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Effects of ChatGpt - Assisted Learning on Students' Mathematical Reasoning, Problem- Solving skills and Achievement in Bagmati Provience of Nepal

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Abstract:

The rapid development of artificial intellengence (AI) has created new opportunities for improving mathematics teaching and learning. chatGPT, as a generative AI-based conversational learning tool, can provide students with immediate feedback, explanations, examples and alternative solution strategies. This study examines the effects of ChatGPT- assisted learning on student's mathematical reasoning, problem solving ability and mathematical achievement in Bagmati Provience, Nepal. A quasi-experimental pre- test- post- test control group design was proposed for the study. The study used the sample of 300 secondary- level students, comprising 150 in students in the experimental group and 150 in the control group. The experimental group received mathematics instruction supported by chatGPT, whereas the control group received conventional instruction. Mathematical reasoning, problem solving and achievement were measured through structured tests administered before and after the intervention. The stimulated findings indicated that the experimental group demonstrated greater improvement in all three outcomes. Mathematical reasoning increased from a pre –test mean 24.80 to 36.70 , problem solving performance from 23.90 to 35.90 and mathematical achievement from 52.10 to 70.80. the corresponding post- test mean for the contro group were 28.90, 28.40 and 61.50 respectively. Independent- sample t- tests indicated statistically significant differences between the groups for mathematical reasoning, $t(197) = 16.02$, $P < 0.001$, problem solving, $t(198) = 15.15$, $p <$ o.oo1 and achievement, $t(196) = 16.51$, $P <$ o.oo1. The findings suggest that chatGPT- assisted learning has potential as a supplementry approach for enhancing mathematics learning. However, effective teacher guidance verification of AI generated responses and responsible use of ChatGPT are essential to avoid overdependence on AI. The study provides a basis for further empirical investigation of generative AI supported mathematics education in Nepal.

Keywords: ChatGpt, Artificial intelligence, Mathematical resoning, Problem solving, Mathematical achievement, Bagmati provience, Nepal

Introduction

Mathematics is a fundemental subject that develops student logical thinking ,

resoning, problem solving ability and capacity to apply knowledage in real life situations. However, Many student experience difficulties in understanding abstract mathematical concept, developing approprite solution strategies and appiying mathematical knowledege to unfamiliar problems. Traditional teacher- centrated approaches may not always provide sufficient opportunities for individual learning, immediate feedback and exploration of multiple solution strategies. Therefore, the integration of innovation technology into mathematics education has become increasingly important. The rapid deveiopment of artifical intellegence (AI) has created new possitilities for teaching and learning mathematics. Among emerging AI technologices, chatgpt is a generative AI based cinversational system capable of responding to question, explaning concept, provding example, generating ailternative solution and giving interavtive feedback. In mathematics learning, chatgpt can potentially funcetioning as a supplementary learning assistantly allowing student to ask question repeatedly, obtain step by step explanations, compare different approches and receive immediate responding such characteristics may support student conceptual understanding, mathematic reasoning and problem solving process. Mathematics reasoning is particularly important because mathematics learning should not be limited to obtaining correct answer.student need to identify patterns, make logical cinnection, justify procedure, evaluate solution, and explain mathmatical ideas.simiarly problem solving requires student to understand a problem, develop stratgies, important appropriate procedure and evalute the resonableness of their solution.chatgpt assisted learning may provide opporyunities for student to engage in there process through questioning, explanation feedback and exploretion of alternative approches.

At the same time, the use of chatGpt in education presents both opportunities and challenges. while AI can provide personalized and immediate assistance, excessive dependence on AI- generated answers may reduce student's independent thinking and may also expose learners to incorrect or misleading information. consequently, the educational value of chatgpt depends substantially on how it is integrated into classroom instruction and how effectively teachers guide students in evaluating and using AI- generated information.

Mathematical reasoning, problem solving and achievement in Bagmati provience,Nepal, focuses on three outcomes of mathematics: mathematical reasoning, problem solving and mathematical achievement. The study compares students receiving chatGpt- assisted mathematics instruction with those receiving conventional instruction. The findings are useful to the chatGPT developers and expected to provide empirical evidence for teachers, researchers, curriculum developers and educational policymakers regarding the appropirate and resposible integration of generative AI into mathematics education in Nepal.

Review of Literature

Theoritical Literature Review: The theoritical literature review related to this study are disscused as below:

1. ChatGPT-assisted learning in education:

ChatGpt is a generative artificial intelligence (GenAI) capable of producing explanations, examples feedback, questions and step- by- step solutions through natural- language interation. Its educational significance lies not simply in providing answers but it its potential to provide personalized assistance, immediate feedback, scaffolding and opportunities for interactive learning. Consequently, researchers have increasingly investigated whether chatgpt can move beyoud simply providing answers and contribute to student's mathematical thinking and learning. Pepin et al. (2025),

in a scoping survey of ChatGPT in mathematics education, identified several major applications, including mathematical concept explanation, personalized learning, assessment, lesson planning, collaboration and learning support. the review also emphasized that the educational value of ChatGPT depends on how tachersa and students use technology rather than simply an access to the technology itself. A recent systematics review by Su (2026), covering 54 peer- reviewed studies indexed in web of science, scopus and SciELO, found that problem solving support was the most frequently reported application of chatGPT in mathematics education (46.3%). Conceptual understanding and metacognitive development were also identified as important potential benefits. However, accuracy and reliable were major concerns, indicating the need for teacher mediation and verification of AI-generated mathematical responses.

2. ChatGPT and Mathematical Reasoning

Mathematical reasoning involves making logical connection, identifying patterns, constructing arguments, explaining procedures, evaluating solutions and justifying mathematical conclusions. therefore efective mathematics learning requires students to go beyond simply ontaining a correct answer. ChatGPT has the potential to support reasoning by asking students to explain their thinking, compare alternative solution methods and examine the steps involved in a solving a problem. Its conventional format can allow students to ask follow up questions and request clarification when they do not understand a mathematical concept. However, the relationship between chatGPT and higher- order mathematical reasoning is not straight forward. A systematic review by Turmuzi et al. (2026) noted that chatGPT is useful for explanations and guided asistance but can encounter difficulties with complex reasoning. Su et al. (2026) similarly conducted that effective use requires tasks that requires students mathematical responses rather than simply copy AI- generated solutions. this indicates an important pedagogical principle: chatGPT should stimulate student's mathematical thinking rather then replace it.

3. ChatGPT and Mathematical problem solving skills

Problem solving is one of the most important objectives of mathematics education. students need to understanding problems, identify relevant information formulate and evaluate their answers. ChatGPT may support these processes by providing hints, breaking complex problems into smaller steps, presenting alternative methods and giving immediate feedback. Recent systematic research on AI in mathematics education found that AI tools can support mathematical problem solving through scaffolding, strategy guidance, immediate feedback and visualization of solution processes. The literature nevertheless identifies a major limitaion. If the students ask ChatGPT for the complete answer and merely copy the generated procedure, the technology may reduce rather than strengthen independent problem solving. Therefore, the educational effect depends on the level of students engagement and teacher-designed learning tasks. This is particularly important for the present study because it does not treat ChatGPT merely as a source of answers. Instead, ChatGPT- assisted learning is conceptualized as guided use of AI to support mathematical reasoning and problem solving processes.

4. ChatGPT and Mathematical Achievement

Mathematical achievement is an important indicator for evaluating the effectiveness of instructional interventions. Recent empirical evidences suggests that generative. AI can have a positive effect on learning outcomes, although the magnitude of the effect varies across contexts. a 2026 meta- analysis of 22 empirical studies involving 5,232 participants reported a moderate positive overall effect of generative AI on

mathematics learning outcomes. the analysis also indicated that the degree of AI integration into teaching, sample size and learning sontent can influence the observed effect. More broadly, a systematic review and meta- analysis of experimental studies conducted that chatGPT can enhance academic performance and higher- order thinking tendencies, although it's effects are not uniform across all learning outcomes.

Empirical Literature review:

Deng et al. (2024), through a systematics review and meta- analysis of experimental studies, reported that chatGPT can improve students academic performance and higher order- thiking tendencies, although its effects are dependent on the instructional context. Su's (2026) systematic review shows similary reports as Deng et al. (2024) concerens about over- reliance, inaccurate responses and insufficient student verification about learning processes. Pardos and Bhandari (2024) conducted an experimental study involving 274 learners to examine whether chatGPT- generated hints could support mathematics learning. Participants were randomly assigned to chatGPT- generated help, or a no- help control condition across four mathematics areas: elementry algebra, intermediate algebra, college algebra and statistics. The findings showed that chatGPT- help condition produced statistically significant learning gains, compared with no- help condition. ChatGPT- generated assistance also produced learning gains comparable to human tutor- authrized help. The study supports the possible contribution of ChatGPT to problem solving. Dilling and Herrmann (2024) examined the use of chatGPT, 129 pre- service teachers in mathematical proof tasks in geometry. Nearly all the participants used chatGPT- 3.5, while a small number used GPT- 4. The researchers analyzed student's experiences, belifs, prompts, interations and submitted mathematical proofs.. The study found that students had relatively limited understanding of how chatGPT operates and misconceptions about the technology were common. This is a particular important for mathematical reasoning variable because mathematical proofs requires justification and logical reasoning. Fridel et al. (2023), conducted Benchmark evaluation of chatGPT/ GPT- 4 and founded that ChatGPT was useful for mathematical information and some undergraduate mathematics, but performance decreased substantially on advanced mathematics. This establishes the importance of checking mathematical reasoning accuracy rather than assuming that fluent answers are correct. Plevries et al. (2023) conducted chatbot put to the test in math and logic problems and compared chatGPT-3.5, GPT- 4 and bard on mathematical/ logic problems ans also he found AI systems performed relatively well on straight forward arithimatic and algebra but were less reliable on complex mathematical and logical problems. This directly supports investigating problem-solving and reasoning, not merely answer generation. Wardat et al. (2023) conducted revolutionary tool for teaching and learning mathematics through qualitative case study involving mathematics stakeholders and the study identified potential for ChatGPT to support mathematics learning, explanations and access to mathematical information, while also pointing to limitations requiring appropriate educational use. Sanchez- ruiz et al. (2023) conducted ChatGPT challenges blended learning methodologies in engineering education: case study in mathematics and he founded ChatGPT creates opportunies for mathematics learning but alsochallenges conventional blended- learning practices and assessment. It heighlights the need for pedagogical adaptation.

Liu et al.(2023) conducted future of education in the Era of generative Artificial Intelligence by systematic review and scholars identified personalization and learning support as potential benefits but raised concerns about about academic integrity and possible effects on mathematical thinking. Gouia- Zarrad and conducted evaluating

Gunn (2024) conducted the study on enhancing student's learning experience in mathematics class through ChatGPT and founded that students used ChatGPT to generate code and support numerical- method learning. the study illustrates how ChatGPT can be incoporated into active, contextualized mathematics learning rather than simply supplying answers. Korkmaz guler et al. (2024) ChatGPT's academic achievement in a mathematics exam, case study comparing GPT-3.5 and GPT- 4. The findings showed that ChatGPT performed better than GPT- 3.5 but both verson made mathematical errors. The authors therefore recommend supervised use rather than treating ChatGPT as an infallible mathematical authority. Noster et al. (2024) conducted pre- service teacher's approaches in solving mathematics tasks with ChatGPT and found that both correct and incoorect chatGPT answers occurred. Participants were particularly vulnerable to accepting incorrect AI- generated solutions. Mathematical knowledge and technological knowledge influenced how effectively chatGPT was used. Scorcht et al. (2024) prompt the problem, 1,080- output validations; mathematical problem tasks and founded that different prompting approaches did not substantially change content- related quality but chain- of- throught andask- me-anything approaches improved aspects of process- related quality. this indicates that how students interact with chatGPt matters. Urban et al. (2024) examined chatGPT improves creative problem- solving performance in University students through preregistrated experiment; 77 chatGPT users vs. 68 controls approaches and found ChatGPT significantly improved solution quality, elaboration and originality in a complex creative problem- solving task. It also increased self- efficacy and reduced perceived mental effort. however metacognitive accuracy remained problematic. Deng et al. (2024) examined does chatGPT enhance student learning ? through systematic review and meta analysis of experimental studies and found that experimental evidence indicated positive effects of ChatGPT on academic performance, affective- motivational states and higher- order thinking propensitives, although effects different across outcomes. this provides broader evidence that experimental designs are important for establishing learning effects. Tunc (2024) examined pre service mathematics teachers purposes of using chatGPT in lesson plan development including 56 pre-service mathematics teachers and founded that Participants used chatGPT for mathematics lesson planning. The study demonstrates the growing role of chatGPT in mathematics teacher education and highlights the importance of teacher's techlogical- pedagogical knowledge.

Busuttil and Callegeja (2025) conducted teacher's beliefs and practices about the ChatGPT in teaching mathematics in secondary schools through secondary mathematics teachers; Track framework and found that teacher's beliefs and practices concerning GenAI/ChatGPT in secondary mathematics highlights teachers knowledege and pedagogical mediation as important condition for successful integration. Pepin et al. (2025) conducted a scoping review scoping survey of ChatGPT in Mathematics education through scoping review and found that ChatGPT can support conceptual understanding, personalized learning, ffedback, lesson planning and collaboration. However, inaccuracies, hallucinations, ethical issues and over- reliance remain important concerns. Zhos et al. (2025) exploring ChatGPT – facialitated scaffolding in undergraduate's mathematical problem solving through mixed- method study and found that ChatGPT- faciliated scaffolding significantly improved mathematical problem – solving performance. The study is particularly important because it examines chatGPT as scaffolding rather than simply as an answer- producing tool. Tuemugi et al. (2025/26) conducted the study about ChatGPT in school Mathematics education through a systematic review through prism review of 20 empirical studies and found that evidence for instant feedback and personalized support but also limitation in

complex problem solving and risks of over- reliance. It emphasizes structured teacher guidance and hybrid learning models. Almarashdi et al. (2024) conducted about the potential: A systematic review of ChatGPT in transforming mathematics teaching and learning throuh prisma systematic review including 31 studies and found that the review reports potential benefits for personalized learning and student engagenent while emphasizing the need to understand how chatGPT in integrated into mathematics teaching.

Su, Hsu & Gonzalez campos (2026) through prisma systematic review including 54 peer review studies and found that problem solving was the largest application category, reported benefits included conceptual understanding and metacognitive development, while accuracy/reliability was a major concern. The authors emphasize teacher mediation andAI literacy. Bulut & Borromeo Ferri (2026) conducted AI powered learning; Secondary schools student's use of chatGPT for solving mathematical modelling problems and directly examined secondary student's use of ChatGPT is highly relevant to proposed secondary- level research and literature towards authentic school mathematics problem solving. Urban, Gencaslan & Dost (2026) was conducted- Is ChatGPT a rational assistant for University students during in Mathematical reasoning ? , including University students; calcus reasoning and examines chatGPT interaction and contributes evidence whether students can use ChatGPT productively when resoning about mathematical concepts.

These Several studies indicate that research on ChatGPT in mathematics education has expanded rapidly since 2026 existing evidence remains fragmented across AI performance studies, perception surveys, teacher education, university- level learning and systematic reviews. Existing studies indicate that ChatGPT can provide feedback, scaffolding, explanations and support for mathematical problem solving but they also document inaccurate solutions, weaknesses in complex reasoning and risks of student over- reliance. Moreover, relatively few empirical studies simultaneously examine mathematical reasoning, mathematical problem- solving and mathematical achievement among secondary- school students using a structured chatGPT- assisted learning intervention. Although recent research involving 836 school students(sample) in kathmandu has reported positive associations among chatGPT functionality, engagement, conversation and mathematics- learning performance, the cross-sectional design does not establish the effects of a controlled ChatGPT- assisted learning (Joshi, D.R.,Khanal, J., Khanal, B. and sharma chapai, K.P (2026). Existing studies on chatGPT- assisted mathematics learning have mainly focused on higher education, student's perceptions engagement and general learning outcomes. Limited empirical evidence is available on secondary level students in Nepal, particularly regarding specific mathematics outcomes. although recent Neplease research has examined ChatGPT use among schools students, evidence on its effects on mathematical reasoning, problem solving and achievement simultaneously remains limited. Therefore, this study addresses the gap by examining the effects of structured chatGPT-assisted learning on mathematical reasoning, problem solving and achievement among secondary- level students in Bagmati province, Nepal.

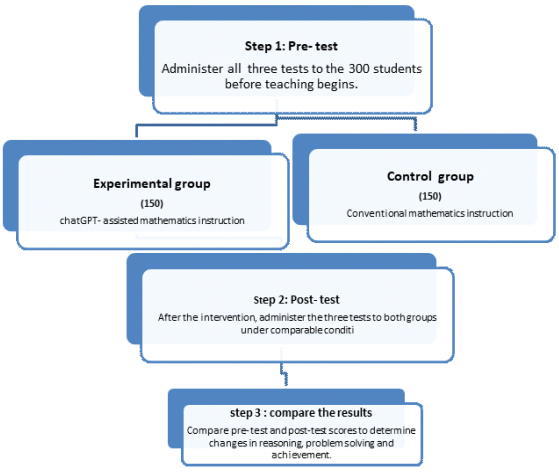
Research Gap

Although the use of artificial intelligence (AI) in education has received increasing attention, significant research gaps remain regarding the effectiveness of chatGPT-assisted learning in mathematics education. In particular, further empirical investigation is needed to examine its effects on students mathematical reasoning, problem- solving skills and mathematics achievement simultaneous. moreover, much of the emerging research on AI- assisted learning has been conducted outside Nepal,

highlighting the need for context- specific evidence from Nepalese secondary education. The effectiveness of ChatGPT- assisted mathematics learning among secondary- level students in Bagmati provience isalso insufficiently established and requires systematic empirical investigation. furthermore, there is a need for comparative evidence to determine whetherr chatGPT- assisted instruction produces measurable improvements in learning outcomes compared with conventional teaching approaches. Therefore, the present study aims to address these gap by investigating the effects of chatGPT-assisted learning on students mathematical reasoning, problem solving and achievement in Bagmati Provience of Nepal.

Coceptual Framework

The overall conceptual framework of this study are illustrated as below:



Objectives of the study

The main objectives of this study is to find the effects of chatGPT- assisted learning on student's mathematical reasoning, problem solving and achievement in Bagmati Province of Nepal. However, the main specific objectives of this study are as follows:

- To examine the effects of chatGpt- assisted learning on mathematical reasoning.
- To determine the effects of ChatGpt - assisted learning on mathematical problem solving.
- To assess the effects of chatGpt- assisted learning on mathematical achievement.

Research Questions

- How does ChatGPT- assisted learning affects student's mathematical reasoning compared with conventional mathematics instruction ?
- How does ChatGPT- assisted learning affects student's problem solving skills compared with conventional mathematics instruction ?
- How does ChatGPT- assisted learning affects student's mathematics achievement compared with conventional mathematics instruction ?

Significance of study

The study entitled "Effects of ChatGPT- Assisted Learning on students Mathematical reasoning, problem solving and achievement in Bagmati provience of Nepal's is significant because it examines the potential of artificial intelligence to improve mathematics education the findings may help mathematics teachers integrate chatGPT effectively into classroom instruction and encourage students to develop mathematical reasoning, problem solving skills and academic achievement. The study may also assist curriculum developers, educational policymakers and school administators in developing AI- supported teaching and learning strategies. Furthermore, it may provide a useful reference for researchers interested in artificial intelligence and mathematics education in Nepal. Overall, the study may contribute to improving mathematics teaching practices and promoting the responsible use of AI in secondary level education.

Methodology of the study:

1. Research design / Population, Sample and research tools

A quantitative quasi- experimental pre- test- post –test contrl group design was used to examine the effects of chatGPT- assisted learning. The population was considered secondary- level students who were studied in Bagmati Provience of Nepal. A sample of 300 students from 10 secondary level school was selected purposively using simple random sampling technique and divided into an experimental group (150) and a control group (150). The experimental group received mathematics instruction using structured ChatGPT- assisted learning, while the control group received conventional mathematics instruction for specified instructional period. A mathematics reasoning test, problem solving test and achievement test were administered were reviewed by experts and tested for reliability and validity as a pilot test not including the main sample of study and calculate the chronbatch alpha and modified them. K-20 were used for dichotomously scored items.The necessary revisions were made before the main data collection. Descriptive statistics and inferential statistics, particularly independent- samples and paired samples t- tests, were used to compare the groups and determine the effects of ChatGPT- assisted learning. Statistical significance was tested at $P < 0.05$. The permission was obtained from the relevent instutions and student's participation was voluntary with confidentiality maintained.

Table- 1 (Sample and sampling distribution)

Group	Sample	Interventions
Experimental group	150	ChatGpt- assisted mathematical learning
Control group	150	Conventional mathematical learning
Total:	300	

Where, the experimental group receives mathematics instruction supported by chatGpt while the control group receives conventional instruction. The outcome measures are used as mathematical reasoning test, mathematical problem solving test and mathematical achievement test. Therefore, the administrative test is the research tools of this study. Mathematics reasoning test, problem solving test, mathematical achievement test were used in this study. Mathematics reasoning test consisting of 10 items designed to measure student's ability to identify mathematical patterns, justify mathematical statements, recognize relationships and draw logical conclusions. Problem solving test consisting of 10 items designed to assess student's ability to understand mathematical problems, select appropriate strategies, perform calculations and verify solutions. Similarly, mathematics achievement test consisting of 20 items based on prescribed mathematics curriculum for the selected grade level. the test may measures students knowledge, understanding and application of mathematical concepts. Mathematics test item consist 10 items having maximum 20 marks and problem solving test consists of 10 items having maximum 30 marks and mathematics achievement test consists of 20 items having maximum 20 marks. In overall, there was 40 construct items having maximum 70 marks under this study.

Data collection procedure

The researcher will obtained permission from the relevant educational authorities, school administrations, teachers and parents where required students and their parents or guardians will be informed about the purpose and procedures of the study and appropriate consent and student assent will be obtained. Pre- test scores will be recorded before the intervention and post- test scores will be collected at its conclusion. Classroom observations will be provide as a optional and supplementary information about student's engagement and learning processess. students names and other identifying

information will be kept confidential.

Validity and realiability of research instruments

The instrument will be developed with refrence to the prescribed mathematics curriculum and relevant literature. Mathematics education experts and experienced mathematics teachers will be review the items for content validity, clarity and grade-level appropriateness. A pilot study will be conducted with students who are similar to the target participants but were not included in the main sample, where feasible. Item difficulty, discrimination and realibility were examined. KR-20 were used for dichotomously scored item were used , while Cronbach's alpha also were used to testthe validity and realibility test items. Necessary revisions were made before the main data collection.

Data Analysis and Interpretation

The collected data were coded, decoded and interpreted by using frequency, percentage, mean and standard deviation and t- test were used to summarize the participant's score on mathematical reasoning, problem solving skills and mathematics achievement to examine the effects of ChatGPT- assisted leaning on mathematics reasoning, problem solving skill and mathematical achievement. The overall statistical informations are illustrated as below:

2. Pre test and post- test data:

Table - 2 (Mathematical Reasoning)

Group	N	Pre- test Mean	Pre- test SD	Post- test Mean	Post - test SD
Exprimental Group	150	24.80	5.40	36.70	5.10
Control Group	150	24.50	5.30	28.90	5.40
Total	300	49.30	10.70	65.60	10.50

Interepretation: The two group had almost similar mathematical reasoning scores before the intervention. the experimental groups mean increased from 24.80 to 36.70, whereas the control group mean increased from 24.50 to 28.90. Larger improvement in the experimental group indicates that chatgpt- assisted learning may have contributed to improvement in students mathematical reasoning ability.

Table - 3 (Problem solving performance)

Group	N	Pre- test (Mean)	Pre- test (SD)	Post - test (Mean)	Post test (SD)	Difference of two Mean
Experimental Group	150	23.90	5.70	35.90	5.50	12.0
Control Group	150	24.10	5.60	28.40	5.60	4.30
Total:	300	48.00	11.30	64.30	11.10	16.30

Interpretation: The experimental group improved from 23.90 to 35.90, representing an increase of 12.0 points. In comparision, the control group increased from 24.10 to 28.40, an increase of only 4.30 points. Thus, the findings suggested that students exposed to ChatGpt- assisted learning demonstrated substantially greater improvement in mathematical problem- solving skills.

Table – 4 (Mathematical Achievement)

Group	N	Pre- test Mean	Pre- test SD	Post- test Mean	Post- test SD	Difference of Mean Achievement.
Expemental Group	150	52.10	8.40	70.80	7.60	18.70
Control Group	150	51.70	8.10	61.50	8.00	9.80
Total:	300	103.80	16.50	132.30	15.60	28.50

Interpretation: The experimental group's achievement increased from 52.10 to 70.80, whereas the control group's achievement increased from 51.70 to 61.50. The experimental group therefore shows that substantially greater improvement than the control group. This suggests that ChatGpt assisted learning could positively influence student's overall mathematics achievement.

Table-5 Independent Samples (T- test of post- test scores)

To examine whether the difference between the two groups was statistically significant, an independent samples. T- test was applied to the post test score.

Variable	Experimental Mean	Control Mean	Mean Difference	t- value	Degree of freedom(df)	P- value
Mathematical reasoning	36.70	28.90	7.80	16.02	297	< 0.001
Problem solving	35.90	28.40	7.50	15.15	298	< 0.001
Mathematics Achievement	70.80	61.50	9.30	16.51	296	< 0.001

Interpretation: The above statistical results indicate that the experimental group performed significantly better than the control group on all three dependent variables. In Mathematical reasoning, the t- value is 16.02 and P- value is less than 0.001. Similarly, the t- value in problem solving is 15.15 and P value is 0.001. The t- value of Mathematical achievement of students is 16.51 and P- value is 0.001. since, all the P- values are less than 0.05, the differences are statistically significant.

Ethical consideration

The researcher maintains voluntary participation, informed consent, confidentiality and responsible use of ChatGPT. Students in contro group will not be disadvantaged in their regular mathematics education. ChatGT will be used as a learning support rather than a substitute for student's independent thinking. students data will not be entered into ChatGPT in identifiable form and all research findings will be reported honestly.

Result and Disscussion:

The findings indicate that chatGpt- assisted learning produced greater improvement than conventional instruction in all three dimensions of mathematics learning: Mathematical reasoning, problem solving and achievement. The improvement in mathematical reasoning may be explained by the interactive nature of chatgpt- assisted learning students can ask questions, request alternative explanation, examine mathematical procedures and receive immadiate feedback. Such interations may encourage students to explain why a particular mathematical procedure works rather than simply memorize formulas. Similarly, the greater improvement in problem solving performance suggests that ChatGpt can provide students with opportunities to explore different solution strategies. When appropriately guided by teachers, students can use AI- generated explanations as scaffolding for understanding complex mathematical problem. The achievement results also shows a considerable difference between the two groups. The experimental group obtained a post- test mean of 70.8, compared with 61.5 for control group. This may indicate that combining teacher instruction with AI supported learning can improve students understanding and application of mathematical concepts. However, the findings shouldnot be interpreted as evidence that chatGpt should replace mathematics teachers. Rather, chatGpt can be considered as a supplementry learning tool. Teacher guidance remains important because AI system can sometimes generate incorrect, incomplete or misleading explanations. The overall study suggest ChatGpt- assisted has a statistically significant positive effects on students mathematical reasoning, problem solving and mathematical achievement. Thus, the chatgpt- assisted learing is the supportive, useful and beneficial supplementry

component of students learning.

Conclusion:

ChatGpt- associated learning showed a positive effects on student's mathematical reasoning, problem solving ability and mathematical achievement. chatgpt- assisted learning provides the opportunities to ask the questions, request alternative explanation, examine mathematical procedures, receive immediate fedback, explore various types of mathematical strategies understanding and also indicate combining teacher instruction with AI supporting learning. Therefore, ChatGpt- assisted learning as a complementary and supplementry tool in in overall learning phenomena.

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