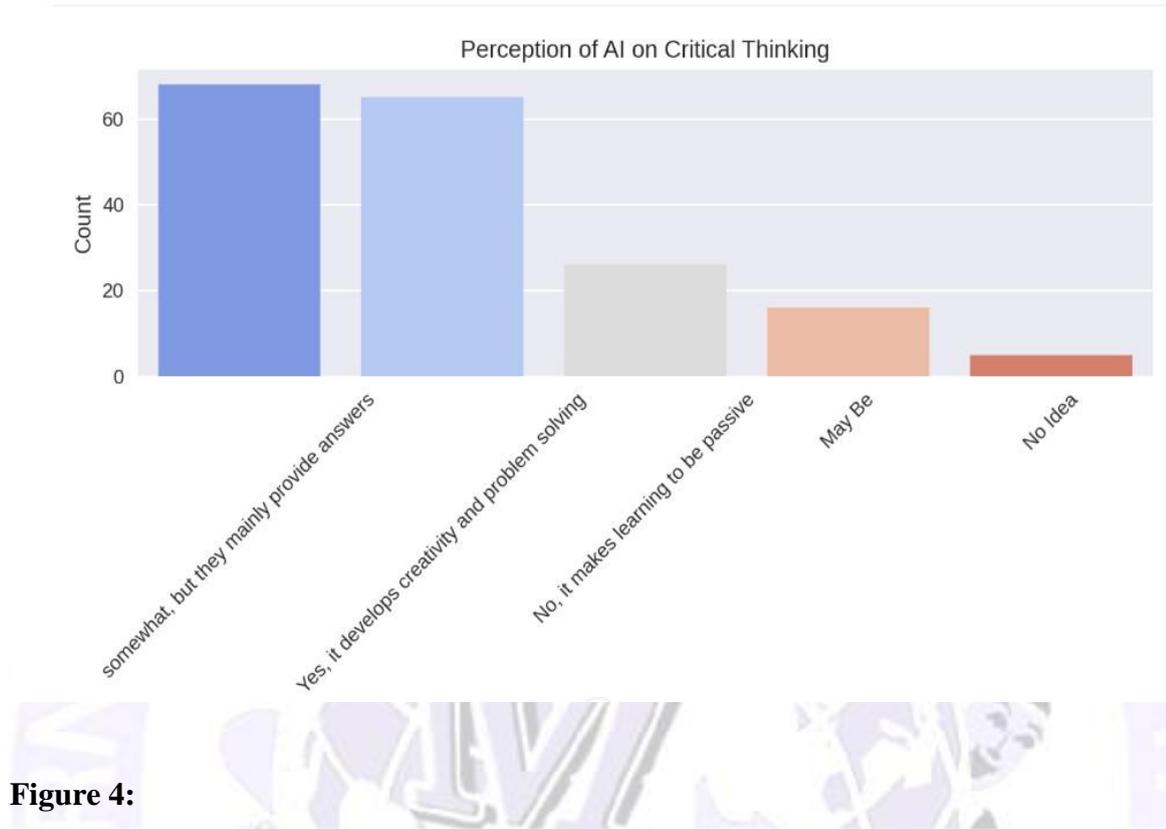

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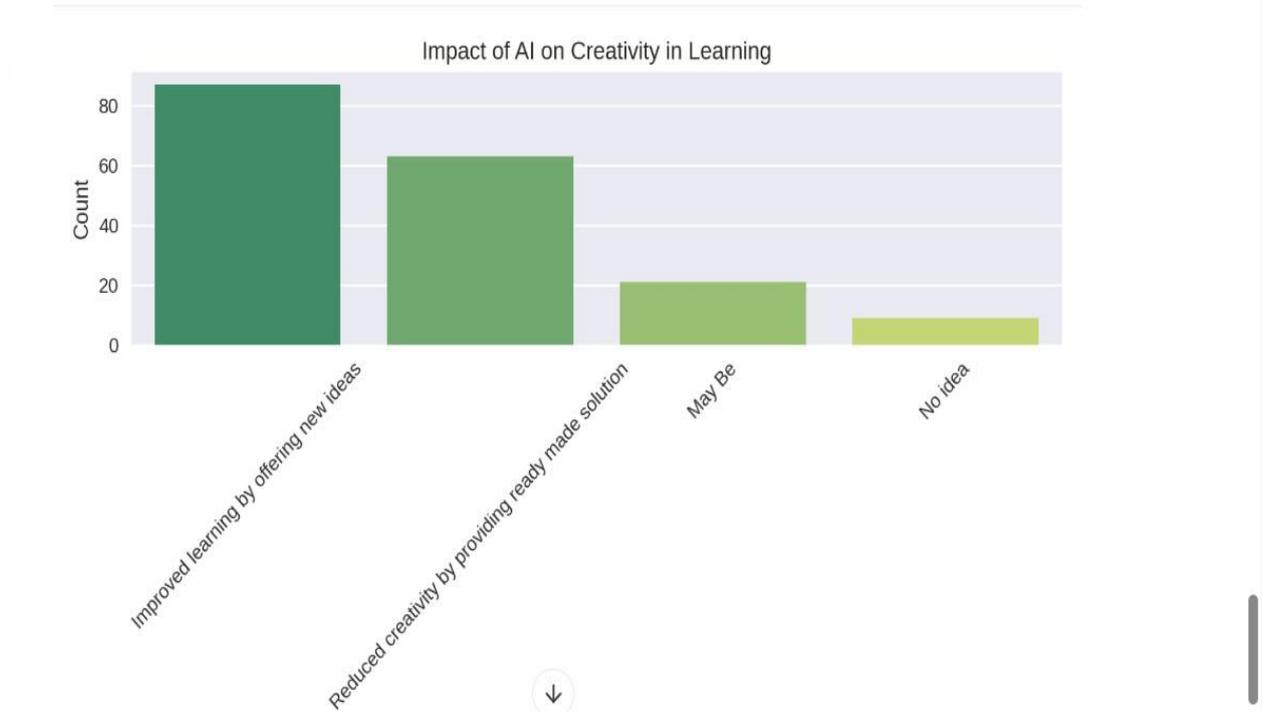
Perception on Teacher-Student Interaction with AI
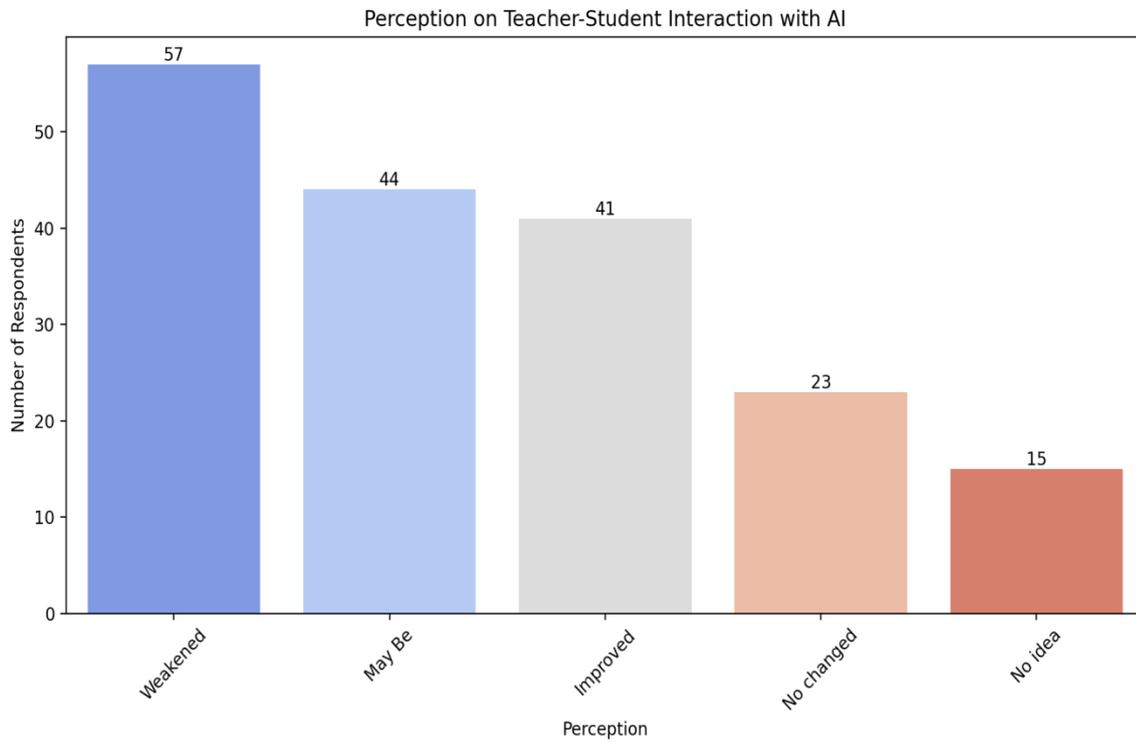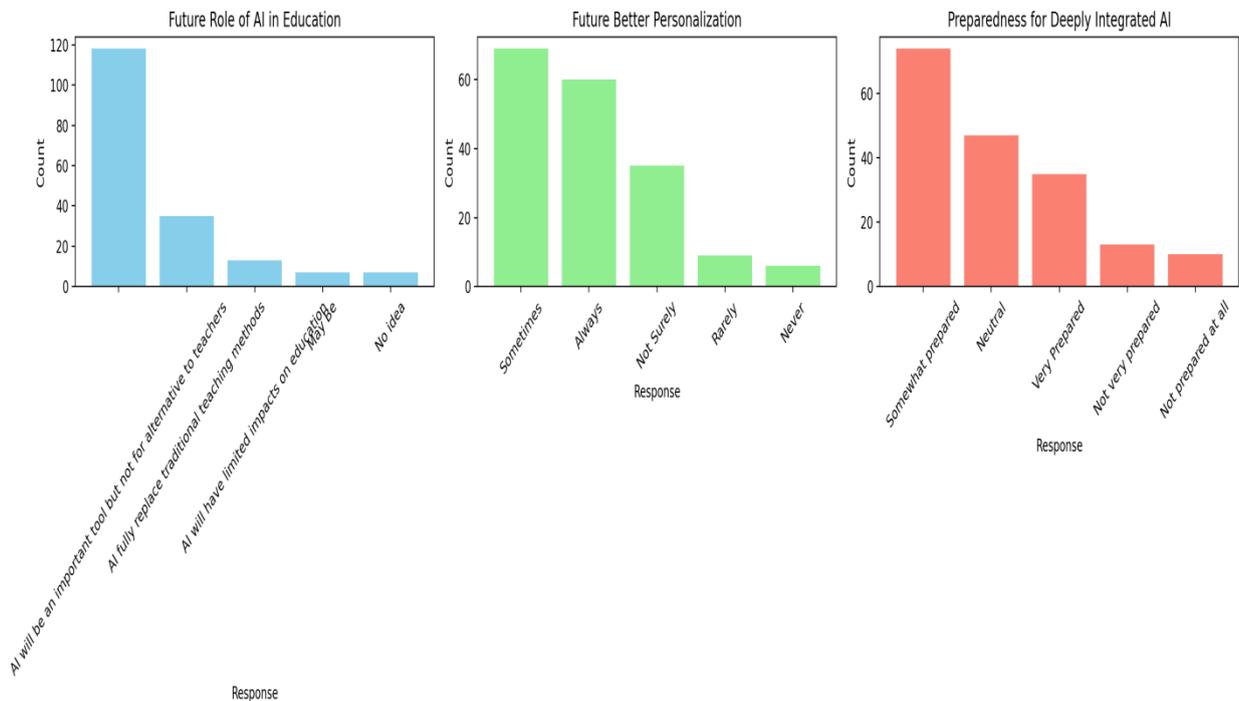
Objective 3: To predict the future of AI in education.

Figure 6:

Result & Discussion

Figure 1: *Impact of AI on learning Experience*

From the collection of data, the researcher found that: ***Effectiveness of AI Tools:*** A considerable proportion of participants rated AI tools as highly effective (over 80%) and somewhat effective (around 60%), while only a minor segment assessed them as neutral or ineffective. ***Learning at One's Own Pace***: The vast majority of respondents indicated "Always" (more than 90%) and "Sometimes" (approximately 70%), demonstrating that AI significantly facilitates self-directed learning**. *Understanding Complex Concepts***: A notable number of participants reported that AI is beneficial "Always" (about 60%) and "Sometimes" (around 50%) in aiding the comprehension of intricate subjects. Conversely, a small group indicated that they "Rarely" or "Never" found AI helpful in this regard.

So, AI is widely regarded as an effective tool for enhancing educational experiences. It promotes self-paced learning, empowering students to manage their own learning tempo. Furthermore, AI is instrumental in assisting learners in understanding complex concepts, thereby establishing its value as an educational resource.

Figure 2: *Impact of AI on academic Performance*

AI exerts a favorable effect on academic performance, as evidenced by the majority of respondents who recognize its advantages at least occasionally or consistently. The significant proportion of "Sometimes" responses indicates that while AI is beneficial, its effectiveness may fluctuate based on various factors such as the subject matter, the manner of usage, or the availability of high-quality. In conclusion, AI has a generally positive impact on the academic performance of most students, although this influence is not uniform or consistent across all contexts. Additional research or enhancements in AI tools could potentially improve their effectiveness in educational environments. Educational institutions might consider offering more support on the integration of AI to optimize its advantages for students.

Figure 3: Critical thinking

The cultivation of critical thinking skills has long been recognized as a fundamental goal within higher education, serving as a vital core competency for the 21st century. This skill set broadens students' viewpoints and promotes their growth as capable and independent learners, thereby improving their self-directed learning competency (Lawasi1, Rohman, Meicky Shoreamanis 2024). Critical thinking skills encompass the enhancement of knowledge through thoughtful analysis and the formulation of reflective judgments, facilitated by opportunities for problem-solving. (linter,2024). Karimi and Khawaja (2023) argue against the notion that artificial intelligence (AI) can enhance students' critical thinking skills. They suggest that the ease and automation of information retrieval may discourage students from engaging in deeper analysis and evaluating the results they obtain. This trend contributes to a passive learning environment, hindering students' opportunities to apply their critical thinking abilities. Supporting this viewpoint, Walter (2024) notes that if students neglect to read the foundational context of a lesson before utilizing AI, they are less likely to critically assess the AI-generated outputs. Consequently, this reliance on AI may adversely affect students' critical thinking capabilities.

In this research investigator found the result from survey: ***AI Helps but Mainly ProvidesDirect Answers (~39%)*** The highest percentage suggests AI assists learning but primarily offers direct answers. This improves efficiency but might limit deeper analytical thinking.AI-based

tools should be structured to stimulate inquiry rather than just provide solutions, *AI Enhances Creativity and Problem-Solving (~31%)* A significant portion believes AI fosters problem-solving and boosts creativity. AI's ability to process vast amounts of data helps learners explore multiple viewpoints. When used correctly, AI can serve as a tool for developing critical thinking.

So, the data reveals that **AI plays a dual role in critical thinking—**it provides structured solutions that aid learning but may also lead to passive engagement.

Figure 4: Creativity

Creativity with problem-solving and the ability to shift and adjust one's perspective to make new connections (Guilford, 1967).Creativity is closely linked to both originality and effectiveness, as noted by Runco (2004) and Runco and Acar (2012).Marrone et al. (2022) assert that students believe artificial intelligence has the potential to enhance their creativity by promoting independent thought and providing avenues for creative expression, including innovative approaches to various scenarios (p. 7).

From the survey researcher found that *AI Encourages Creativity through New Ideas (~47%)* A large portion of respondents believes AI enhances creativity by introducing fresh ideas.AI offers innovative resources that push students to explore unconventional methods. Personalized suggestions from AI can inspire broader thinking in creative tasks.*AI Reduces Creativity by Providing Ready-Made Solutions (~36%)* Many participants feel AI might limit creativity by offering pre-made solutions. While AI increases efficiency, it may reduce independent problem-solving. Over-reliance on AI-generated content could hinder originality and deep analysis.

The graph indicates that while AI significantly contributes to creative learning, concerns exist regarding its tendency to provide instant solutions that may discourage independent thought.

Figure 5: Impact of AI on teacher Student Relation

AI chatbots have the potential to improve interactions between teachers and students by providing a dependable and responsive means of communication (Clarke et al., 2018; Serholt, 2019). For example, research conducted by Fryer et al. (2019) indicated that students who utilized an AI chatbot for inquiries related to their courses experienced a more positive relationship with their instructors.

The chart shows how respondents perceive the impact of AI on teacher-student interaction. The distribution of responses indicates a mix of opinions—some respondents feel that AI has improved the interaction while others believe it has weakened it.

Figure 6: Future Role of AI in Education

The answers differ, reflecting that although most consider AI an important tool, there is disagreement about the scope of its role. Some of the respondents see it as a supporting technology, and not a replacement of the teachers.

Future Better Personalization

Most of the respondents feel that AI will lead to better personalization in learning experiences, reflecting optimism that future AI technologies will adapt learning to individual requirements better.

Preparedness for Highly Integrated AI

In terms of being prepared for learning with highly integrated AI, answers reflect different levels of preparedness among students. Some are highly prepared, whereas others are less prepared, highlighting a possible requirement for additional education and training.

Overall, although there is hope for better personalization and the changing use of AI in education, there is also the recognition that there will be further need for readiness and a balancing approach to sustain human interaction within learning settings.

Conclusion:

The key findings of the research suggest that AI has a significant impact on learning in higher education. So. The key findings are 1. Enhancing and Optimizing Student Learning: AI-powered tools are widely perceived as effective in improving educational experiences, facilitating self-directed learning, and aiding the understanding of complex concepts. AI-driven personalization and adaptive learning have the potential to enhance individual learning outcomes and academic performance. 2. Impact on Critical Thinking and Creativity: - AI plays a dual role in critical thinking, as it provides structured solutions that aid learning but may also lead to passive engagement, potentially hindering deeper analytical thinking. While AI can inspire innovative ideas and problem-solving, there are concerns about its ability to diminish originality and independent thought, potentially impacting student creativity. 3. Influence on Teacher-Student Relationships - The impact of AI on teacher-student interactions is mixed, with some perceiving it as improving the relationship, while others believe it has weakened the dynamic. 4.Future Trends and Implications - Students envision a future where AI will lead to better personalization of learning experiences, but there are varying levels of preparedness for highly integrated AI in education.

Future Recommendation for Research:

Several future research recommendations regarding the impact of artificial intelligence (AI) on learning in higher education:

- Exploring AI's Impact on Critical Thinking and Creativity: The findings suggest a dual role of AI in critical thinking, where it provides structured solutions but may also lead to passive engagement. Further research is needed to understand how AI can be leveraged to enhance critical thinking skills while maintaining student creativity and independent thought.

- Investigating the Influence on Teacher-Student Relationships: The mixed perspectives on the impact of AI on teacher-student interactions warrant additional research to better understand the dynamics and develop strategies to optimize the relationship between learners and instructors in AI-enhanced learning environments.

- Assessing Student Readiness for Highly Integrated AI: The varying levels of student preparedness for highly integrated AI in education highlight the need for further research to identify the factors that contribute to student readiness and develop appropriate support mechanisms to ensure a smooth transition towards AI-driven learning.

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