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# THE ROLE OF AI IN SHAPING PASSIVE LEARNING BEHAVIOUR: A VYGOTSKIAN PERSPECTIVE FROM PAKISTANI STUDENTS

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**ABSTRACT**

This study investigated the influence of Artificial intelligence (AI) on the learning behaviors of Pakistani students, examining how AI tools may encourage passive learning. Using Sociocultural Theory (Vygotsky, 1978), the research examined how Al-powered tools affect student's critical thinking, cognitive engagement, and social interaction within learning environments. A mixed-method approach was employed, combining quantitative surveys of a hundred Pakistani female university students from Government College Women University Sialkot (GCWUS), followed by qualitative interviews. The findings of this research revealed that Al tools reduce the need for in-depth thinking and independent problem-solving skills, highlighting the importance of balancing Al-based learning with human teaching to promote active and reflective learning practices.

## 1. Introduction

The rapid integration of Artificial Intelligence (AI) into education systems has changed the way students learn worldwide, including in Pakistan. AI-powered tools, such as adaptive learning platforms, virtual tutors, and automated assessment systems, have made learning more accessible, personalized, and efficient. These tools are designed to enhance student learning by offering content according to individual needs, providing instant feedback, and allowing learners to progress at their own pace. Despite it's benefits, numerous studies have expressed concerns that the use of Artificial Intelligence (AI) as a search engine could lead to a decline in critical thinking skills and that AI tools might hamper creativity and originality in students' writing (Spector And Ma, 2019). This widespread AI use in education raises concerns about its long-term effects on student learning habits, potentially leading to passive learning. Passive learning, characterized by dependency on external guidance, reduced cognitive engagement and minimal critical thinking, may result from over-reliance on AI technologies. This phenomenon is notable within the framework of Sociocultural Theory (Vygotsky, 1978), which emphasize the role of social interaction and cognitive tools in learning. Sociocultural Theory (Vygotsky, 1978) states that students learn best in social contexts through critical thinking and teamwork. When students lack social interaction and rely heavily on AI-driven feedback, they're more likely to develop passive learning habits. To explore these effects, this research adopted a mixed-methods design, combining quantitative data from a questionnaire administered to female university students aged 18-25 with qualitative semi-structured interviews to thoroughly examine student's experience with AI in education. This study investigated AI-driven passive learning behaviors through the lens of Vygotsky's sociocultural theory. By analyzing AI's impact on cognitive engagement, critical thinking, and agency, this research addressed a significant gap in the literature regarding the implications of AI-powered education for student development. This research further sought to inform educators, policymakers, and technology developers about the need for balanced AI integration that enhance active, socially-engaged learning experiences.

**Research Objectives:**

The primary objectives of this research were:

1. To investigate Al's influence on student learning behaviors.
2. To examine the effects of AI-driven learning environments on student critical thinking.

**Research Questions:**

This study investigated the impact of AI on learning behaviors among Pakistani university students, addressing:

Q1. How does the use of AI tools influence passive learning behaviors among Pakistani university students?

Q2. How can AI be integrated into educational settings to support active and critical learning?

## 2. Literature Review

### 2.1 AI in Education: Global and Local Perspectives:

Artificial intelligence, according to Coppin, is the ability of machines to adapt to new situations, deal with emerging situations, solve problems, answer questions, device plans, and perform various other functions that require some level of intelligence typically evident in human beings. The integration of AI into educational settings has resulted in a significant transformation of traditional learning environments globally. AI-driven tools, including adaptive learning systems, virtual tutors, and automated assessments, are increasingly recognized for their potential to

personalize learning and enhance accessibility (Holmes et al., 2019). These tools allow for customized learning pathways that respond to individual student needs, providing immediate feedback and supporting independent study (Chen et al., 2020). In Pakistan, AI adoption in education has been gradual, with universities beginning to integrate AI tools to improve student engagement and streamline assessment processes (Ahmad et al., 2021). However, challenges remain, including limited resources, infrastructure issues, and a lack of training for both students and educators in effectively using these technologies (Rahman & Aslam, 2023). These challenges shape the way AI is utilized in the Pakistani educational context, influencing its impact on learning behaviors.

**2.2 Benefits of AI for Personalized and Accessible Learning**

Research shows that AI can improve learning efficiency by enabling students to learn at their own pace and tailoring how knowledge is delivered (Baker, 2018). To enhance learning outcomes, adaptive learning platforms, for example, can modify the difficulty level of assignments according to a student's performance (Zawacki-Richter et al., 2019). Virtual tutors with AI capabilities also provide ongoing assistance outside of the classroom, assisting students with individual practice and subject revision (Wang & Heffernan, 2019). Additionally, automated assessment tools provide rapid feedback, which enhances the self-assessment process (Spector & Ma, 2019). In higher education, where a variety of student backgrounds frequently call for a range of support, these qualities have greatly aided accessible and flexible learning models by promoting individualized instruction and quick responses to student needs.

**2.3 Concerns of AI-Induced Passive Learning Behaviors**

AI's effects on student engagement and cognitive development are being examined despite its advantages. A study indicates that an over-dependence on AI for gathering information might destroy student's ability to think critically (Lu, 2019) . Students who rely on AI as their main source of information may be less inclined to interact with the content in-depth or to challenge its veracity, which could result in passive knowledge consumption. Language models and other AI writing tools have also sparked debate on originality and creativity (Spector & Ma, 2019).

**2.4 Vygotsky's Sociocultural Theory and Its Relevance in AI-Driven Learning**

According to Vygotsky's Sociocultural Theory, social interactions and group learning are crucial for cognitive growth (Vygotsky, 1978). This theory posits that the most profound learning occurs when students participate in social activities that enhance collective problem-solving and critical thinking. Learners experience higher cognitive engagement and autonomy when interacting with teachers, classmates, and cognitive resources in a shared environment. In contrast, learning that utilizes AI tools frequently misses these social interactions, which may hinder the development process. The social component of learning is reduced when students only receive feedback or direction from AI systems, which could result in passive learning practices (Lantolf & Thorne, 2006). Peer cooperation and critical discussions, two essential components of active learning as envisioned by Vygotsky's theory, are diminished by this reliance on AI feedback

These resources frequently provide written prompts or pre-written answers, which might deter pupils from refining their ideas and eventually stifle their originality and individuality. Students who are used to AI-driven recommendations run the risk of becoming too reliant, which would reduce their cognitive engagement and encourage passive learning behaviors (Van den Boom & Lutz, 2020).

**2.5 Research Gap: How AI affects learning in Pakistan**

While studies show that AI improve personalized learning, there's a lack of research on its impact on learning behaviors of students from a sociocultural perspective, particularly in

Pakistan. As AI becomes more common in education, it is important to study how it effects Pakistani student's engagement, creativity and critical thinking. By understanding these effects, educators and policymakers can develop strategies for balanced AI integration

## 3. Research Methodology:

This research employed a mixed-methods design combining both qualitative and quantitative approaches to see how AI affects student's learning behaviors in detail and comprehensive way. This study was conducted by implementing the instrument of questionnaire (see Appendix) prepared through a Likert Scale. A structured questionnaire was developed to collect data on student's AI usage, learning behaviors, cognitive engagement, and reliance on AI for academic tasks. The questionnaire consisted of 15 close-ended questions in the English Language. It was shared online with the targeted audience through Google forms keeping the ethical constraints of the sample population. For this research, female university students of various departments from Government College Women University Sialkot were selected to quantify the results of this research based on their experiences. To explore participant's experiences more deeply, semi-structured interviews were conducted from 10 students. The questions aimed to understand student's views on AI's role in their studies, its influence on their learning autonomy, and its impact on their critical thinking. Each interview lasted approximately 7 to 8 minutes and was audio-recorded with participant consent. Responses were later transcribed for qualitative analysis.

### 3.1 Significance of Research:

In Pakistan, where Artificial Intelligence (AI) integration is growing rapidly, this study was important in both academic and practical contexts, as it investigates the impact of AI tools on student learning behaviors in Pakistan. While earlier studies have examined the advantages and limitations of AI in education worldwide, this paper distinguished itself by qualitatively exploring the implications of reduced social interaction, cognitive involvement, and critical thinking in AI-facilitated learning environments. Quantitatively, this research contributes by collecting data through a structured questionnaire based on the Likert scale, which was designed to measure the dependency on AI, reduced cognitive involvement, and passive learning behaviors. Qualitatively, the study uses thematic analysis of interview responses to capture the intricate viewpoints of students. By letting participants to share their experiences in their own words, the research uncovers more profound insights like how AI affects their motivation, sense of agency, and interactions with peers and instructors. These qualitative findings complement the quantitative data by offering a comprehensive understanding of the topic. This dual approach makes the study a vital addition to understanding the wider implications of AI on learning behaviors, especially in settings where cultural and technological dynamics intersect. The findings of this research inform various stakeholders to take crucial steps to promote active learning among students. For educators, it emphasizes the need of balancing AI integration with tactics that encourage active, socially engaged learning. For policymakers, it highlights the need to regulate the use of AI in education to prevent over-reliance. For technology developers, this study provides a foundation for developing AI tools that not only increase efficiency but also encourage critical thinking, collaboration and active engagement among students.

### 3.2 Theoretical Framework:

This research stands out for its application of Vygotsky's Sociocultural Theory as a framework for understanding passive learning habits. This research bridges a significant gap in literature by merging quantitative data analysis with qualitative findings to explore the sociocultural impact of AI within education. It broadens the application of Sociocultural Theory by addressing how AI tools, serving as cognitive mediators, may unintentionally hinder the development of active

learning skills among students. The main goal of this study was to find out how AI, which is intended to enhance learning experiences, can lead to unintended effects such as over-dependence and reduced participation of students. This research finds out whether the integration of AI in education aligns with the principles of Sociocultural Theory by encouraging active involvement or it goes against by encouraging inactive behaviors among students.

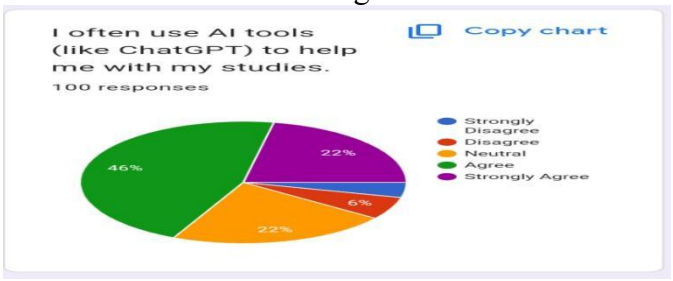
**4. Data Analysis:**

In this section of paper, a detailed analysis of the data collected quantitatively and qualitatively is presented. It looks closely at how Vygotsky's Sociocultural Theory contributed to analyze these responses. Quantitative data was collected through an online questionnaire that was distributed via Google Forms. It gathered 100 responses and the findings are presented in pie charts for enhanced clarity. The questionnaire consists of four sections. Each section examines a specific facet of the study. The qualitative data was analyzed using thematic analysis to understand nuanced perspectives on the topic.

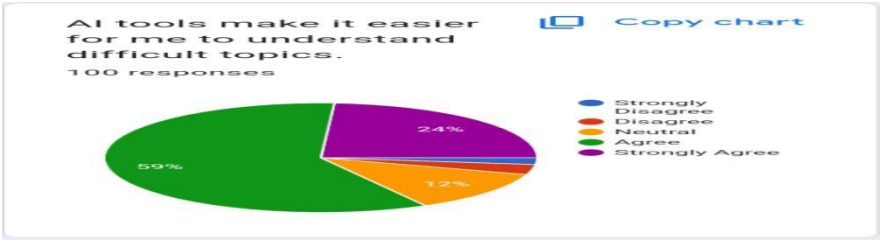
**4.1 Quantitative Data Analysis**

**Section 1: AI Usage and Reliance**

This section focused on understanding the extent to which students rely on AI tools in their academic practices. The questions aimed to determine that how often students use these tools, why they use them and how it affects their learning.

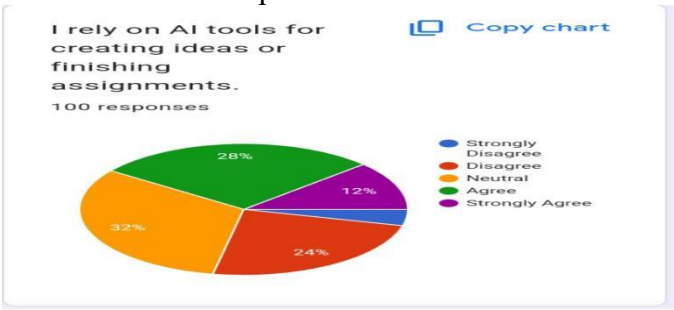



The statistics portrayed in the above pie chart depict that the majority of respondents, forty six percent (46%) agreed on frequent use of AI tools in academia. This means that many students rely on AI tools as a regular part of their study routine. While an equal percentage of twenty two (22%) respondents strongly agreed and strongly disagreed with the above statement revealing that they really like using AI tools for academic purposes. However, other strongly disagreed, indicating that some students either avoid or are not comfortable using AI tools for studying. Meanwhile, twenty two (22%) remained neutral, suggesting that they neither depends on AI nor fully dismissed its use.

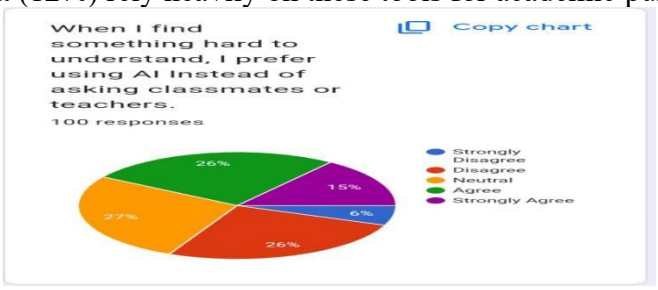



This above mentioned question finds out that how often students rely on AI for idea generation and assignment completion. The responses showed that fifty nine percent (59%) of students find AI tools beneficial as it makes it easier for them to understand hard topics. Additionally, twenty four percent (24%) strongly agreed, indicating that they really like using these tools in their understanding of difficult subjects. On the other hand, ten percent (10%) neutral respondents

suggest that either they rely on on other methods or don't find these tools impactful revealing that they don't really think AI tools are helpful or not.



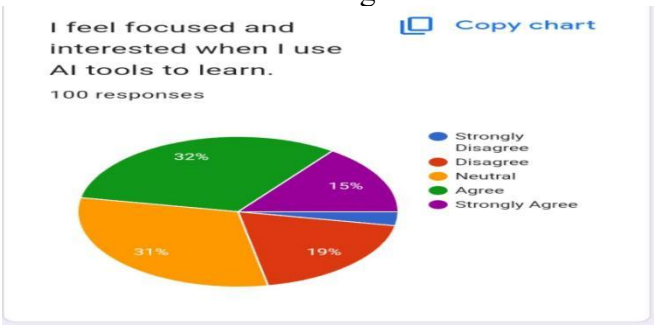

Thirty two percent (32%) respondents having mixed feelings were neutral about relying on AI tools for finishing assignments and creating ideas. This means they sometimes use AI tools but not always. Twenty eight percent (28%) say they rely on AI to some extent. However, a smaller group of twelve percent (12%) rely heavily on these tools for academic purposes.



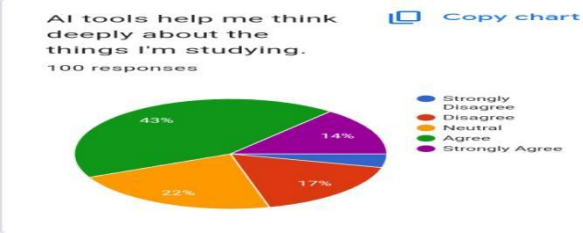

When students find something difficult to understand, they're not sure whether to use AI or ask for human help. Twenty seven percent (27%) of students use both AI and human help. Twenty six percent (26%) disagreed indicating that they prefer human guidance. However, fifteen percent 15% were strongly agreed meaning they prefer AI for clarifying complex concepts.

**Section 2: Engagement and Cognitive Involvement**

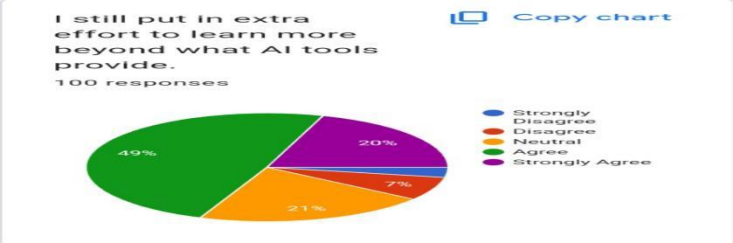
This section focuses on the relationship between use of AI and student's thinking and learning. It checks whether AI enhances their ability to actively participate in learning tasks, engage with study material, and develop problem-solving skills independently. The questions were designed to know if AI makes learning easier or lazier.



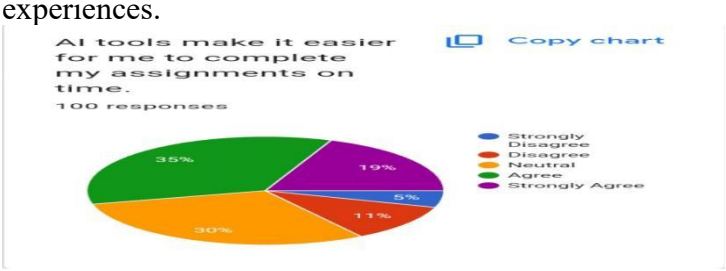

According to the figures in the above pie chart, thirty two percent (32%) of participants agreed that AI tools help them stay focused and engaged. This suggested that AI provides an interactive learning environment for many students. While, thirty one (31%) of participants were neutral reflecting their mixed experiences and nineteen percent (19%) disagreed and revealed that they found AI tools less engaging and less interesting.




Forty three percent (43%) of participants by agreeing to this question showed that many students utilize AI to break down and comprehend complex ideas more effectively. Further, fourteen percent (14%) strongly agreed, supporting the notion that some students consider AI as a crucial for enhancing critical understanding. However, twenty-two percent (22%) remained neutral which indicates their limited or mixed experience regarding AI's role in promoting deep thinking. In contrast, seventeen percent (17%) were in disagreement, suggesting that for a smaller group, AI tools didn't aid enhancing intellectual engagement. Overall, the findings highlighted that AI encourages thorough learning among participants.




This question particularly deals with the commitment of students to independent learning and results revealed that majority forty nine percent (49%) of students still put in extra effort to learn and go beyond AI-generated material. However, twenty one percent (21%) were neutral, indicating a balanced approach and seventeen percent (17%) disagreed, showing varied experiences.

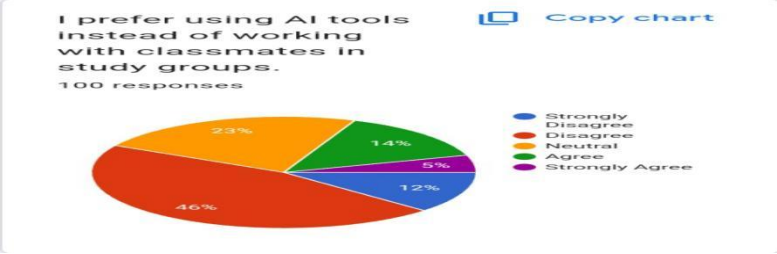



This pie chart reveals that majority of thirty-five percent (35%) students believe AI tools help them complete their assignments on time. This indicates AI's role in supporting time management. Whereas, thirty percent (30%) remained neutral or kept their view silenced, while eleven percent (11%) disagreed.

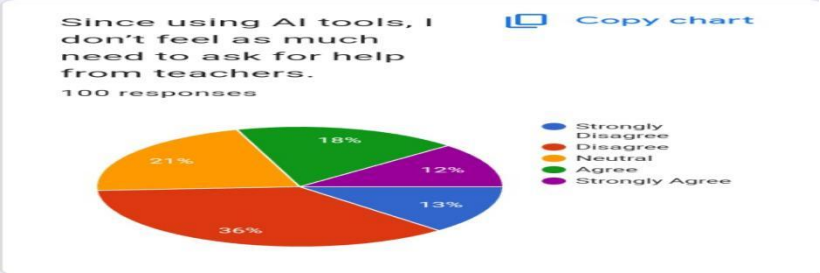
**Section 3: Social Interaction and Collaborative Learning**

This section looks at the impact of AI on student's group work and social learning. It examines whether the AI tools reduce or increase teamwork opportunities and peer interaction. This is important because, according to Vygotsky's theory, working together is key to learning. Learning is not solely an individual endeavor but occurs through collaboration, communication and

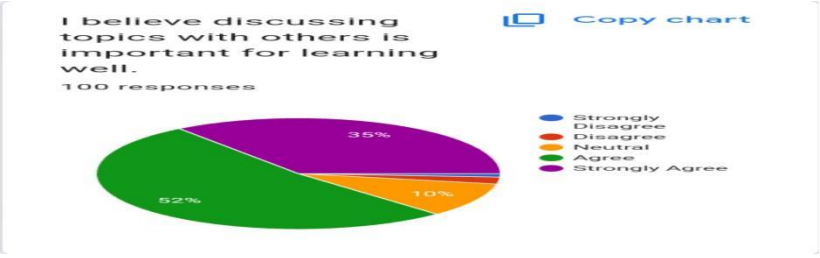
participation in social activities. The questions aim to find out the extent to which AI enhances or hinders collaborative learning.




The responses to this question highlighted a significant inclination towards collaborative learning. Forty-six percent (46%) of participants disagreed with the statement, emphasizing they value study groups over using AI tools alone. Whereas, twenty-three percent (23%) remained neutral while a smaller group of fourteen percent (14%) agreed, suggesting that only a small minority preferred AI tools to collaborative study environments. This response is quite clear in its figures illustrating the importance of social interaction in the learning process, even in era of advanced AI tools.

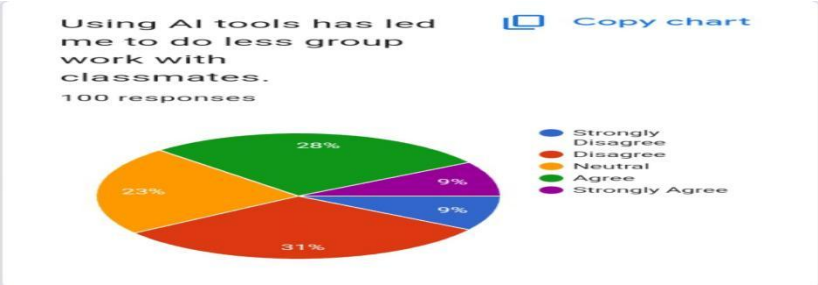



The results of this question showed that thirty-six percent (36%) of participants disagreed with the statement, demonstrating that the majority of students still seek guidance from teacher despite the availability of AI tools. Twenty-one percent (21%) were neutral, indicating a balanced reliance on both AI resources and teacher support. Additionally, a portion of students around eighteen percent (18%) agreed, suggesting that some students feel less inclined to seek help from teachers due to convenience of AI tools. This implies that although AI tools are beneficial for independent learning, they have not entirely replaced traditional sources of support for most students.




Collaboration and discussion are vital aspects of active learning, and this question assessed student's attitudes towards these practices. An overwhelming majority of fifty-two percent (52%) agreed with thirty-five percent (35%) strongly agreed participants acknowledged the importance of discussion in learning. This suggests that students still recognize the value of social interaction

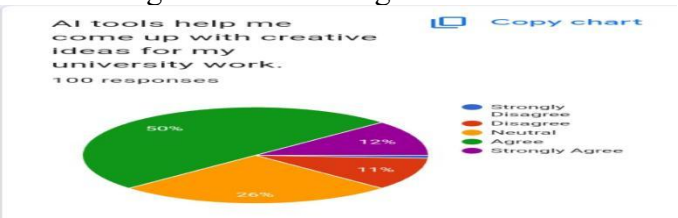
for deeper understanding. In contrast, only ten percent (10%) remained neutral, indicating minimal doubt.



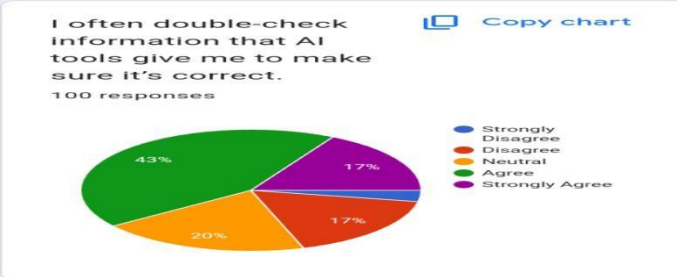

Here interestingly, opinions were quite divided. While thirty-one percent (31%) of participants disagreed that AI reduced group work, twenty-eight (28%) agreed, indicating that for some, AI has replaced collaborative efforts. Another twenty-three percent (23%) remained neutral, suggesting that the influence of AI on group work depends on individual preferences or specific tasks

**Section 4: Critical Thinking and Creativity**

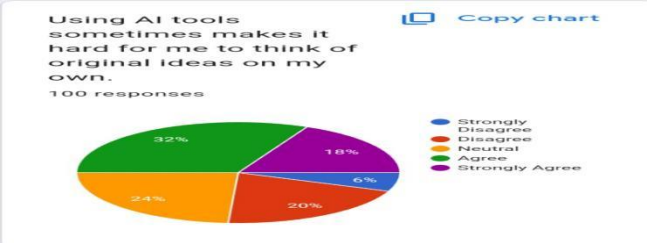
This last section of questionnaire explores how AI influences student's critical thinking and creativity. The questions examines whether students rely on AI for quick answers to develop their own innovative ideas and analytical skills. This helps in understanding if AI boosts or limits student's higher-level thinking skills




Creativity is a crucial skill in education, and this question examined AI tools role in enhancing it. The results showed that fifty percent (50%) of the participants acknowledged that AI tools help in generating ideas, showing their potential as inspiration tools. However, a proportion of twenty-six (26%) remained neutral and expressed uncertainty. In contrast, eleven percent (11%) respondents disagreed, suggesting that not all students find AI effective for enhancing creativity.




The key focus of this question was to assess student's trust in AI-generated information. A significant portion of forty-three percent (43%) agreed that they double-check the information provided by these tools which shows their awareness of AI's limitations. However, twenty percent (20%) remained neutral, suggesting that some students might not verify AI responses regularly. On the other hand, equal number of seventeen percent (17%) participants disagreed and strongly disagreed, indicating their heavy reliance on AI, raising concerns about the risks over-trust in AI-generated information




This question explored the impact of AI on originality in student's work. The results show that thirty-two percent (32%) agreed participants expressed concerns that AI might compromise originality, hindering their independent thinking. In contrast, twenty percent (20%) disagreed, indicating that AI does not compromise their ability to produce original work. Meanwhile, twenty-four (24%) remained neutral, showing uncertainty about effects of AI on original thought.

**4.2 Qualitative Data Analysis**

The qualitative analysis revealed that participants use AI tools frequently, especially for academic tasks like university assignments, projects, and during final exams. For example, one participant mentioned, ***"I use AI-generated tools very often, especially for assignments and projects."*** This highlights a reliance on AI for study-related activities and getting guidelines for their work. The second question aimed to know the situations where they find themselves relying on AI. Mostly stated that they rely on these tools when they are ***"short on time".*** One response noted, ***"I often prefer AI for saving time when I have to make notes or get material."*** Additionally, some relied when "***classmates or instructors were unavailable***" or when they doubted the ability of classmates or teachers to resolve difficult issues. This suggested that convenience and time management were key factors for frequent reliance on AI. When asked about the impact of AI tools on their critical thinking, majority of participants felt that AI did not affect their critical thinking. One student responded ***"No, I don't think so it affects my critical thinking skills in any way."*** However, few participants acknowledged AI dependency for saving time. Other notable response highlighted how relying on AI might lead to dependency, but the participant emphasized their own ability to solve problems when necessary. Finally, when asked about the best AI integration in education in their opinion to support active learning, the participants suggested that AI should provide quizzes or interactive tools that could enhance critical thinking. One participant recommended, ***"AI can give us quizzes on any topic to increase critical thinking.*** While, others emphasized the need of improving AI's ***"accuracy and broadening its response base"*** to cover wide range of perspectives. In conclusion, the qualitative responses showed that while these AI tools are widely recognized and used, there are concerns about their accuracy, dependency and limited scope. Participants highlighted its importance to act as a support instead of a replacement for critical thinking and collaboration.

**5. Discussion Analysis:**

The primary goal of this study was to explore the role of AI tools in shaping passive learning behaviors among Pakistani university students. Using Vygotsky's sociocultural theory, the research investigated the effects of AI on critical thinking, social interaction and cognitive involvement. The findings from both qualitative and quantitative data provide a deeper understanding of the complex relationship between students learning behaviors and AI.

**5.1 AI and Passive Learning Behaviors:**

From the quantitative data it was cleared that the students regularly used AI tools, such as ChatGPT, for academic purposes with forty-six percent (46%) reporting frequent use. Despite

AI's benefits, its frequent use raised concerns about passive learning. For example, the responses from questionnaire and interviews indicated that while AI tools help students understand difficult topics (59% agreed), they may not have promoted independent thinking or deep cognitive engagement. Many students expressed that they sometimes prefer using AI rather than asking for help from teachers and classmates. Furthermore, this reliance of students on AI instead of social interactions resulted in reduced active engagement which is in contradiction with Vygotsky's sociocultural theory.

**5.2 Impact on Cognitive Engagement and Critical Thinking:**

The research findings indicated that AI tools were viewed as time-saving and helpful in completing assignments (35% agreed, 30% were neutral, 19% strongly agreed). However, the results also raised concerns about the depth of cognitive engagement. Many students agreed that AI tools helped them think deeply about their studies (43% agreed, 14% strongly agreed). While, some students reported that they still put in extra effort to learn beyond AI-generated material (49% agreed, 20% strongly agreed). This finding aligned with the idea that many students think of AI tools as supplements rather than replacements for active learning. The qualitative data also highlighted that students did not believe AI tools hindered their critical thinking as it could be seen in one of answers, ***"No, I don't think so it affects my critical thinking skills in any way".*** However, many students noted that they were cautious about relying too heavily on AI and always double-checked its information (43% agreed, 20% neutral).

**5.3 Social Interaction and Collaborative Learning:**

Social interaction and collaboration emerged as a significant theme in the qualitative data analysis. Several students preferred AI tools when teachers or classmates were not available, especially during exams or when time was limited. However, they held mixed views on whether AI impacted group work or collaborative learning. The questionnaire results showed that forty-six percent (46%) of students disagreed with the idea of preferring AI tools over group work, emphasizing the value of social interaction in learning. This finding aligns with the Vygotsky's theory.

**5.4 Creative thinking and Originality:**

The data also examined the effect of AI on creative thinking and originality. Half of the student population of fifty percent (50%) agreed that AI tools helped them in generation of creative ideas in studies. However, minority of thirty-two percent (32%) were concerned that AI sometimes made it more difficult for them to think independently by limiting their ability to think of original ideas. This finding highlighted a critical issue that AI's convenient use may limit student’s ability to engage in independent, creative thinking.

**5.5 Implications**

This study emphasized the importance for teachers to carefully assess how Al tools are incorporated into the learning processes Although Al has the ability to help in learning by giving individualized and fast feedback, it also has the risk of encouraging passive learning patterns if relied on too heavily. The findings of this research indicated that a balanced strategy is required, one that enhance the use of Al as supplemental support while also encouraging active, collaborative, and critical learning approaches. Educators should be conscious of the influence that Al tools can have on social interaction and make sure that possibilities for cooperation and conversation are not lost. Additionally, future advancements of Al tools should prioritize on their ability to assist critical thinking and creativity rather than simplifying tasks and assignments.

In short, this research concluded that AI tools are transforming the way students learn, while also introducing challenges related to passive learning and decreased cognitive engagement. By

analyzing both quantitative and qualitative data through a Vygotskian lens, this study contributed to the growing body of research on AI in education.

**Recommendations:**

Based on the findings from the data analysis and the discussion above, sever key recommendations can be made for AI's effective use in education.

**1. Encouraging balanced use of AI:**

Although AI tools have shown to be beneficial for students in terms of accessibility and efficiency, it is equally important that their use does not hinder the development of independent thinking. Educators should encourage students to use these tools as supplementary aids rather than solely relying on them. A balance should be maintained where students are encouraged. There should be a balance where students are urged to think critically and evaluate AI-generated information before use to pursue independent learning in conjunction with AI usage

**2. Integrating AI with Collaborative Learning:**

As this study highlighted the importance of social interactions and collaborative learning, educators should strive to incorporate AI tools into group activities and discussions. These tools can be used as a starting point in discussions, problem-solving, or brainstorming sessions. For example, teachers can assign tasks where students can use AI tools to get primary information and then collaborate with others in groups to critically evaluate, discuss, and apply the findings. This will help students in maintaining collaborative and social elements of learning, which are essential for cognitive development according to Vygotsky's theory.

**3: Enhancing critical thinking through AI:**

In order to ensure the development of critical thinking skills among students while using AI tools, the educators should design such assignments that encourage students to critically analyze the outputs generated by these tools. For example, teacher can assign a task where students cross-check the AI-generated information with other sources to evaluate its relevancy and accuracy by providing their own analysis and interpretation. This way, students will not only learn its effective use but also develop the critical thinking skills Important for academic success.

**4. Enhancing AI tools for active learning:**

AI tools developers should focus on enhancing their capacity to promote active learning. These tools should be designed to encourage students to engage more thoroughly with the material. It can include giving more open-ended questions, suggesting areas for further inquiry, or delivering context-based challenges. Moreover, these tools should include features that enhance creativity such as suggesting difficult problems that only demand original solutions

**5. Providing training and support for students:**

Students should receive proper guidance on effective use of AI tools in academic contexts. It emphasizes the responsible usage and avoiding over-reliance.

**6. Regular Feedback on AI-enhanced learning:**

Educators should provide regular feedback on student's use of AI tools. Periodic assessment should evaluate how students integrate AI tools with their own thinking and problem-solving processes

**7. Ethical considerations and AI dependency:**

Educators and policymakers should address the ethical implications of use of AI tools for educational purposes. They should encourage balance between AI and human input in learning.

**Conclusion:**

This study explored how Artificial Intelligence (AI) tools impact student’s learning behaviors through Vygotskian lens. The research used both quantitative and qualitative methods to

understand the use of AI in educational settings and its effects on critical thinking, collaborative learning, social interaction and cognitive involvement. The findings show that students frequently use AI tools such as ChatGPT and Grammarly to help them with their academic task. They use these resources to clarify difficult concepts, brainstorm new ideas, and fulfill assignments. Nonetheless, the data also raised concerns about over-relying on AI, which can hinder student's capabilities in critical thinking, creativity and independent problem-solving. Additionally, the qualitative data gathered from student interviews revealed that, despite the usefulness of AI tools, there are some hurdles to their usage, such as inaccurate or incomplete information and the tendency for limited responses. However, they also acknowledged the potential for AI to enhance their educational experiences if used responsibly and in a balanced way. The Vygotskian theory, which emphasizes the role of social interaction in learning through collaboration was pertinent for understanding the relationship between AI tools and student's learning habits. This research highlighted the need for educators to promote responsible use of AI in education, ensuring the cultivation of critical thinking and teamwork skills instead of their replacement. Moreover, this study explored AI's impact on student's learning behaviors in Pakistan where AI integration is still developing. This research laid a foundation for future studies and offered recommendations for educators and developers to maximize AI's potential in promoting active learning.

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**Appendix: Questionnaire**

| Sections | Questions | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|---|
| Section 1: AI Usage and reliance | 1.I often use AI tools (like ChatGPT) to help me with my studies | | | | | |
| | 2. AI tools makes it easier for me to understand difficult topics. | | | | | |
| | 3. I rely on AI tools for creating ideas or finishing assignments. | | | | | |
| | 4. When I find something hard to understand, I prefer using AI instead of asking classmates or teachers. | | | | | |
| Section 2: Engagement & Cognitive Involvement | 5. I feel focused and interested when I use AI tools to learn. | | | | | |
| | 6. AI tools help me think deeply about the things I am studying. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 7. I still put in extra effort to learn more beyond what AI tools provide. | | | | | |
| | 8.AI tools make it easier for me to complete my assignments on time. | | | | | |
| Section 3: Social Interaction & Collaborative Learning | 9. I prefer using AI tools instead of working with classmates in study groups | | | | | |
| | 10. Since using AI Tools, I don't feel as much need to ask for help from teachers. | | | | | |
| | 11. I believe discussing topics with others is important for learning well. | | | | | |
| | 12. Using AI tools has led me to do less group work with classmates. | | | | | |
| Section 4: Critical Thinking & Creativity | 13. AI tools help me come up with creative ideas for my university work. | | | | | |
| | 14. I often double-check information that AI tools give me to make sure its correct. | | | | | |
| | 15. Using AI tools sometimes make it hard for me to think of original ideas on my own. | | | | | |

**Appendix**

**Interview Questions**

1. How do you typically use AI tools (like ChatGPT or other educational platforms) in your studies, and what benefits do you notice?
2. Do you feel that using AI tools has affected your ability to think critically or engage deeply with your studies? Can you give an example?
3. How has AI influenced your creativity in assignments? Do you feel it helps or limits your ability to come up with original ideas?

4. In what situations do you find yourself relying on AI tools rather than discussing topics with classmates or instructors? Why do you choose AI in these moments?
5. Do you think AI has changed how you learn, making you more or less active and involved in your studies? How so?