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**THE IMPACT OF ARTIFICIAL INTELLIGENT ON THE
ANALYTICAL ABILITY SKILLS OF GRADUATE STUDENTS
AT (KUST) KOHAT**

Shakeel Nawaz

M. Phil Scholar, Institute of Education and Research KUST Kohat.
shakeel.econ@gmail.com

Prof. Dr. Muhammad Naseer-Ud-Din

Vice Chancellor, Kohat University of Science and Technology, KUST
Kohat.
dr.naseeruddin@kust.edu.pk

Abdul Wahab

PH.D Scholar Institute of Education and Research KUST, Kohat
Corresponding author: abdulwahab@Kust.edu.pk

ABSTRACT

Artificial Intelligence (AI) is transforming education by giving students tools that make learning easier and enhance their cognitive ability skills. One of these tools, AI-ChatGPT, supports students in boosting their ability to analyze problems, solve them, and think critically. This study investigates how AI-ChatGPT impacts on the analytical ability of higher education students At KUST, Kohat. This study involved 160 graduate students who answered defined survey questionnaires. The data was analyzed using through SPSS software, which employed different statistical methods to understand relationships.

The study examined a strong positive relationship between the use of AI-ChatGPT and improved analytical skills of graduate students. AI-ChatGPT was found to contribute to 80.0 % of the variations in students' analytical capabilities. Moreover, it supports independent learning and cognitive growth in students.

Educational institutions have encouraged students to integrate AI-ChatGPT into their curriculums to enhance graduate students' reasoning skills. Further research is needed to monitor changes over time and include various universities because the current study focused only on one university and relied on self-reported information.

In the age of AI, tools like AI-ChatGPT are essential for helping students acquire the analytical skills necessary for success both in academics and in their future careers.

Keywords: Artificial Intelligent (ChatGPT), analyze skills, learning enhancement, higher education, artificial intelligence, quantitative approaches.

INTRODUCTION

1.1 Background of the Study

The present Artificial Intelligence tools advancement has a significant impact on various fields including education. AI-ChatGPT has become one of the essential tools to improve the cognitive skills and abilities of higher education students. These kinds of tools assist break down complex topics, aiding students in understanding them better, which in turn enhances their reasoning skills (Huang, 2021). More colleges and universities are adopting AI to determine if it can genuinely enhance students' analytical skills and academic understanding.

In higher education institutions, graduate students need strong analytical skills. This means they must examine information closely, identify patterns, and make sound conclusions, as noted by Jones & Smith (2020). Traditional teaching methods often don't provide individualized help for developing these skills. Therefore, Artificial Intelligence tools Particularly ChatGPT, can improve and enhance the responses of the students and offer personalized learning and prompt response to assist the analytical skills of the graduate students (Miler, 2020). Despite the fast integration of artificial intelligent advanced technology tools in education systems there is a limited amount of research regarding how it assists the student's analytical abilities. This study intends to examine the AI-ChatGPT can improve the analytical abilities of graduate students at KUST.

1.2 Statement of Problem

To the graduate student it is important to have a strong understanding of analytical skills for their research work, academic purposes and for their decision making. Majority of the graduates' students have a problem analytical thinking because of their dependence on traditional memorization systems of education, lack of guidance and have limited to advanced learning opportunities. So, these kinds of problems and challenges face them in trouble to analyze the information accurately and build a valid solid and reasonable argument (Brown & Tylor, 2019). So, in this regard the current technologies like Artificial Intelligence ChatGPT offer a reasonable solution to this kind of problem for higher education students. It enhances the graduate student's experience analytical abilities and develops logical arguments for critical thinking. Researchers are interested in studying whether AI-ChatGPT effectively enhances students' ability to analyze information. They aim to

investigate its impact on the growth of analytical skills in graduate students at KUST Kohat.

1.3 Objectives of the Study

- Explore how using AI-ChatGPT affects students' ability to analyze information effectively.
- Assess how accurately AI-ChatGPT can predict improvements in students' analytical skills over time.

1.4 Questions of the Study

- What is the relationship between the AI-ChatGPT tools and the analytical skills of graduate students at KUST, Kohat.
- How can AI-ChatGPT make changes and improvements in the development of students' analytical skills?

1.5 Significance of Study

This study helps us to understand how AI is used in education, especially for improving the analytical skills of students in graduate programs. The research is important for many people:

- **Graduate Students:** To see that AI-ChatGPT affects their analytical skills, students can learn to use these AI tools more effectively to enhance their learning and achieve better results.
- **Educators:** The study grants teachers with understandings into the efficiency of AI learning tools. This can assist educators in incorporating AI into their teaching methods, making classes more engaging and helping students develop better thinking skills (Singh and Kumar, 2022).
- **Higher Education:** Higher educational institutions like KUST be able to apply the study's findings to introduce AI learning strategies and support. They can enhance course designs and offer students' academic assistance that incorporates AI technology.
- **Researchers:** This study increases valuable information to existing knowledge about AI in education. It shows the effect of AI-ChatGPT on analytical abilities, offering evidence that can help guide more investigations or explorations in this field.

LITERATURE REVIEW

Research examining the power of artificial intelligence (AI) is transforming different fields, specifically in higher education. AI tools, such as ChatGPT, can influence graduate students analytical abilities skills. These tools can improve how we analyze and understand information. In this chapter, we examine studies and articles about AI in education, how different thinking skills work, and the influence of AI-ChatGPT on our ability to think critically and reason.

2.1 AI in Education

Education systems have improved significantly with the improvement of artificial intelligence (AI), which now provides personalized learning

materials, prompt responses, and interactive teaching settings (Huang, 2021). AI systems manage educational platforms by using machinery learning and natural language administration to assess how students perform. This is followed by offering research-based results and study recommendation (Peters et al., 2018). Studies have shown that AI tools encourage students, helping them learn more effectively and improve their problem-solving abilities, as noted by Jones and Smith (2020). Students acquisition many benefits from AI-ChatGPT chatbots. These tools assist them with various educational tasks, like summarizing information, generating new ideas, and clarifying complex topics (Miller, 2020). AI-ChatGPT processes vast amounts of information to offer students innovative learning methods, supporting their path toward becoming more self-sufficient learners.

2.2 Cognitive Abilities and AI

Students must do well in school because thinking and solving problems are key skills. Bloom, in 1956, described analytical skills as the ability to break down big problems into smaller pieces and examine details to find solutions. Students can improve these skills using computer systems that create learning plans and provide automatic feedback (Singh & Kumar, 2022).

Learning tools that use computers help students become better thinkers and problem solvers. These tools teach students to notice patterns and understand how ideas are connected (Brown & Taylor, 2019). They offer lessons tailored to each student's interests and needs, which boosts school performance and enhances thinking abilities (Wilson, 2021).

2.3 AI-ChatGPT and Analytical Skills

Research shows that AI-ChatGPT is important for developing analytical skills. It provides clear answers, starts meaningful discussions, and helps students understand difficult ideas (Brown & Taylor, 2019). Many studies highlight how it boosts thinking skills, especially in understanding texts, judging arguments, and making decisions (Miller, 2020).

The ability of AI-ChatGPT to communicate like a human helps students strengthen their reasoning skills through clear conversations. It uses a questioning style inspired by the ancient Greek philosopher Socrates. This method encourages students to explain their thoughts, identify mistakes in reasoning, and improve their arguments (Anderson & Krathwohl, 2001). By offering different viewpoints and questioning assumptions, this tool helps students develop their critical and analytical thinking abilities (Singh & Kumar, 2022).

2.4 Theoretical Framework

This research is based on Bloom's Taxonomy revised in 2001, which outlines six levels of thinking skills. These six levels are (recalling,

comprehension, directing, analyzing, evaluating, and creating) cognitive ability domain of blooms taxonomy. When people reach the analyzing stage, they take complex ideas and break them into smaller parts to identify patterns and make sense of how things are related. AI-ChatGPT is a tool that assists students by helping them break down information and assess evidence, which in turn helps them build strong arguments through evaluating information.

Furthermore, AI-ChatGPT aligns with Vygotsky's Sociocultural Theory, which emphasizes learning through interaction and support. Vygotsky believed that interacting with others and using techniques like scaffolding are vital for developing cognitive skills in students. In this context, AI-ChatGPT serves as a supportive tool. It guides students with structured assistance, encourages deep thinking, and enhances their ability to evaluate complex academic content.

2.5 Experimental Studies on AI and Analytical Abilities

Several studies have been conducted on the impact of Artificial Intelligence on graduate student cognitive learning abilities.

- In 2021, Huang's research demonstrated that students using AI-based learning tools outperformed those using traditional methods, particularly in analytical reasoning.
- Ones and Smith, in 2020, explored that student who interacted with AI chatbots significantly improved their skills in academic evaluation and synthesis.
- According to Miller's 2020 research, AI-assisted tutoring boosted student performance in problem-solving and encouraged more active participation in analytical discussions during class.
- Singh and Kumar's 2022 study found that AI-ChatGPT helped students develop higher-order thinking skills by teaching them how to assess arguments and reach strong conclusions.
- Overall, these outcomes show that AI-based learning platforms offer valuable educational experiences that help students enhance their analytical skills.

METHODOLOGY

The researcher used the methodology that includes design, targeting population, sampling and sampling techniques, data collection, data analysis (Descriptive and inferential statistics) etc.

3.1 Research Design

The research uses two types of study designs that is inferential and descriptive methods. The descriptive method shows us how strong graduate students are in analytical skills. The inferential method looks at the relationships between using AI-ChatGPT and analytical skills. Besides it the regression analysis is done to verify that how well AI-ChatGPT can predict changes in students' analytical skills. This helps us

understand whether using AI-ChatGPT can improve or affect these skills in any way.

3.2 Sampling

This study targeted the graduate students from the Social Sciences Department at KUST. The researchers used a random sampling method to choose 160 graduates' students from different areas within the department. The purpose of using this method was to give every student an equal opportunity to be selected. This approach helps ensure the study results are accurate and can be applied to all students in the department.

3.3 Data Collection

This research collects the data and uses a survey adapted questionnaire. This tool was designed to assess the students' skills in analysis abilities and their interactions with AI-ChatGPT. It included different sections, the first section focusing on personal demographic details, the second section consists of how often and in what ways students use AI-ChatGPT, and the last part assessing their ability to think analytically. To make it convenient for participants and to collect the data efficiently, the questionnaires were available online through Google Forms.

3.4 Data Analysis Methods

This research data was collected from the graduate students at KUST Social Sciences department, and it was used to analyzed a Statistical Package for the Social Sciences (SPSS) software which is commonly used in social sciences research.

3.5 Statistical techniques:

- **Descriptive Statistical Method:** In this method (mean, media, mode and S.D) were employed to summarize students' analytical skills and AI-ChatGPT usage patterns.
- **Inferential Statistical Method:** In this procedure it determines how AI-ChatGPT can influence the higher-level student's analytical ability.

3.6 Ethical Issues

In our research, we closely followed strict ethical rules. Everyone who took part did so voluntarily and agreed to it after we explained everything to them. Before collecting any data, we made sure they understood and agreed. We kept their identities private and protected their privacy throughout the process. The information we gathered was used only for academic purposes, and participants had the right to leave the study whenever they wanted.

3.7 Limitations of the Study

The study looks at how AI-ChatGPT impacts analytical skills but has a few limitations:

- **Limited Participant Group:** It only includes 160 graduate students from KUST. This small number makes it hard to apply the

findings to students at other universities or in different areas of study.

- **Reliance on Self-Reports:** The data comes from what students say about themselves. This may not always be accurate or could be biased, particularly in terms of how they use AI-ChatGPT and their analytical skills.
- **Only One-Time Data Collection:** This research takes the information for the first time. It does not explore the long lasting effects of using AI-ChatGPT on improving analysis ability of students.

ANALYSIS AND RESULT

Here, the study explained the findings from the study using data collected from graduate students at KUST social sciences departments. In this research we make the analysis into two different styles i.e. (descriptive statistics and inferential statistics). Through using this method, the study aimed to explore the AI-ChatGPT using and its impacts on analytical skills of graduate's students particularly in KUST. This study results were thoroughly structured and organized based on the research goals and the specific hypotheses we wanted to test.

4.1 Descriptive Statistics

It is one of the main tools that can be used to explain and describe in detail the data that we collect. Descriptive statistics tools that include average, also known as the mean, which tell us the typical number in a group. Then also there is the standard deviation that shows how much the numbers in our data differ from each other. And another tool is the response frequency distribution, which helps us understand how often each response appears. By using these statistics, we can understand how people use AI-ChatGPT and how well it can analytical skills.

4.1.1 Demographic section of Participant

Here is the detailed information about the 160 graduate students who participated in the survey:

- **Gender Breakdown:** Out of all the graduate students, 54.6 percent were male students, and 45.4 percent were female students participated in survey.
- **Degree Program:** Most students, 62.7% students were included in MS/M.Phil. Programs. The remaining 37.3% of students were doing Ph.D. programs.
- **Areas of Study:** These students were from different fields within social sciences. The main areas were Education, English, Sociology, Psychology, and other varied fields. Below is a table that provides the demographic breakdown of these students:

Table No. 4.1: The Demographic Distribution of Contributors:

Variables	Categories	Frequencies	Percentage
Gender	Male	88	54.6%
	Female	72	45.4%
Degree Program	MS/M.Phil.	101	62.7%
	Ph.D.	60	37.3%
Field of Study	Education	55	34.2%
	Psychology	11	6.8%
	English	26	16.1%
	Sociology	23	14.3%
	Other	46	28.6%

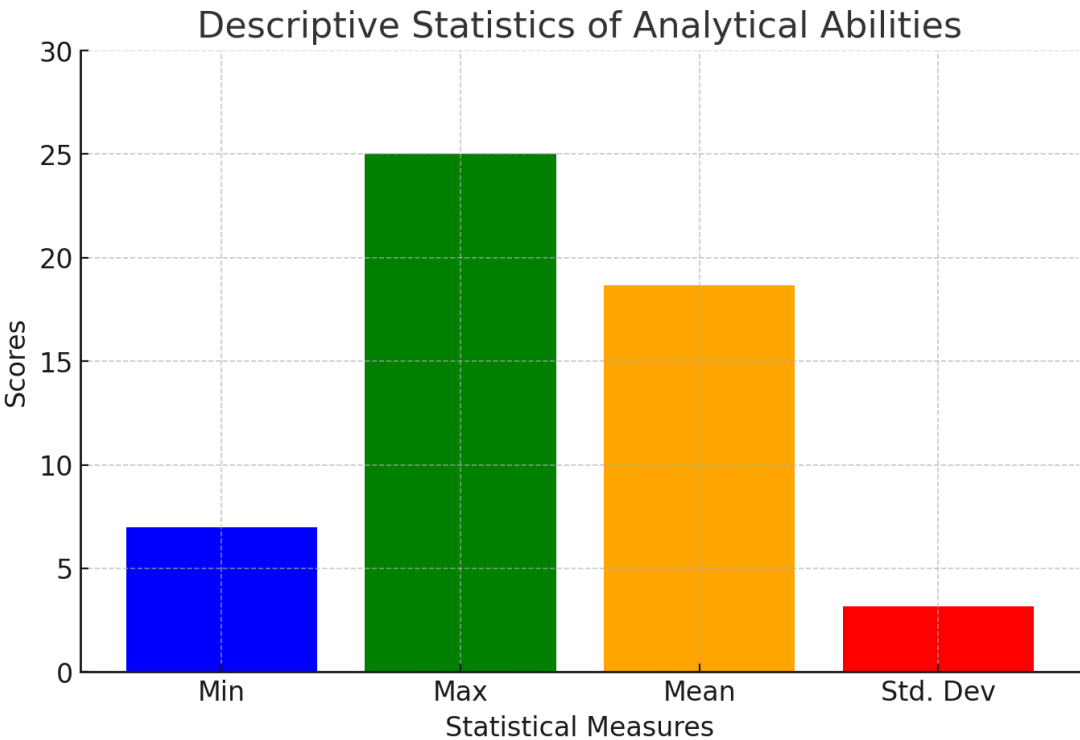
4.2 Descriptive Analysis of Analytical Abilities

We are looking at how well students can handle complex information, assess arguments, and spot patterns. This comes from their survey answers about these skills. Below, you'll find the results of this analysis.

Table No. 4.2: The Descriptive Statistics of Analytical Abilities of graduate students:

Variable	N	Mini	Maxi	Mean	S.D
Analytical Ability	160	7.00	25.00	19.00	3.2

The average score of the above table no. 4.2 is 19.00. This suggests that most students have between medium and high-level skills in analyzing information. The standard deviation, which is 3.18, indicates there is some variation in the scores or differences in how students performed. This means not every student scored the same, and there is a range in their abilities.



4.3 Inferential Statistics

Researchers used inferential statistics to explore how students' analytical skills are influenced by their use of AI-ChatGPT. They applied techniques such as Pearson correlation and regression analysis to investigate this relationship.

4.3.1 Correlation Analysis

To understand the link between AI-ChatGPT usage and analytical skills, they used Pearson correlation. This method helped determine both the strength and direction of the relationship.

Table No. 4.3: The correlation association Between AI-ChatGPT and Analytical Abilities of graduate’s students.

Variables	AI-ChatGPT	Analytical Ability
Artificial Intelligence tools	1	0.605
Analysis Skills	0.605	1

The association value is 0.01 level (2-tailed) which is significant, and it means it is an important finding. The correlation coefficient is $r = 0.605$ with $p < 0.01$. This number shows there is a strong and positive connection between how much students use AI-ChatGPT and how good their analytical abilities are. In simple words, as the students use AI tools

like ChatGPT more leads it to improve the analytical skills of the students.

4.3.2 Analysis of Regression

We performed an essential linear regression analysis to find out if using AI-ChatGPT can significantly predict a person's analytical skills.

Table No. 4.4: The Regression Summary:

Model	R	R Square	Adjusted R Square	Std. Error
1	0.90	0.80	0.80	7.3

The value of R-squared is 0.80, which shows and indicates 0.80 % of the differences in analytical abilities that can be clarified by how much AI-ChatGPT is used. This demonstrates a strong connection, showing that using AI-ChatGPT is strongly related to better analytical abilities.

Table 4.5: The Analysis of Variation Results:

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	300.60	1	300.600	600.4	0.000
Residual	8400.30	160	51.30		
Total	400.10	160			

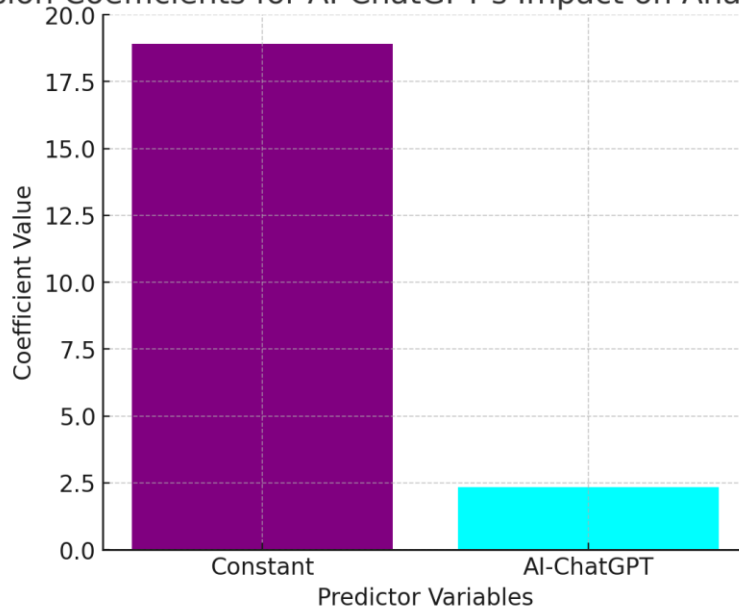
The F-value of 600.4 and a p-value of less than 0.001 demonstrate that the use of AI tools i.e. ChatGPT, it has a significant effect in predicting the analytical abilities of graduate students. This means that when students use AI-ChatGPT, it strongly relates to how well they can think analytically. The statistical results, with a high F-value and a very low p-value, suggest that there is a clear, strong connection between using this AI tool and the students' skills in analyzing information.

Table No. 4.6: The Regression Model of Coefficients:

Model	Unstandardized Factors	Standardized Factors	t	Sig.
	B	Std. Error	Beta	
Constant	19.00	3.00		7.00
AI-ChatGPT	2.40	0.10	0.884	24.00

When students increase the use of AI-ChatGPT, their analytical ability scores get better. For every additional unit of usage, their scores rise by approximately 2.35 points. This finding indicates a highly significant with a p-value of less than 0.001, which means it is very reliable and not likely to be due to chance.

Regression Coefficients for AI-ChatGPT's Impact on Analytical Abilities



4.4 Summary of Findings

- Students generally show a moderate to high level of analytical abilities of graduate students, with an average score of 19.00 in analytical ability.
- The findings of the study indicated a strong positive relationship in the use of AI-ChatGPT and improved analytical abilities, where the correlation value is 0.605, showing that as students use AI-ChatGPT more, their analytical thinking skills tend to improve.
- Regression analysis reveals that AI-ChatGPT is responsible for 80.0 % of the variation seen in students' analytical skills, suggesting that it plays a major role in shaping these abilities.
- AI-ChatGPT is a key predictor of students' analytical abilities, with its positive impact measured at 2.40, and this result is highly significant, with a p-value of less than 0.001.

Collectively, these findings support the view that using AI-ChatGPT benefits students by boosting their analytical skills. It helps them become better at thinking critically, evaluating details, and understanding information.

Discussion and Conclusion

This section discusses the results that we discovered in section 4 and their significance for the study's overall framework. It highlights the importance of these research findings and notes some areas the study couldn't explore, offering suggestions for future research directions.

5.1 Findings

5.1.1 The association and relationship between AI-ChatGPT use and the Analytical Abilities of students.

This research findings demonstrate a clear positive connection ($r = 0.614$, $p < 0.01$) between the use of AI-ChatGPT and the development of analytical skills. This indicates those students who regularly engage AI tools like ChatGPT generally possess better analytical abilities. Such outcomes are consistent with existing studies that emphasize the importance of AI-based educational tools in improving advanced thinking skills, including analysis, evaluation, and synthesis. These skills are crucial for understanding complex problems and making well-informed decisions. AI tools like ChatGPT can support students in developing these critical abilities, making them valuable resources in modern education.

5.1.2 Predictive Power of AI-ChatGPT on Analytical Abilities

Using AI-ChatGPT has a big impact on improving analytical skills, according to a study called regression analysis. The study shows a key number, $B = 2.352$, with a very small chance of it happening by accident ($p < 0.001$). In plain words, this means that AI-ChatGPT can explain 80.00 % of why people have different levels of analytical skills. This clearly shows that AI-ChatGPT is a valuable tool for education, helping students get better at evaluating and understanding difficult knowledge.

5.1.3 Differences with Previous Studies

This study results are like past research that shows AI-driven educational tools can help improve analytical thinking skills. Earlier studies have shown that AI increases student interest, supports learning on their own, and offers organized guidance that aids in developing the mind.

5.2 Implications

5.2.1 Implications for Students

This research examined that the using of AI-ChatGPT can improve their problem-solving and critical thinking abilities that are very essential for academic progress. Through the proper use of AI tools for learning purposes, the students can learn to understand their problems better, consider various viewpoints, and make smart choices. It can assist the students to become highly skilled, analyzing and to find the solutions to the problem and their performance in institutions.

5.2.2 Implications for Educators

Educators can use AI-ChatGPT in their pedagogy methods to make education better for students. These AI tools can support students by helping them think more critically. By utilizing these tools, the students can explore their ideas. The tools also provide automatic feedback, which helps students understand what they have done well and where they can improve. Besides this, it can offer exercises and practices to the

students where they can interact with improving learning effective and efficiently.

5.2.3 Implications for Institutions

Higher educational institutions may utilize and take a benefit through using of AI-powered learning platforms to assist the cognitive thinking and in creating courses, assessing student work, and boosting student involvement. Therefore, through utilizing AI equipment like ChatGPT, higher educational institutions can enhance the overall quality of education. These tools help students develop important thinking skills that are essential for their success.

5.3 Limitations of the Study

1. **Limited Generalizability:** The results only come from data gathered from graduate students at KUST in Kohat. Because of this, these results might not apply to students from other universities or who study different subjects.
2. **Self-Reported Data:** The study uses answers that students gave about themselves. Sometimes, these answers might not be completely honest or may reflect personal bias.
3. **Cross-Sectional Nature:** The research only gathers data from one specific time. This approach makes it challenging to understand how AI-ChatGPT might affect analytical skills over a long period.

5.4 Recommendations

Based on findings, I recommend here in this research, there are some simple and important recommendations on using AI ChatGPT tools in higher level education:

1. **Integration of AI in Higher education Institutions:** higher educational institutions like KUST, should use AI tools, particularly ChatGPT, to assist the learners and to enhance their critical, innovative and solution of the problems skills.
2. **Broaden Research Scope:** Future studies should involve students from various universities and different fields of study to gain diverse insights and perspectives.
3. **Study Long-Term Impacts:** It's important to conduct long-term research to see how using AI tools affects students' thinking skills over time and whether these tools offer lasting benefits.
4. **Compare Different AI Tools:** Research should look at other AI tools as well, comparing them to ChatGPT to determine which supports analytical thinking better and offers the most benefits.
5. **Emphasize Ethical Use:** Educators should help students understand by what method to use the AI tools with full responsibly, teaching them not to depend on these tools too much and ensuring they avoid plagiarism by producing their own work.

These suggestions aim to improve the use of AI tools like ChatGPT in education and explore their effectiveness more deeply. If you need further adjustments or want more details, feel free to ask.

5.6 Conclusion

This study examined that, in what manner AI-ChatGPT influences the analytical abilities of graduate students at KUST. Results showed that when students used AI-ChatGPT, their analytical skills improved. This suggests that AI-ChatGPT could be very beneficial in educational environments. However, more research is necessary to understand its full impact in higher education. Schools and teachers could use AI-powered tools to assist students in learning and in enhancing their critical thinking skills. By incorporating such technology, educational institutions can potentially offer enriched learning experiences and better prepare students for future challenges.

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