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The Role of Artificial Intelligence in Enhancing Students Engagement at Elementary level in Private School, Karachi

Tashifa Fayyaz

M.Phil. Education, Department of Education, Faculty of Social Sciences & Humanities, Hamdard University, Karachi

Dr. Munawer Sultana

Department of Education, Faculty of Social Sciences & Humanities, Hamdard University, Karachi

ABSTRACT

The role of Artificial Intelligence (AI) in modifying education has achieved importance globally, especially in enhancing students' engagement in classroom at elementary level. This study explores the effectiveness of AI-integrated education in enhancing student engagement at elementary level in a private school of Karachi. This research find out how AI tools and platforms encourage active participation and motivation among young learner by providing personalized learning experiences. This research also examines the impact of AI on student-teacher interaction, engagement, collaboration and classroom dynamics. Action research was used under qualitative design and convenient sampling was employed to conduct this study. Five pre-intervention and five post intervention lesson plans are conducted for observation. Sample of this research was 25 students of grade 7th of a private school Karachi. Findings shows that AI-based learning activities enhance the engagement, interaction and collaboration among students. Result further indicates that AI-integrated learning minimize boredom and disengagement and helps in dealing with challenges of traditional education. This study highlights how AI-based learning activities bridge up the gaps in engagement of students in classrooms at elementary level in private schools. On the basis of these findings it is recommended Schools should provide training sessions and workshops to teachers to equip them with practical AI-based strategies and tools. Teachers should use customizable AI-based tools to make activities interactive and collaborative which minimize setup time while enhancing engagement.

Keywords: Engagement, AI-based learning, Collaboration, Simulations

Research Objectives

Following was the objective of this research projects:

General Objective

To explore the Role of Artificial Intelligence in Enhancing Student Motivation and Engagement in Elementary Grades

Specific Objectives

To figure out the effect of AI tools (simulations) on learners' engagement

To find out AI tools that can lead to improve student engagement at elementary level.



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To examine how Artificial Intelligence influences students' engagement during classroom learning activities.

Research Questions

How integration of AI can be helpful in enhancing student's engagement in classroom?

What type of AI technology can be utilized to improve learner engagement in elementary classroom?

How Artificial Intelligence can be used to influence students' engagement level in classroom?

Introduction

Artificial Intelligence (AI) has developed as a transformative network across numerous fields, including education. AI refers to the imitation of human intelligence by machines designed to perform jobs that typically require human cognition, such as decision-making, problem-solving, and learning. Artificial Intelligence technologies are progressively being assimilated to enhance personalized learning experiences, learning outcomes and improve student motivation and engagement in Educational environment. In elementary education AI technologies are being integrated to foster student engagement and motivation in the light of the fact the Artificial Intelligence systems have capability to transform traditional approaches in education.

The integration of AI in education system has undergone substantial development over the past few decades. Initially, AI in education system concentrated on adaptive learning boards and AI tutoring systems designed to modify the learning experiences for students based on their personal needs. The early AI systems were restricted to their competences however set the groundwork for more advanced technologies. Currently, AI is being used in a variety of methods, including virtual teaching assistants, automated grading systems, and educational data analytics that provide insights into student learning patterns.

With its potential to transform, AI has been enhancing student motivation and engagement by identifying the gaps in learning and providing experiences for personalized learning. Furthermore, immersive and interactive experiences for learning can be created via AI systems to keep students attentive, motivated and engaged. Learning gaps which learners are struggling with can be identified and adjusted through more tailored teaching approaches with the help of AI too make the learning more engaging and efficient.

Recent research emphasize on general or higher educational settings, with limited focus on young learners. Hence, this study is aimed towards addressing the mentioned gap in elementary educational settings by exploring the possible implications of Artificial Intelligence in elementary education, with a particular emphasis on creating more personalized and interactive environment through effectively implementing AI tools in classrooms.

The necessity for this research is also underscored due to the rapid developing of education field, where technology is progressively seen as a crucial element of effective learning and teaching. The integration of digital tools in education is also enhanced by the COVID-19 pandemic, underlining the potential of AI to support in-class learning environments through enhanced engagement. As the educational institutions endure to adopt technology-driven approaches, this study will contribute to deepen the understanding of how AI can explicitly enhance student engagement at the elementary level is crucial for shaping the prospect of education. This study will also offer practical insights for learners and educators on how to harness artificial intelligence to enhance students' engagement at elementary level.



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Rationale

In recent years, Artificial Intelligence (AI) integration in education has extended significant attention. Researchers are exploring its prospective to modernize the learning and teaching process. Transformative role of Artificial intelligence is highlighted in several studies across various levels i.e. in administrative and educational system.

Despite these developments, there is a huge gap and lacking in integration and application of AI in the context of Pakistan. Literature on this topic is available but dearth of action research studies found on the same topic. Hence, this study intervene the system and explore the Role of Artificial Intelligence in Enhancing Student Engagement in Elementary Grades. Also, a notable gap in integration of Artificial Intelligence (AI) in teaching and learning process at elementary level education of Pakistan is found.

Being a teacher-student and an experienced teacher of AI integration, it is observed that there is a need for integration of AI at primary level as the teachers are not employing AI tools in their classroom, either they are not aware or they do not know how to use these tools. This study tries to explore the enhancement of student engagement through AI integration. The review of the studies clarifies the transformative role of Artificial intelligence in enhancement of student engagement and learning process.

Significance

For Teachers

This study will offer a variety of strategies for educators to integrate AI in lesson planning and improving classroom environment by providing personalized learning experiences to elementary level learners. Furthermore this research will address the compensations and contests of AI integration in classrooms by facilitating educators with a view to overcome technical limitations

For Students

This study will offer insights into how AI tools can be integrated practically to develop a deeper understanding of students in their lessons which aligns with the idea of using AI for personalized learning. Most importantly, this study will be helpful for student in developing problem solving and critical thinking skills and promoting higher order thinking skills and inquiry based learning with the help of Artificial Intelligence (Shaukat R., 2024). Moreover this research will identify the AI applications and websites which can help the student with the opportunities of personalized learning at elementary level in Pakistan.

For Future Researchers

Due to inadequate references of studies particularly on AI Integration in education at elementary level within Pakistan, this study will offer a confined perspective on role of AI integration in enhancing student engagement at elementary level. Upcoming scholars can explore this research area in advance by conducting quantitative researches or case studies on a larger scale. Furthermore, researchers can also refine the study focused to address the integration of Artificial Intelligence in specific subject.

Literature Review

Educational landscape has rapidly being transformed through AI, specifically to enhance students' engagement at elementary level. Integration of AI tools improves learning outcomes, enhance classroom engagement and foster personalized learning experiences. Integration of AI technologies in educational settings has been more vigorous in



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developed countries, while developing countries and Pakistan are initiating the exploration of AI's potential to transform the educational strategies. This literature review explores various characteristics of AI's role in nurturing student engagement, underlining standpoints from developed, developing countries, and Pakistan.

AI in Education: A Global Perspective

In education AI has evolved as an essential tool for transmuting teaching methods. Role of Artificial Intelligence in educational settings extends from personalized learning to computerized assessments, offering exceptional possibilities to enhance engagement (Ahmad et al. 2021). According to OECD (2025), AI is integrated in educational Institutions of developed countries to nurture adaptive learning environments and enhance classroom engagement, allowing systems to respond enthusiastically to learner's needs. The AI technologies can provide personalized Assessment methods and learning resources, which assistance foster students' engagement in classroom.

Kim (2024) highlighted that AI-driven educator collaboration boosts instructional approaches by reducing administrative burdens and providing educators more time to focus on engaging students in learning. The integration of AI tools such as AI-Chabot and virtual assistants further help in tailored tutoring, which not only engages students but also enhances the effective achievement of learning outcomes (Xu et al., 2023). Moreover, the placement of AI technologies in smart classrooms in developed countries offer real-time learning feedback by facilitating learners with interaction to AI tools which preserve engagement in everyday learning practices (Dimitriadou & Lanitis, 2023).

Globally, AI-based platforms are being integrated to modify learning settings rendering to learners' needs and abilities. AI-powered tools such as adaptive learning systems examine learner performance and adjust content delivery consequently. This process keeps students engaged through providing tasks and lessons at very suitable level of difficulty, enhancing continuous improvement. AI-translation tools allow learners to access global learning resources, and Chabot are gradually being used to support learners with their queries and problems. Furthermore, AI tools are being implemented to systematize the ranking of assignments and tests, to provide prompt feedback, allowing learners to fix their errors and make progress in their performance on the spot.

AI-driven educational platforms connect AI with collaborative quizzes, video lessons to enhance the achievement of higher levels of engagement in developing countries. Distant learning where educational institutes are lacking assistant staff facilitated by AI- powered virtual tutoring platforms. AI tools are being integrated to monitor learners' engagement and performance in some developing countries. Regardless of these improvements, some challenges like internet connectivity, operating devices and instructor training limits extensive enactment. On the other hand, these integrations are gradually improving student engagement in classrooms across developing countries.

AI in Education: Challenges in Developing Countries

Regardless of the assistances, the developing countries face significant challenges while adopting AI in education. According to Ahmed et al., (2021) many difficulties are being faced while integrating AI in education by developing countries due the lack of infrastructure. These developing countries are facing problems due to the lack of teacher training, economical resources and teacher training. However, AI remains substantial due to its potential to enhance engagement in classrooms if the mentioned obstacles could be resolved. Teacher support plays a significant role in integration of AI. Teachers are



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required not only to be trained for using AI tools but also how they engage student through integration of AI (Wu and Yang, 2022).

According to Mallik & Gangopadhyay (2023), in China and India the focus of AI integration in education has been growing along with the development of AI-driven learning platform which have potential to foster both engagement and proactive learning. While the role of AI in education is still emerging in Pakistan at elementary level. Pakistan has made developments in educational transformation however AI is not being utilized (Shoukat, 2024).

Lack of teacher training and technological resources hinder the efficiency of AI in improving engagement level at the elementary grades. According to Rathore et al. (2023), this gap can be bridged by inculcating AI-based teaching and learning strategies in curriculum. This will allow to create more engaging learning environment and interactive classrooms in Pakistani context.

According to Hussain et al. (2024), developed and developing countries have varied level of AI integration in education. Educational systems of developed regions like Europe and North America embedded AI tools to provide personalized learning experiences with the help of adaptive technologies. In these regions, students are benefitted from refined AI learning platforms. These AI learning platforms not only enhance engagement level but also provide deeper insights into learners' progress level through contemporary analytics. On the flip side, Shoukat (2024) highlights the challenge of developing countries that Pakistan and India are facing infrastructural challenges which limit the accessibility of AI in education. In various circumstances, urban areas restricted to engage students with the help of AI-based teaching strategies, while rural areas are left to rely on traditional teaching approaches. While in under-resourced schools, there are steps being implemented to enhance engagement with the help of AI solutions. This gap between rural and urban areas could be bridged by integrating AI-based solutions which are cost-effective (Rathore et al., 2023).

AI as Personalized Learning platform

AI platforms work as key ways for personalized learning which enhance engagement in classroom. An argument is found in the study of Ahmad et al. (2021) that differentiated instructions can be tailored to the diverse needs of students with the help of AI tools. Those AI platforms which are adaptive help to fulfil students' needs, adjust their progress, offer real-time feedback and customize learning strategies. Engagement can be enhance through this approach, especially for students who struggle with conservative learning environment.

AI is being used in developed countries education system which aims to facilitate students with personalized learning experiences. For instance, AI-Based learning platforms like PhET, Coursera, Kahoot, Quizzez and Quizlet **modify the leaning content according to students learning styles and paces. It helps to engage and motivate students** (Holmes & Tuomi, 2025).

Xu et al. (2023) state in their study that **AI Platforms which are personalized, aid teacher to find out the areas where students are struggling and need more support. These personalized tools enhance engagement with the help of directed interventions.**

Meanwhile Pakistan has significant potential for personalized AI-based learning, though it is not fully acknowledged. The need for Personalized AI-driven tools is highlighted in the study of Ullah et al. (2024). They highlighted that AI-based learning platforms are required to resolve the particular educational challenges of Pakistani



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education system. Classroom engagement can be revolutionized in Pakistan by facilitating teachers with AI-driven tools to tailor the teaching strategies. With the help of AI-based tools, teacher can tailor teaching strategies to diverse needs of individuals. Both teacher and student s' engagement can be enhance through this approach.

Role of Artificial Intelligence in enhancing Classroom activities

Classroom environment can be interactive with the help of AI which also enhance student engagement through AI-Based interactive activities. According to Tedre et al. (2021) students can be engaged in interactive manner and more concepts can be explored practically through AI-based teaching and learning tools such as simulations, educational games and Quizzes. AI helps to teach and understand the complex concepts which are difficult to teach through traditional teaching methods,

The study highlights that AI-based classroom activities are common in developed countries, For example, learners use AI tools like simulations, robotics and virtual Labs to make the learning more engaging (Lin & Brummelen V., 2021). The researchers argue that AI-based activities foster collaboration among students by facilitating a dynamic learning environment in classroom and keep students engaged and active (UNESCO, 2025).

Integration of AI-based activities in classroom is limited in Pakistan however it is being incorporated gradually. The study recommends the development of AI tools associated with Pakistan's National curriculum to make learning more engaging and interactive. AI-driven classroom activities like AI-based experiments, simulations and visual field trips, can provide the opportunities of personalized learning to students with high level of engagement and interaction (Ullah et al., 2024).

AI for Teacher Support and Administrative Efficiency

AI-integrated learning does not only enhance students' engagement but also help to reduce the burden of educators and develops administrative efficiency. AI-based application can handle routine tasks, such as attendance, grading administrative task and scheduling the day to day routine which helps educators to focus on students' engagement and interaction. Devveloped countries use AI-based systems like attendance tracking portals, auto-grading applications to reduce burden of educators (Ahmad et al., 2022).

AI not only enhances student engagement but also improves administrative efficiency, freeing up more time for teachers to focus on interactive instruction. According to Ahmad et al. (2022), AI can handle routine administrative tasks such as grading, attendance, and scheduling, allowing teachers to invest more time in engaging students directly. In developed countries, AI-driven systems like automatic essay grading and attendance tracking are widely used to reduce teacher workload.

Teachers in developed countries assimilate with AI-driven systems to plan teaching strategies to enhance the level of student engagement in classroom. Teacher utilize AI for modifying their instructional strategies to cater individual needs of learners. AI also helps in providing insights of students' performance (Kim, 2024). In a study Rathore et al. (2023) declares that in developing countries including Pakistan, AI-based systems can administer the routine task and support teachers to reduce their workload so that they can have more time to engage students in classroom activities.

Furthermore, AI plays a significant role in helping educators by providing personalized assistance which not only handle administrative tasks but also boost their teaching practices. For example, AI-driven systems help teachers to apply directed interventions



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by analyzing data of students' performance through analyzing trends and patterns. This approach enables teachers to target the learning gaps where learners may struggle and also provide assistance in adjusting instructional strategies and facilitating learners timely. The potential to in-cooperate AI to modify teaching strategies does not only improves the quality of education but also nurture the interaction between teacher and learners. This methodology fosters inclusivity in education system and also empowers educators to create differentiated learning experiences that meet the diverse needs of learners (Hussain et al., 2024).

In Pakistan and other developing countries having inadequate educational resources, collaborate with AI for assistance in planning instructional strategies that significantly improve the teaching and learning experience. This strategy considerably helps in boosting the engagement and interaction level of students in classroom and also overall learning achievements (Rathore et al., 2023). Additionally, collaboration and communication among administrative bodies, parents, teachers and students can be improved through integrating AI in educational settings. AI-driven systems not only assist in professional development of teacher but also helps in providing real-time and constructive feedback that enables educators to continuously tailor their instructional practices. AI-powered systems help in scheduling and planning sessions to ensure that educators share their best practices and share their resources with other team members. Through this collaborative strategy, educators can create a professional learning community to foster modernization in teaching methodologies (Holmes & Tuomi, 2025).

Role of AI in Enhancing Engagement at Elementary Level

The significant role of AI in education specifically in enhancement of student's engagement level at elementary level seems promising however it need major investment in teacher training and infrastructure. AI is evolving continuously in developed countries, offering more modern AI-powered tools and applications that boost engagement level in classroom through provided opportunities for personalized learning experiences with administrative support and interactive activities (Hussain et al., 2024). There is need to integrate AI solution in developing countries including Pakistan to solve the major common issues faced by teachers and learners (Shoukat, 2024).

AI has capability to transform education into more student-centric education, enhancing engagement level through interactive tools and adaptive learning programs (Devi et al., 2022). In light of this fact another study declared that AI has potential to modify our education system, however in developing countries including Pakistan it requires huge investments in infrastructure and teacher training though AI development is crucial (Rathore et al., 2023).

AI plays a transformative role in enhancement of student engagement level in classroom at elementary level. AI offers opportunities for improved administrative efficiency, interactive classroom activities, personalized learning experiences and professional development programs. Developed countries have productively integrated AI-power systems in their educational settings. While in developing countries and Pakistan are facing challenges in integration of AI which is limiting the potential of AI in education. Nonetheless, with the proper investment in teacher training and infrastructure, AI can modify the education system across diverse contexts through personalized learning experiences and enhancing engagement level in classroom.



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Methodology

Qualitative Research

This research employs a qualitative method. Qualitative research is aimed to explore subjective experiences and gather insights into multifaceted spectacles, for instance the role of Artificial Intelligence (AI) in education to enhance student engagement at the elementary level. Through focusing on qualitative approach, this study aims to understand learners' behaviors, performances, and overall engagement in a better way (Libarkin, J. C., & Kurdziel, J. P., 2024).

Action Research

This research works through an action research methodology. Action research is a reflective and participatory methodology which permits the researcher to applicate changes, evaluate their impacts, and do necessary modifications (Perry, M., & Patrick, T., 2021). This approach is specifically suitable for education-based researches, because it includes researchers and teachers collaboration to familiarize AI tools in teaching and learning process and observe their impacts on learner engagement (Cresswell, J., & Poth, C. N., 2023). The malleable nature of action research facilitates a constant sequence of planning, acting, observing, and reflecting, that can be helpful in exploring how integration of AI stimulus learners' engagement in real-time classroom situations (Simmons, L., Marzouk, A., & Mooney, L., 2022).

Sampling

Population for this research is elementary level students of all the private schools in Karachi while the target sample for this study is the 25 students of class 7th of Zafar Public Secondary School. Students at this age group are at fundamental stage in their social and development, this group was selected due to the ideal sample for this study to check out the impact of AI integration (Rapp, M., Reimer, A., & Wilke, M., 2022).

Convenient sampling technique is used to select the sample due to time efficiency, cost-effectiveness and ease of access. This sampling technique allows the researcher collect data quickly from readily available participants (Etikan, I., Musa, S. A., & Alkassim, R. S., 2021).

Limitations

This research is conducted in only one Private School of Karachi. Finding of this study may not be able to generalize to other organizations, specifically in Public Sector due to different cultural and socio-economic factors. The results reflect particular institutional circumstances instead of wider developments within diverse educational backgrounds (Maxwell, 2021).

The full impact of AI integration on learners' engagement cannot be captured due to limited research timeframe. According to Holmes & Tuomi (2025), to understand continual engagement effects, longitudinal studies are required because short term findings may not reflect long lasting impacts.

Data Collection

The data collection process is based on multiple tools such as lesson planning, reflection writings, observations and field notes. The process is followed by two stages:

Pre-Intervention: Five classes will be conducted through traditional method of teaching at initial stage. The data is gathered by using mentioned tools without integrating AI in teaching methods. This stage is focused on the observation of students' interaction with



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each other and with teacher, their whole class participation and concentration toward lesson and instruction.

Post-Intervention: The post intervention phase includes 5 lessons which will be conducted with the integration of AI tools, such as interactive learning platforms.

Data analysis

The data is analyzed through thematic analysis. This stage includes transcribing the data, coding, categorizing and themes. This approach ensures the contextual relevancy in findings. Data analysis through thematic analysis contributes to the deeper understanding of the impact of AI integration on students' engagement at elementary level (Finlay, 2021). Thematic analysis provides a flexible theoretical approach to analyze qualitative data. With the help of this flexible approach researchers can provide deeper insights to complex concepts (Braun & Clarke, 2022).

Results

The analysis led to find the highlighted difference of engagement level of students between the pre-intervention and post-intervention.

Pre-Intervention Phase:

Engagement Level: Pre intervention phase lead to less engaging classroom and lower level of interaction among students. This phase provide limited chances for students' participation and collaboration.

Student A: Often started doodling in her notebook. When I asked her she replied "I like to draw circles on my notebook to divert mind".

Student B: She started interrupting; "Miss, may I go and sit on back side?" I allowed and then after 5 minutes she asked: "Miss. May I go to drink water?" after she came back she again interrupted by laughing loudly. I asked her if there's any problem so she replied: "Today's class is so boring because the same concept is being repeated again and again".

Student C: Student sighed and said: "There should be something to do as there is nothing excited happening".

The about statements prove that students were not engaged in classroom and they were zoning out throughout the lesson. Lesson was not interesting which lead to boredom. Students were not at same medium to learn due to the lack of engagement.

Interaction and Comprehension: In this phase, complex concepts were difficult to teach through traditional methods such as; density. Some concepts of particular discipline needs visual explanation. Such concepts cannot be taught through traditional Methods. Teacher was explaining the concepts through discussion.

Class discussions were going on and when the teacher asked a question:

Student A: She hesitated and respond "I don't feel good when I participate".

Student B: She was curious but struggled with comprehension. She asked "Ms. Can you please repeat that how light bends from one medium to another?"

Student C: "These lesson feel like one-way street".

Student D: She seems like she was scared to say and finally she said "I wanted to ask question but the classroom environment is not that encouraging, may be my questions doesn't make sense"

Student E: "This topic is boring and I learn through application more than just listening". Lesson was not interactive and Students were not able to relate some concepts like "bending of light and density in real life." Due to the lack of interaction students were not able to clarify their confusions. Students were getting distract from lesson and



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through many times they did not grasp the concepts. Students were also struggling in understanding complex concepts due to lack of application based activities.

Student-Centered Environment: Classroom environment was mainly teacher-centered which effected overall engagement, involvement and motivation level of student due to passive attitude of students towards learning.

Student A: "I wanted to do something to make me feel involved in classroom".

Student B: She was leaning on other student's shoulder and defended that she is listening and understanding in that position as well".

Student C: She followed instructions just for the Obligation.

The above statements show that classroom environment was teacher centered because teacher was explaining concepts verbally and students were not active participants in classroom.

Challenges: Due to the lack of engagement students were facing challenges in staying focus. The attention was often fading and resulting to waning understanding and participation. Sense of disengagement and disinterest was being created which hindered the overall participation level of students in classroom.

Student A: She was asking for permission to go outside.

Student B: Repeatedly asking "When will this lesson end?"

Student C: She was making faces as she is confused and said "I'm not getting the concept".

The above statements proved that in pre-intervention phase students were not focused towards the learning. Due to the lack of engagement students were not showing interest in learning which affected the overall participation of students.

Post-Intervention Phase:

Engagement level: The integration of AI tools in teaching and learning noticeably enhanced the engagement level of students in classroom. Students enjoyed the activities and participated in practices through AI simulations. Students were also excited to know what they were going to learn next.

Student A: "Miss, can we do more activities like this?"

Student B: "I wish I could learn all subject through these Simulations".

Student C: "I am enjoying so much".

The mentioned statements of students show that the classrooms in post-intervention phase are more engaging than pre-intervention phase. AI integration made the classroom well engaged and students were participating actively in classroom activities without reminders.

Interaction and Comprehension: AI integrated approach created a dynamic environment that did not only increased the interactions of students but also helped them in learning complex concepts. Integration of AI does not only encouraged interactive learning but also facilitated improved understanding of subject matter.

Student A: "This is the easiest way to learn the concepts".

Student B: "I was unable to understand how we can see the colors if we can see only 3 colors, but now it's so much easy to understand how the only three colors make unlimited colors".

Students C: "She was helping her friend by explaining how to perform activity".

Student D: she was helping her mate "Just hold the lid of container and add more heat to it."

Student E: Once she completed the simulation, she explained "I know how the energy changes from one form to another and it's useful for us to use energy in many ways."



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Student F: She added “yes, and that is why we use solar plates in our homes to convert solar energy into electrical energy.”

Integration of AI in classroom activities made class interactive and facilitated students to learn the complex concepts. The students who were struggling with comprehension in pre-intervention phase are now learning the concepts effortlessly.

Student-Centered Environment: Unlikely pre intervention, this stage created student-centered environment and improved students’ interaction and collaboration with peers. Students were active and enjoying the class. Students were realizing that they do have value in learning. Some students showed good collaboration and managed their tasks efficiently. The students were so excited for group discussion. As one of them asked;

Student A: “I love to present and discuss the topic with my friends.”

A group of three friends enjoyed in performing simulations and they guided each other.

Student B: “We all can do something new, one with heat the pot, second will apply the pressure and third one will note the readings”.

The above responses of students supported the fact that AI integration helps to create a student learning environment in classroom. Students were actively participating in classroom activities. Furthermore, students were collaborating with their peers in performing activities.

AI as a catalyst to learning: AI simulations and activities worked as a catalyst to learning for those student who were inactive throughout the classroom. Passive students also showed interest in learning through AI tools and simulations. Classroom engagement boosted and students’ performance enhanced due to the integration of AI in education.

Student A: “I never thought that we can learn in this way”.

Student B: She was an inactive student and used to sit in the backside of classroom, but as soon as the activity started she requested to sit in front”.

Student C: She usually sleeps during class but due to the AI-Based activities she started learning actively.

The post-intervention phase boosted the engagement level of classroom. Students who were not interested in learning in pre-intervention phase, they actively took part in activities and improved their overall performance in classroom. AI integration worked as catalyst in enhancing engagement and interaction of students in classroom.

Challenges: Students enjoyed the classes a lot and got engaged in activities efficiently however there was a major challenge which is lack of time for activities. Students were eager to do more practice and learn many more thing but due to the restricted schedule of school student didn’t get more time.

Student A: “Can’t we take an extra class to do these activities?”

Student B: “These activities are so interesting and 20 minutes are not enough for me, I want to perform more simulations.”

Student C: “Miss, can we do it again in our Lunch Time Break?”

AI integration facilitated students to learn in an easy way through application based activities and it improves their interest in studies as well. However, the challenge in post-intervention phase was lack of time for practicing AI-based activities. Students struggles with this challenge as they were eager to learn through AI-based activities but they did not get enough time to practice those activities.

The result determine the noticeable potential of integration of AI tools in enhancing engagement and collaboration of students. This emphasizes the role of AI in fostering improved learning experiences and transforming the educational practices by addressing the limitations of traditional teaching and learning methods.

In post-intervention lessons, students were engaged and interactive throughout the class



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which provided personalized learning experience to the students. Increased engagement not only helped students to understand the complex concepts but also make them collaborative and enhanced learning outcomes.

Discussion

The significant role of AI is highlighted in the findings of this research. AI has played an important role in enhancing the engagement level of students in classroom at elementary level. These finding supported the study by Holmes & Tuomi (2025) and Ahmad et al. (2022) that AI tools enhance engagement level of students in classroom. Collaboration and interaction levels were also improved with the help of AI-based activity tools. AI fostered and transformed the classroom environment into students' centered as students actively got involved in activities and participated in personalized learning activities.

The current findings shows that integrating AI in teaching and learning process worked as a catalyst for learning in classroom at elementary level. AI integration brought variety of learning activities which are interactive and engaging and helped in boosting the interest of students in learning. AI's potential to create a dynamic environment is emphasized in the previous study (Rathore et al., 2023). This study aligns with the literature which emphasize the role of AI in transforming education by making it more collaborative. AI-driven tools and platforms foster problem solving activities and group discussions. The literature review shows the effectiveness of AI-based activities in enhancing group-based learning and peer interaction (Wu and Yang, 2022).

A significant challenge was observed in post-intervention phase: lack of enough time for practicing AI-based activities. This challenge reflects the literature review, identifying the challenge of time management as an operational barrier (Ahmad et al., 2021). The study highlights the issue of time management as the most common challenge while incorporating AI-driven platforms and technologies into traditional classroom settings (Dimitriadou and Lanitis, 2023). Regardless of this issue, AI facilitated the student-centered approach which aligns with the literature that AI-based learning provides personalized learning experiences and improves students' performance (Allah et al., 2024; Cope et al., 2021).

Furthermore, findings of the current study highlights the importance of AI tools in bridging up the gaps in engagement among students. This finding is supported by the literature that AI-based tools and strategies considerably enhance participation of young students in classroom activities and blended learning settings (Xu et al., 2023). AI-integrated learning contributes to foster classroom engagement, participation and inclusivity (Mallik and Gangopadhyay, 2023).

Moreover, the inferences of current study for the Pakistani education system is supported by the literature highlighting the transformative role of AI-based learning in developing countries including Pakistan (Shoukat, 2024). However, the lack of time for activities emphasizes the need for curriculum adjustments and teacher training to maximize the potential of AI in enhancing students' engagement and overall performance (UNESCO, 2025; Tedre et al., 2021).

In conclusion, this research endorses the significance of AI integration in enhancing student participation and engagement, however it also highlights the operating challenges that educators and learners face. Upcoming implications should focus on developing organized frameworks for AI integration into classroom settings while addressing the limitations of time.



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Conclusion

This study delves into how AI integration influence the engagement level of students in classrooms at elementary grades. The current study used Pre-intervention and post-intervention lesson plans to analyze students' performance after the integration of AI-based tools and strategies. With the help of this study, researcher was able to find out the proofs of impact of AI-integration on enhancement of students' engagement level. The conclusion highlights that this research promotes the integration of Artificial Intelligence in classroom at elementary level. Students can be engaged in classroom in interactive ways with the help of AI-integrated learning. AI-based learning helps to create students centered environment by encouraging collaboration and interaction among students. Finally, AI-integrated approach worked as a catalyst in teaching and learning process by providing engaged and interactive classroom which unravels students' potential in learning by exceeding outdated teaching and learning boundaries.

Recommendations

The recommendation of this study are as follows:

Schools should provide training sessions and workshops to teachers to equip them with practical AI-based strategies and tools.

Teachers should use customizable AI-based tools to make activities interactive and collaborative which minimize setup time while enhancing engagement.

Teacher should incorporate AI-integration gradually with simpler tools and upgrading as students and teachers become more familiar.

Teachers should encourage group-based AI projects to promote collaboration and interaction among students.

School should provide awareness sessions to parents to attain their support in AI-integrated activities at home.

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