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The efficacy of teachers' instructional strategy on students' performance in mathematics

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ABSTRACT

Mastering mathematics by many students can be a difficult undertaking because of its abstract nature, intricate concepts, and requirement for accuracy. Mathematics works with theoretical structures and demands a certain set of abilities and methods that make it challenging to master, in contrast to other topics that depend on concrete objects. Students may become frustrated and feel like they are lagging behind if they are unable to comprehend mathematical ideas. Nonetheless, students might better grasp mathematical topics when they employ a few basic learning tactics. The study aimed to determine the effectiveness of teachers' instructional strategies on students' performance in mathematics, specifically identifying the factors that should be taken into account before choosing a teaching methodology. The study examined two distinct teaching approaches and their efficacy in a classroom setting. The research study's instruments included observation and interviews; 117 students and 6 mathematics teachers participated in the study; the data sample was selected using a simple random sampling procedure; and descriptive statistical methods were used to analyze and discuss the study's findings. The key findings of the study showed that teachers did not use activity-based learning to help students learn how to solve real-world problems using applied knowledge. Teachers were also failing to use the right technique to teach mathematical ideas in a way that would benefit students. Additionally, students declined the study of mathematics because they believed their teachers were providing them with authoritarian education. Lastly, the teaching tactics used by the math teachers had a negative impact on the academic achievement of the students. The study suggests that in order to improve the achievement of students in mathematics, the Ghana Education Service and policy makers should provide regular in-service training for teachers of mathematics. This would provide them with the necessary teaching strategies.

Keywords: teacher's efficacy, instructional strategy, teacher-centered approach, student-centered approach

INTRODUCTION

Mathematics is an interesting subject, but many people have aversions of it, undoubtedly because of the way teachers teach it. It is not novel that mathematics has the lowest academic achievement rate. Students' interest and self-efficacy beliefs in mathematics are influenced by their views of the subject's difficulty (Ahmad, 2022). This view is the outcome of a fear of mathematics. Mathematics is acknowledged as a vital curriculum area in the vast majority of our schools in Ghana. It is a subject which plays a role in a variety of other subjects such as Economics, Physics, Accounting, and Businesses.

At every educational level, the main goal of instruction is to fundamentally alter the student (Tebabal & Kahssay, 2011). Teachers should use the most suitable instructional approaches to meet specific goals and level exit outcomes in order to aid in the transference of knowledge.

Contrasting to the student-centered approach, a lot of teaching professionals in the conventional age frequently used the teacher-centered approach to convey knowledge to learners. The topic of educational inquiry has been greatly intrigued by questions regarding the impact of teaching methods on student achievement up until this point (Hightower et al., 2011).

Remarkably, the majority of junior high school students consistently score poorly academically, and this is largely due to teachers using inadequate teaching methods to transfer knowledge to their students (Adunola, 2011). Extensive studies on the efficacy of instructional strategies suggest that student progress frequently mirrors the caliber of instruction.

Ayeni (2011) asserts that teaching is a process that entails changing students in ways that are desired in order to accomplish particular goals. Adunola (2011) argues that for a teaching approach to be effective, teachers must be knowledgeable about a variety of teaching tactics that take into account of the concepts of degree in complexity.

During my recent experience at Abetifi Anglican Junior High School, I noticed that students were not very interested in mathematics and that they were not able to do well in the subject hence the need to delve into the cause of such menace.

This research was carried out in the Ghanaian Eastern Region's town of Abetifi, which is located in the Kwahu East District. Roughly 5,300 people live in the town. The primary occupations of the indigenous people are trading and peasant farming. The town of Abetifi boasts of approximately ten (10) Basic institutions, three (3) SHS/TVET institutions, a College of Education, and a Private University, making it the center for education in Kwahu. Despite receiving numerous honours, the town prioritized farming and trading over education.

It was found that most students at Abetifi Anglican Junior High School were unable to perform exceptionally well in mathematics as a result of improper teaching methods during the research survey. When presenting mathematical concepts, it became apparent that the mathematics teachers emphasized rote memorization. An interview with students was used to determine this. The students were forced to learn the material by memorization without really comprehending it. After the aforementioned issue, it was required to identify the issue and provide a workable solution by applying the proper teaching style.

In education, there are numerous teaching strategies. Every tactic is designed to help educators be successful in their efforts to spread information. The concept of methodological variety has been prioritized in competency-based education programs, which consider both the generally valued professional competence as well as the growth of the students' individual abilities (Rainwater, 2016). Nevertheless, there are a few things that need to be taken into account prior to choosing the best approach. Teaching methodology should emphasize learning that fosters the capacity to generate new knowledge and encourages students to learn on their own by giving them chances to collaborate, be interactive, and exhibit their abilities, attitudes, and skills (McClarty & Gaertner, 2015). The primary objective of this study is to determine how the teaching approach of instructors in mathematics affects the mathematical performance of their students. The specific objective of this research is to identify the variables that should be taken into account before choosing a teaching strategy. Additionally, it frequently identifies the many approaches that mathematics teachers employ to instruct their students in the subject. The goal of the study is to evaluate the efficacy of two distinct teaching philosophies in a classroom setting.

Research Questions

The following research questions is formulated to serve as a guide to this study.

RQ1 What are the various factors to be considered before the selection of a teaching strategy?

RQ2 What are the impacts of the various considerable factors before the selection of a teaching?

RQ3 How can teachers teaching skills be improved to promote students' performance in mathematics?

THEORETICAL BACKGROUND AND LITERATURE REVIEW

This study is grounded in the Connectivism learning theory. The duty for learning is shifted from the teacher to the learner by connectivism. According to Dunaway (2011), connectivism is a philosophy of learning that uses various node series to link hundreds of networks in order to support both synchronous and asynchronous learning. While teachers establish learning ecologies, mold communities, and release students into the world, students design their own learning experiences. Nussbaum-Beach and Hall (2012) posits that today's students are "do-it-yourself" learners who after acquiring knowledge, transforms what they have learnt and share with other individuals. It is obvious that both inside and outside of the classroom, technology is transforming how students learn. Today's students use their laptops and smartphones as a central repository of information, as opposed to memorizing lessons from textbooks and teachers. The environment for teaching and learning has altered as a result of the growing usage of technology in the classroom. Gaps in conventional teaching theories and the ongoing need for novel approaches follow along with it.

Ayeni (2011) asserts that teaching is an ongoing process that entails using the right techniques to help students change in the ways that are desired. The teacher has the majority of control over the procedures, methods, and processes that they employ while teaching. Nevertheless, the context in which a teacher uses their teaching technique will determine how effective it is. According to Adunola (2011), teachers should employ the most effective teaching strategies for the subjects they are teaching in order to effect the desired changes in their students. In order to satisfy requirements and meet the academic objectives of students, teachers must drive their lessons through effective teaching techniques. These techniques foster connections, increase student engagement to a deep level, and gather input from both students and other educators. Bhardwaj and Pal (2011) maintained that effective teaching methods primarily serve students needs because each student interprets and reacts to questions in a different way (Chang, 2010). Accordingly, matching the teaching strategy to the demands and preferred learning styles of the students affects their academic performance (Zeeb, 2004).

Empirical Knowledge of Variables under Study

Emphasis on teacher methodology can increase student accomplishment. Students learn in accordance with their developmental stages, interests, experiences, and methods of instruction, in addition to the material that is given to them. Many studies in all fields have tried to determine whether teacher-centered or student-centered approaches are better at helping students meet learning objectives (Barrett et al., 2018). However, there are differences in the methods that work best in the classroom (Marmah, 2014). When teachers implement proper high-pedagogical strategies and a carefully designed curriculum, students typically learn more.

Important findings of teacher effectiveness and student achievement were referenced by other scholars. Frome et al. (2005), for instance, discovered that activities including group projects, reporting on mathematical assignments, providing explanations for work, and utilizing manipulatives all contributed to middle school students' success in mathematics.

Variables pertaining to the school, students, and teachers were examined in the process of determining what supports achievement in mathematics. Malcolm et al. (2000) proposed in their literature review that student, teacher, and school variables should be taken into account in more thorough investigations of the elements that support accomplishment in science and mathematics. The delivery of mathematics concepts by various teachers has been categorised into teacher-centered and student-centered pedagogies.

Teacher-Centered Teaching Pedagogy

With this approach, students just get knowledge from the teacher without developing a deeper interest in the material being covered. Serin (2018) posits that students passively absorb the necessary information from their teachers. Because the teacher controls the learning process, students typically have less opportunity to think aloud or engage with other students.

This approach is primarily theoretical, less applied, and involves memorization. To help students learn how to solve real-world problems using applied knowledge, the teacher in charge of the information exchange, they convey as much information as possible in the least amount of time and effort. This could lead to a loss of student interest and comprehension. Zakaria et al. (2010) addressed these shortcomings by stating that instruction ought to actively involve students as the main participants rather than just concentrating on providing rules, definitions, and procedures for them to memorize.

Student-Centered Teaching Pedagogy

According to Janor et al. (2013), student-centered methods are those that are focused on the individual student. With this method, the instructor guides and participates in the learning process. Students can actively engage in their learning when using this teaching methodology. For classroom instruction, student-centered teaching approaches are preferred across all academic majors (Barrett et al., 2018). Participation in demonstrations, group projects, and classroom cooperation are among the activities in which students are encouraged to actively engage. Several academics now frequently use more adaptable student-centered techniques to improve active learning, thanks to the introduction of the idea of discovery learning (Greitzer, 2002). These days, the majority of educators use the student-centered teaching style to encourage students' engagement, enjoyment, and analytical investigation (Hesson & Shad, 2007).

The constructivism theory has served as the conceptual foundation for the student-centered teaching style (Cuban 2006), which has been widely adopted by educators for several decades. The student-centered approach has been used by teachers at different grade levels for a number of motives, including enhancing students' comprehension of historical concepts and ideas (Stout, 2004), giving students more ownership over their education and allowing students to develop multiple perspectives. Since the knowledge transfer from the teacher to the student is not centralized, the teaching approach is seen to be more successful. This teaching strategy is particularly successful in raising student accomplishment because it encourages goal-oriented behaviour in the classroom.

Forms of Student-Centered Teaching Method

Scrutinizing closely a few student-centered teaching approaches that have been emphasized by other scholars. Several student-centered teaching approaches include the following:

1. Teachers begin by going over the curriculum with the class; students then work in teams to select a question, conduct research to find the solution, write a report, and present in class. They also use the school library, the internet, and classroom resources (Passman, 2000).
2. Students work with the teacher to study the curriculum, examine the material that the teacher provides, undertake interviews, observe classes, and complete writing assignments. They also engage in conversations, investigate, synthesize, and evaluate associated knowledge (Ogawa, 2001).
3. Students collaborate in groups, examine and understand historical materials, present their findings, and draw parallels (Stout, 2004).
4. Peer assistance is used by the teacher (Wallhead, 2004). According to Luke (2004), students use computers for individual, group, and whole class activities in addition to exploring real-world issues, self-selected inquiry subjects, and creating multimedia presentations. They also generate and investigate their own topics using a variety of online and office sources.

A thorough examination of the research literature reveals that the term "student-centered teaching approach" has been defined in a wide range of ways. It appears reasonable to conclude that there is disagreement on definitions of the student-centered teaching methodology but have a distinct mental meaning (Hodson, 2002), hence, it would seem wise for instructors to be aware of this phenomenon.

MATERIALS AND METHODS

The study sheds light on how students' performance in mathematics is impacted by the methods used by mathematics instructors. The participants in the study are made up of 117 students from Abetifi Junior High School. A simple random sample method was employed to choose the participants for the research. Miller and Brewer (2003) approach to the selection of a data

Table 1. Descriptive statistics on teaching methodology used by teachers

Methodology	Number	Percentage (%)
Teacher-centered method	5	83.3
Student-centered method	1	16.7
Total	6	100

Table 2. Teachers rating of students' performance in mathematics

Methodology	Number	Percentage (%)
Excellent	5	5.6
Good	13	14.4
Average	47	52.2
Below average	25	27.8
Total	90	100

sample was used to determine the sample size of students for this study. With a significance level of 0.05, a 95% confidence interval and a 5% margin of error, a total sample of 90 students in Abetifi Anglican Junior High School was used for the study.

$$Sample\ size = \frac{117}{1 + 117(0.05)^2} = 90 \quad (1)$$

The study conducted on the sample would have strong internal and external validity because of its randomization. Because the goal of the study was to examine the impacts of teacher methods on students' performance in mathematics, 6 mathematics teachers were sampled purposively for the survey. The selection of the teachers was expedient for this study they had in-depth and detailed information about the phenomena under investigation.

Observation

An in-depth examination of the teaching and learning of mathematics was done. The maximum level of "ecological" validity is achieved through direct observation, which aims to track product usage in environments that are similar to real-world usage. This kind of observation was necessary due to the several effects on the data the data being gathered. The data was gathered using a variety of methods, including the usage of senses. After the in-depth observation, an interview was conducted to confirm the information gathered.

Interview

A group interview was conducted as part of the study. Groups of five (5), with eighteen (18) students in each group, were interviewed on their attitude and interest towards mathematics. Students shared a variety of issues and facts that were beneficial in one way or another.

One group claimed that owing to the teachers' portrayal of mathematics as a challenging topic, they have little interest in the subject.

Another group disclosed that, as a result of their tardiness and absence from class, they usually miss the majority of the mathematical lessons.

Another group said that teachers do not include them in the arithmetic lessons in the teaching and learning process.

To ensure confidentiality, the respondents were interviewed in groups, hence, none of the groups overheard the other's conversation.

Data Analysis

In order to answer the study questions, data analysis was done based on clearly defined data that addressed the research questions. An interview guide and observation schedule are used in the study to gather data from the respondents.

The respondents' answers were obtained and analysed. The interview material was analysed and described in terms of how it can improve students' mathematics skills. The variables used to examine the data is subsequently displayed in the form of tables and figures. Finding out the descriptive statistics on teaching methods that teachers employed while being observed was the goal of this study. **Table 1** shows the data that was gathered.

Table 1 makes it clear that more teachers used the teacher-centered technique than the student-centered approach to instruction. Nevertheless, when asked to compare the ways that teacher-centered and student-centered approaches improve students' performance in mathematics, 66.7% (n = 4) of the respondents supported student-centered approaches, while 33.3% (n = 2) supported teacher-centered approaches. It is in line with Stout's (2004) assertion that a student-centered teaching strategy enhances students' comprehension of historical concepts and ideas. However, given time restrictions and the lack of teaching manipulatives, it is determined that the majority of teachers adopt the teacher-centered style.

Rating students' mathematics performance was another requirement placed on the teachers. **Table 2** displays the findings.

It is clear from **Table 2** that students do poorly in the subject, which is related to the teaching strategy used by the mathematics teachers. According to the table, 14.4% of students are classified as good, and 5.6% of students are ranked as excellent. 52.2% and 27.8% students were rated as being average and below average, respectively.

Table 3. Factors to consider before the selection of a particular teaching strategy

Strategies	Yes	No	Total
Instructional objectives	6 (100%)	0 (0%)	6 (100)
Availability of teaching and learning aids	4 (66.7%)	2 (33.3%)	6 (100)
Teachers' ability and preferences	5 (83.3%)	1 (16.7%)	6 (100)
The age of students	3 (50%)	3 (50%)	6 (100)
The size of class	4 (66.7%)	2 (33.3%)	6 (100)
Time bound	5 (83.3%)	1 (16.7%)	6 (100)

It is evident that teachers' methods are the reason why student score poorly in mathematics, according to their rankings. This is consistent with Teo and Wong's (2000) assertion that the teacher-centered approach to instruction emphasizes memorization, theory over practice. Students typically show a lack of interest in the subject as a result.

Research question 1: What are the factors to consider before the selection of a teaching strategy?

Regarding the different strategies used by teachers to teach various mathematical topics, respondents were asked of the considerable factors before the selection of a teaching strategy. The respondents' opinions regarding the research question are shown in **Table 3**.

Based on the answers provided in **Table 3**, it is evident that every teacher (100%) takes instructional objectives into account prior to choosing a teaching strategy. Regarding the question of whether the availability of teaching and learning aids should be taken into account when choosing a teaching approach, thirty-three percent of the respondents disagreed, and sixty-seven percent agreed. The majority of respondents (83.3%) said that choosing a teaching methodology should take into account the preferences and abilities of the teachers. A minority of respondents (16.7%) disagree that a teacher's abilities and preferences should be taken into account when choosing a teaching style. While half of the respondents (50%) said that choosing a teacher approach should take the age of the students into account, the other half (50%) thought it was not essential. The majority of respondents, 66.7%, held the opinion that choosing a teaching approach should take the size of the class into account. However, a sizable portion of respondents (33.3%) believed that choosing a teaching approach should not be based on the size of the class. With regard to the matter of time bound, 83.3% of the participants confirmed that it is a criterion that should be taken into account when choosing a teaching methodology, whilst 16.7% of the participants disagreed that time bound should be taken into account when choosing a teaching methodology.

Analysing the statistics under this section makes it abundantly evident that there are a number of elements to take into consideration when choosing a teaching approach. The age of the students, the size of the class, the availability of teaching and learning aids, the instructors' abilities and preferences, and time constraints are a few examples of these variables.

Research question 2: What are the impacts of the various strategies deployed by teachers on students' achievements in mathematics?

Regarding whether the elements listed in **Table 3** of the study had an impact on students' attitudes and mathematical learning, the respondents' responses were not all the same. It can be inferred from **Table 3** responses that the variables listed have varying effects on students' learning.

> Is it true that stating the goals of the lesson has an impact on students' attitudes and learning outcomes?
>
> (Responses recorded from teachers)

> Clearly stating our educational objectives aids in the methodical presentation of our instruction, which progresses from tangible to more abstract ideas, consequently facilitating our students' understanding of mathematical ideas.

When the question of using teaching and learning aids was raised, it was reviewed that these tools benefit students in understanding more difficult or abstract subjects. The overall consensus was summarized up by the mathematics teachers' responses:

> In addition to stimulating students, teaching and learning aids make it easier for them to grasp more complex mathematical ideas.

When asked about their preferences and skills, the majority of instructors responded:

> To help in imparting the mathematical concept, a teacher should be well-versed in both the best pedagogical knowledge and the content or subject matter.

When asked about the age of students as a factor, it was observed that students' ages are occasionally disregarded. The head teacher of the school gave this usual response:

> Students' ages in class vary." It is not required to take into account the age of students at this level.

Teachers' written responses, when asked about class size and time constraints, were as follows:

Table 4. Descriptive statistics of students' performance based on teachers methodology

Methodology	Students passed (%)	Students failed (%)
Teacher-centered methodology	20	80
Student-centered methodology	90	10

> We rarely think about the class size since its assumed to be of small significance.

On the other hand, the majority of them stated that:

> Class size is truly thought to be a factor that affects student's attitude and learning in mathematics because of its great effects on students' performance.

A minority of teachers stated that the amount of time allotted for mathematics classes has a significant impact on pupils' learning and attitudes in a variety of ways.

Research question 3: How can teachers teaching skills be improved to promote students' performance in mathematics?

The results of question three (3) make it abundantly evident how teacher-centered and student-centered teaching strategies affect students' mathematical ability. Students were given an identical assignment to complete for assessment. The students were divided into two groups: One group received instruction from a traditional teacher, while the other group attended classes from a teacher who employed student-centered approaches.

Table 4 presents an analysis of the student performance of the two groups, based on the findings of the evaluation procedure.

Table 4 makes it quite evident that just 20% of the students who received instruction using the teacher-centered approach were able to pass the test. 80% of their classmates did not pass the test. However, only 10% of the students who were taught using the student-centered method failed the test; in contrast, 90% of the students who were taught using this method passed.

This statistical analysis makes it abundantly evident that mathematics teachers' methods of instruction have a significant impact on how well their students succeed in the subject. Adunola (2011) asserts that teachers should employ the most effective teaching strategies for the material in order to achieve the desired changes in their students' performance.

It may also be concluded that a variety of elements, including instructional objectives, student age, teacher ability and preferences, and a host of other considerations, should be taken into account when choosing the best teaching technique because they have an impact on students' -attitudes and learning.

DISCUSSION

Student learning and accomplishment in mathematics are significantly impacted by the teaching strategies used by teachers. It was determined that the teaching strategies used by the mathematics teachers at Abetifi Anglican Junior High School had a significant impact on the students' achievement in mathematics. According to every study done to date, learning and performance in mathematics are influenced by the way the subject is taught. But the outcomes of those investigations weren't always consistent. The current study intends to investigate how learners' achievement is impacted by mathematics teaching strategies.

When comparing the ways in which student-centered and teacher-centered approaches enhance students' performance in mathematics, 66.7% of the respondents favoured student-centered approaches, whilst 33.3% preferred teacher-centered approaches. This is consistent with Stout's (2004) claim that using a student-centered teaching approach improves students' understanding of historical concepts and ideas. In a similar vein, Carbonneau and Marley (2013), discovered that using student-centered teaching strategy such as the use of manipulatives was a suitable approach to support students in problem-solving, enhance their understanding of mathematics, and improve their academic achievement. A number of important variables were listed prior to the choice of a teaching strategy in relation to the various methods employed by teachers to teach the various mathematical disciplines. Finding the right teaching approach requires careful evaluation of several factors, as the statistical analysis makes clear. Several factors include the students' ages, the class size, the availability of teaching and learning aids, the skills and preferences of the instructors, and time restrictions.

Students' mathematical achievement in relation to the kind of teaching strategy employed by teachers indicated that students struggle to understand the material and experience nervousness when learning mathematics in a regular classroom under a teacher-centered approach. However, when the teacher employs various teaching pedagogies and involves the students in discussions and other engaging teaching techniques, students experience less or no anxiety when studying mathematics. Mathematical teachers must investigate novel and non-traditional teaching approaches in order to enhance their students' learning outcomes and mathematical motivation. Teachers primarily employ the traditional teacher-centered teaching strategy; it is impossible to discern that they employ a single method exclusively, but it has been noted that junior high students are interested in student-centered, activity-based cooperative learning and inquiry-based learning.

Effective teaching, according to research, is essential to students' progress and understanding of mathematics (Boaler, 2002). The instructional techniques that teachers employ during instruction are instruments that guarantee the attainment of the goals. Students can improve their problem-solving techniques and analytical skills through activities conducted in a mathematics environment throughout the course of the lesson. Furthermore, for students to have appropriate experiences of learning and cultivate mathematical reasoning, good teaching strategies are crucial. These abilities have an impact on how well students learn

mathematics. Strong grasp of concepts is fostered in students by effective classroom instruction in mathematics. With carefully thought-out lessons, teachers may help students understand mathematics. Students can relate abstract mathematical ideas to real-world experiences by taking part in conversations and exercises to solve problems. Additionally, students benefit from teamwork exercises because they develop conceptualization and logical thinking abilities. One important strategy for handling challenging mathematics problems in the classroom is to encourage pupils to collaborate with each other. Additionally, teachers must give differentiated ways to accommodate all of the learning requirements of their students when making decisions. Differentiated instruction is a teaching strategy used to address the various requirements of students, claims Grimes and Stevens (2009).

According to Nabayra and Sagge (2022), the teacher has always played a vital role in teaching mathematics. Students require a variety of critical tools to overcome the obstacles they face, including active engagement, attentive attention to their issues and concerns, clarification and explanation, and an effort to enhance their thinking. The approach with which a teacher presents mathematics can eliminate the adverse mindsets and preconceptions that most students have about it, even though most students dislike it. According to Hudson et al. (2005), the teacher's role is crucial in helping pupils create conceptual understanding. Furthermore, the following additional qualities are necessary for effective instruction:

a. Overview: Teachers can concentrate on what and how students need to learn by using an introductory exercise to gauge students' past knowledge.
b. Enhancement of abilities: Engaging in educational activities helps students gain the ability to comprehend mathematical ideas.
c. Directed application: collaborative endeavours provide students a chance to talk about the issues. These exercises provide students with a chance to assess their knowledge.
d. Independent exercise: Students must practice on their own to become proficient in mathematics. Students strengthen their mathematical abilities as they go through issues.

CONCLUSION

In the event that acquiring knowledge is a process that entails research, formulation, reasoning, and the application of suitable problem-solving techniques, educators ought to understand that assigning tasks to students instead of merely asking them to retain facts helps them learn more effectively. The traditional classroom setting, which consists of a lecture and a presentation by the instructor, does not encourage student engagement or foster the necessary degree of reasoning. Engaging students in problem-solving exercises during class activities helps them develop a deeper knowledge of the main subject. Raising pupils' interest with words of incentive and encouragement improves their performance outcomes. Students' performance improves as a result of a methodical approach, thus, from known to unknown.

Recommendation

In light of the results and conclusions, the following suggestions were put forth:

1. To improve the growth of students' learning experiences, teachers should establish an appropriate atmosphere for learning.
2. To maintain students' interest and motivation throughout the learning process, teachers should also broaden their understanding of different teaching techniques.
3. To improve students' comprehension of topics presented (from concrete to semi-concrete to abstract), teachers should offer lessons using teaching and learning resources.
4. Students should be encouraged to start associations and organizations focused on mathematics and to routinely host a variety of competitions.
5. Regular workshops and conferences are necessary to allow educators to develop new knowledge and approaches to teaching and delivering a range of subjects.

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AI statement: The author stated that there was no AI tool employed in this study. The author is solely accountable for the data used in the study.

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REFERENCES

Adunola, O. (2011). *The impact of teachers' teaching methods on the academic performance of primary school pupils in Ijebu - ode local area of Ogun State*. Ego Booster Books.

Ahmad, M. (2022). Mathematics phobia in students: A concern. Rising Kashmir. http://risingkashmir.com/mathematics-phobia-in-students-a-concern-611a9174- 3fe4-4ef9-a2a6-089e511a4d68

Ayeni, A. J. (2011), Teachers professional development and quality assurance in Nigeria secondary schools. *World Journal of Education, 1*(2), 143-149. https://doi.org/10.5430/wje.v1n2p143

Barrett, J. L., Denegar, C. R., & Mazerolle, S. M. (2018). Challenges facing new educators: Expanding teaching strategies for clinical reasoning and evidence-based medicine. *Athletic Training Education Journal, 13*(4), 359-366. https://doi.org/10.4085/1304359

Bhardwaj, B. K., & Pal, S. (2011). Mining educational data to analyze students' performance. *International Journal of Advanced Computer Science and Applications,* 2(6), 63-69. https://doi.org/10.14569/IJACSA.2011.020609

Boaler, J. (2002). Experiencing school mathematics: Traditional and reform approaches to teaching and their impact on student learning. Routledge. https://doi.org/10.4324/9781410606365

Carbonneau, K. J., & Marley, S. C. (2013). Activity-based learning strategies and academic achievement. In J. A. C. Hattie, & E. M. Anderman (Eds.), *The international handbook of student achievement* (pp. 282-284). Routledge.

Chang, Y.-C. (2010). Students' perception of teaching styles and use of learning strategies [Master's thesis, University of Tennessee, Knoxville]. http://www.trace.tennessee.edu/utk_gradthes/782

Cuban, L. (2006). Getting past futile pedagogical wars. *Phi Delta Kappan, 87*(10), 783-795. https://doi.org/10.1177/003172170608701017

Dunaway, M. K. (2011). Connectivism: Learning theory and pedagogical practice for networked information landscapes. *Reference Services Review, 39*(4), 675-685. https://doi.org/10.1108/00907321111186686

Frome, P., Lasaster, B., & Conney, S. (2005). *Well - qualified teachers and high-quality teaching. Are they the same?* (ERIC Digest No. ED485264). Southern Regional Education Boar. https://eric.ed.gov/?id=ED485264&utm_source=chatgpt.com

Greitzer, F. A. (2002). Cognitive approach to student-centered E-learning. In *Proceedings of the Human Factors and Society Annual Meeting*, *46*(25). https://doi.org/10.1177/154193120204602515

Grimes, K., & Stevens, D. (2009). Glass, bug, mud. *Phi Delta Kappan, 90*(9), 677-680. https://doi.org/10.1177/003172170909000914

Hesson, M., & Shad, K. F. (2007). A student - centered learning model. *American Journal of Applied Sciences, 4*(9), 628-636. https://doi.org/10.3844/ajassp.2007.628.636

Hightower, A. M., Delgado, R. C., Lloyd, S. C., Wittenstein, R., Sellers, K., & Swanson, C. B. (2011). *Improving student learning by supporting quality teaching: Key issues, effective strategies* (Research report). Editorial Projects in Education. https://www.edweek.org/research-center/research-center-reports/improving-student-learning-by-supporting-quality-teaching-key-issues-effective-strategies?utm_source=chatgpt.com

Hodson, K. K. (2002). *Student-centered teaching: Refiguring the center* (ERIC Document Reproduction Service No. ED465167). ERIC. https://files.eric.ed.gov/fulltext/ED465167.pdf?utm_source=chatgpt.com

Hudson, P., Skamp, K., & Brooks, L. (2005). Development of an instrument: Mentoring for effective primary science teaching. *Science Education, 89*(4), 657-674. https://doi.org/10.1002/sce.20025

Janor, H., Rahim, R. A., Rahman, A. A., Auzairy, N. A., Hashim, N. A., & Yusof, M. Z. (2013). Integrating student-centered learning in finance courses: The case of a Malaysian Research University. *International Education Studies, 6*(6), 108-123. https://doi.org/10.5539/ies.v6n6p108

Luke, C. L. (2004). *Inquiry-based learning in a University Spanish class: An evaluative case study of curricular implementation* [Doctoral dissertation, University of Texas at Austin]. https://citeseerx.ist.psu.edu/document?doi=d36dbf12fe4b83202b62abaed50b7c35f9672f3d&repid=rep1&type=pdf

Malcolm, C., Keane, M., Hoohlo, L., Kgaka, M., & Ovens, J. (2000). *People were working together: A study of successful schools*. University of Witwatersrand.

Marmah, A. M. (2014). Students' perception about lecture as a method pf teaching tertiary institutions: Views of students from College of Technology Education, Kumasi (COLTEK). *International Journal of Education and Research, 2*(6), 601-612.

McClarty, K. L., & Gaertner, M. N. (2015). *Measuring mastery: Best practices for assessment in competency-based education*. American Enterprise Institute. https://files.eric.ed.gov/fulltext/ED557614.pdf?utm_source=chatgpt.com

Miller, R. l., & Brewer, J. D. (2003). *The A-Z of social research: A dictionary of key social science research concept*. SAGE.

Nabayra, L. J., & Sagge, R. G. (2022). The mathematics teaching performance of scholar education graduates in selected public schools in the Philippines: An explanatory sequential mixed method study. *Canadian Journal of Educational and Social Studies, 2*(4), 23-36. https://doi.org/10.53103/cjess.v2i4.47

Nussbaum-Beach, S., & Hall, L. R. (2012). *The connected educator: Learning and leading in a digital age*. Solution Tree Press.

Ogawa, M. (2001). Building multiple historical perspective: An investigation of how middle school students are influenced by different, perspectives [Doctoral dissertation, University of Georgia]. https://files.eric.ed.gov/fulltext/ED453108.pdf?utm_source=chatgpt.com

Passman, R. (2000). *Pressure cooker: Experience with student-centered teaching and learning in high-stakes assessment environments* (ERIC Document Reproduction Service No. ED440116). ERIC.

Rainwater, T. S. M. (2016). Teaching and learning in competency-based education courses and programs: Faculty and student perspectives. *The Journal of Competency-Based Education, 1*(1), 42-47. https://doi.org/10.1002/cbe2.1008

Serin, H. (2018). A comparison of teacher-centered and student-centered approaches in educational settings. *International Journal of Social Sciences & Educational Studies, 5*(1), 164-167.

Stout, M. J. (2004). Students as historical detectives: The effects of an inquiry teaching approach on middle school students' understanding of historical ideas and concepts [Doctoral dissertation, University of Maryland College Park]. https://drum.lib.umd.edu/items/cefa2717-9bcd-4910-b4c7-dbcfeb25b00a?utm_source=chatgpt.com

Tebabal, A., & Kahssay, G. (2011). The effects of student-centered approach in improving students 'graphical interpretation skills and conceptual understanding of kinematical motion. *Latin-American Journal of Physics Education, 5*(2), 374-381.

Teo, R., & Wong, A. (2000). Does problem based learning create a better student: A reflection? In *The 2nd Asia Pacific Conference on Problem Based Learning: Education across Disciplines* (pp. 4-7).

Wallhead, T. L. (2004). *A didactic analysis of student content development during the peer-assisted learning tasks of a unit of sport education* [Doctoral dissertation, The Ohio State University]. https://etd.ohiolink.edu/acprod/odb_etd/etd/r/1501/10?clear=10&p10_accession_num=osu1092234758&utm_source=chatgpt.com

Zakaria, E., Chin, C. L., & Said, Y. (2010). The effects of cooperative learning on students' mathematics achievement and attitude towards mathematics. *Journal of Social Sciences, 6*(2), 272-275. https://doi.org/10.3844/jssp.2010.272.275

Zeeb, M. S. (2004). Improving student success through matching learning and teaching styles [Unpublished Master's, University of Phoenix, Tempe, Arizona]. http://www.creativelearningcentre.com