



Overview of the Impacts of Inquiry-Based and Peer Teaching Strategies on Mathematics Achievement

*Ugo, H. E., & Oliweh, S. I.

Department of Curriculum and Instructional Technology, University of Benin, Benin City, Nigeria.

*Corresponding author email: happyu134@gmail.com

Abstract

This study looked at Overview of the Impacts of Inquiry-Based and Peer Teaching Strategies on Mathematics Achievement'. Beyond the face-to-face (traditional) teaching style, inquiry-based and peer tutoring strategies represent a comprehensive and innovative approach to teaching mathematics. It suggests that students' attitudes and academic performance in mathematics are significantly impacted by the two approaches. According to this research, peer tutoring and inquiry-based learning are viable and highly successful learning strategies. Accordingly, the study found that both teaching styles offer students a friendly learning environment, which is reflected in their mathematics achievement. It has been seen that inquiry-based and peer tutoring strategies increase students' mathematical confidence, fostering a positive mathematical mind-set that supports good academic accomplishment in the subject. It unequivocally states that the combination of peer tutoring and inquiry-based techniques is promising. Based on the findings, it is recommended that: the government and non-governmental organisations should organize workshop, seminars and lectures on appropriate use of inquiry based and peer tutoring methods.

Keywords: Impacts, Inquiry-Based, Peer Teaching, Mathematics Achievement, Students

Introduction

Education serves as a crucial instrument employed by societies to empower their citizens, fostering greater usefulness, competence, and self-reliance. Its primary aim is to impart essential skills, competencies, and abilities necessary for individuals to actively engage and contribute effectively within society. Education in Nigeria, at all levels, is primarily focused on preparing people with the mental, physical, and emotional skills needed to make meaningful contributions to society. The Federal Republic of Nigeria (2014). These educational objectives are progressively developed across primary, secondary, and tertiary levels in Nigeria. In schools in Nigeria for instance, mathematics is a compulsory subject for all students at the secondary levels of education, ensuring a solid foundation in mathematical skills and knowledge. Owing to the significance placed on mathematics, the Federal Ministry of Education, as stated in the Federal Republic of Nigeria (2004), National Policy on Education, mandated that mathematics be taught to all students from primary to secondary school in Nigeria. It is also a requirement for admission to postsecondary institutions, regardless of program of study.

In addition to logical reasoning and numerical computations, mathematics is the organisation, arrangement, and interaction of concepts based in basic operations such as counting, measuring, and describing shapes. Over time, its evolution has led to a heightened emphasis on intricate and abstract principles (Whitehead, 2017). Among all the science disciplines, mathematics plays a foundational role in fostering a child's ability to inquire and reason critically. Mathematics enables individuals to provide precise interpretations of their ideas and conclusions. It constitutes the numerical and analytical aspects of human knowledge and experience. Mathematics is a deductive science, distinct in its truth-seeking method. Mathematics is an ordered and structured science, starting with undefined constituents, moving through axioms or postulates, and ending with theorems. In contrast to other sciences, it is based on the deductive process, where generalisations and theories are accepted only after thorough proof. Concepts are systematically arranged in a logical hierarchy, advancing from the known to the unknown. Mastery of prerequisite concepts is imperative for comprehending subsequent topics or more advanced concepts in mathematics (Hastuti Noer, 2017). As highlighted by Yadav, (2019), the ultimate aim of teaching is to facilitate learning, and if learning has not been achieved, then the objective remains unmet. Therefore, effective teaching must be student-centred and directed towards facilitating their learning, as emphasized by Ayua (2017). Effectiveness in teaching Mathematics is best gauged by its tangible impact on student learning. Yadav (2019) underscores that within the realm of Mathematics Education, certain challenges arise during face-to-face

instruction, especially for novice learners, making problem-solving a complex task. For instance, students may exhibit a lack of interest, motivation, and positive attitude towards Mathematics, with some not intending to specialize in the subject, resulting in minimal attention towards understanding fundamental concepts in Mathematics. This trend invariably correlates with diminished knowledge retention and underperformance in Mathematics examinations. Recognizing the vital importance of mathematics, the Federal Ministry of Education, as highlighted in the National Policy on Education (Federal Republic of Nigeria, 2004), has established mathematics as a compulsory subject across all levels of education in Nigeria, from primary to pre-tertiary levels. Given the consistently poor performance of students in mathematics examinations, it is crucial to reassess our classroom culture, reconsider our perceptions of 21st-century learners, and ask ourselves how students prefer to learn. Today's students seek knowledge through hands-on, experiential learning. They desire to think critically, analyze, evaluate, apply, and create. They value storytelling, autonomy, interaction, and collaboration, and they engage deeply using meaningful technological tools. As societal needs change, we must adapt our teaching strategies to prepare students for future challenges. Effective preparation involves adopting instructional practices that develop critical thinking, reflection, questioning, collaboration, communication, and research skills. This research will focus on inquiry-based and peer tutoring strategies among various teaching methods.

Inquiry-based teaching is a student-centred approach that uses meaningful tasks like case studies, projects, and research to provide context for learning (Avsec & Kocijancic, 2016). This strategy encourages students to collaborate in problem-solving, develop research skills, and enhance their capacity for making trade-offs (Avsec et al., 2014). Inquiry-Based Learning is applicable across various educational levels, as highlighted by Duran and Dökme, (2016).

Peer tutoring, a well-established educational practice, has gained recognition as an innovative and effective teaching strategy. It involves students taking on the role of instructors for their peers.

In this approach, high-achieving students, known as tutors, are paired with lower-achieving students, referred to as tutees, to support their learning and understanding of the subject matter, with the goal of achieving mastery. "Peer tutoring is a cooperative learning method that pairs students with similar learning objectives (Topping, 2018). This active teaching approach promotes inclusivity and allows students to learn from one another (Cockerill et al., 2018). Despite the high interest in mathematics among Nigerian students, performance at the senior secondary school level has consistently been inadequate (Gimba, 2016; Iwendi, 2019). Researchers have increasingly focused on understanding the underlying causes of this poor performance. Research indicates that the lack of interest in mathematics is primarily due to factors like subpar quality of mathematics teachers, overcrowded classrooms, and insufficient instructional materials (Iwendi, 2019).

This study is aimed at overviewing the Impacts of Inquiry-Based and Peer Tutoring Strategies on Mathematics Achievement.

This paper will examine;

- Inquiry-Based Education/Learning
- Understanding Inquiry Based Strategy in Mathematics Achievement
- Peer Guidance/Teaching
- Understanding Peer Teaching Strategy in Mathematics Achievement
- Conclusion/Recommendations

Inquiry Based Education/Learning

Inquiry-Based Education/Learning is an innovative approach widely used in educational literatures. Inquiry-Based Learning, also known as guided inquiry, undergraduate research, and discovery learning, is increasingly prevalent in education but lacks research for a comprehensive overview and synthesis. Prince and Felder (2006) provide a comprehensive review of inquiry-based learning strategy, which is part of the 'inductive' approach to teaching and learning. Inductive teaching methods, including inquiry-based learning, problem-based learning, project-based learning, case-based teaching, and discovery learning, involve students interpreting observations or complex real-world problems, generating guiding principles, and understanding that scientific knowledge is subject to revision and influenced by the model or theory used. Moreover, the inquiry learning strategy give students freedom in formulating questions and choosing how to solve them, and providing opportunities for meaningful and positive interactions (Aditomo & Klieme, 2019). While using the inquiry technique, students can actively participate in creating concepts; yet, the teacher still provides guidance to the tutors during the learning process. If students are successful in improving their comprehension of mathematics issues and solving them, their learning will be more important to them personally and will centre on helping them discover concepts

(Ananda & Prabawanto, 2020). The inquiry technique places more emphasis on the process by which students work out solutions to the instructor's assigned mathematics problems while continuing to be guided and supervised by the teacher. According to Razali et al. (2020), the discovering method of inquiry is particularly beneficial in assisting students in comprehending topics and honing their problem-solving abilities. According to Razali et al. (2020), the inquiry method is an interactive learning approach that can help students develop their conceptual grasp of solving mathematical problems and is predicted to improve their learning outcomes in the subject. Guido (2017) looks into inquiry from the viewpoints of both students and teachers. He claims that while inquiry-based teaching focuses on advancing students beyond fundamental curiosity and into the domains of critical thinking and comprehension, from the viewpoint of the instructor, it focuses on researching an open question or problem. The demands of society have evolved dramatically throughout time as the globe has altered. As a result, mathematics teachers must consider their students and the difficulties they may face in the future. The 21st century educational approaches must foster critical thinking, reflection, questioning, cooperation, communication, and a research-oriented approach in order to ensure that our students are adequately prepared to meet the demands and expectations of the future.

According to Avsec and Kocijancic (2016), an inquiry-based method is a student-centred instructional technique that places learning in context through the use of relevant tasks like cases, projects, and research. By using this technique, pupils interact with their surroundings and are actively involved in their education. Alfieri et al. (2011) emphasize that Inquiry-Based Learning allows students to interact with materials, explore phenomena, and apply principles, enabling them to observe patterns, understand causes, and achieve deeper learning (p. 3). As a result, adopting an Inquiry-Based strategy actively engages students and enhances their learning. The aim of this study was to explore the challenges that student teachers encounter when implementing Inquiry-Based Learning in their classrooms. It also sought to examine their reflections, views, and opinions on the use of Inquiry Based Learning, which can be applied at various levels (Duran & Dökme, 2016).

Mackenzie (2016) examines the distinctions among four types of student inquiry: structured, controlled, guided, and free. He explains that teachers typically start the school year with a structured inquiry model, progress to controlled inquiry, then guided inquiry, and ideally end the year with free inquiry.

A brief summary of Mackenzie's four types of student inquiry:

1. **Structured Inquiry:** Teachers provide a clear framework and specific instructions, guiding students through the inquiry process step by step.
2. **Controlled Inquiry:** Students have more control over the inquiry, but teachers still determine the topics and provide guidance on the procedures.
3. **Guided Inquiry:** Students take on a more active role in directing their learning, with teachers offering support and guidance as needed.
4. **Free Inquiry:** Students have full autonomy in choosing their topics and methods, allowing for independent exploration and discovery.

The key components of an Inquiry-Based approach that most researchers agree upon are as follows:

- Learning driven by inquiry, centered around questions or problems.
- A process of seeking knowledge and developing new understanding.
- A learner-centred approach where the teacher acts as a facilitator.
- A shift towards self-directed learning, with students taking greater responsibility for their learning and developing self-reflection skills.
- An active, hands-on approach to learning.

Understanding Inquiry-Based Strategy in Mathematics Achievement

Adejo (2015) investigated the impact of the guided inquiry method on the academic performance of chemistry students in selected senior secondary schools in Kaduna State. The study revealed that students taught through the inquiry-based approach significantly outperformed those who were taught using traditional methods. The findings align with Ezeugwu's (2007) assertion that the methods employed by teachers in their instruction can significantly impact students' skill acquisition and overall achievement. Ifeanyi-Uche (2013) investigated the impact of the inquiry-based method on the academic performance of secondary school students and discovered that the experimental group, which used the inquiry-based method, outperformed the control group, which utilized the lecture method, with statistically significant differences in achievement. Abdi (2014) investigated the impact of the Inquiry-based learning method on students' academic performance in science courses and found that students taught using this method achieved higher scores compared to those who were taught using traditional methods. Additionally, gender differences are a recurring theme in academic research, especially in studies related to Mathematics and science.

Peer Guidance/Teaching

Drawing from Wang's (2018) findings, peer tutoring examines how educators (teachers, departments, and schools) might use it to help students learn from one another in a reciprocal relationship. Personalised learning and efficient classroom management are fostered by this system, which makes it easier to make optimal use of peer tutoring and instructor capabilities. In essence, peer tutoring consists of students acting as teachers for their peers, regardless of age gaps or similarities, either through one-on-one or small-group instruction under the supervision of a mentor supervising two or three students (Cornelius & Sandmel, 2018). This summary captures the fundamentals of peer tutoring, which is a major area of focus for this study. According to Cross et al. (2020), peer teaching, also known as tutoring, serves as an educational framework in which students work together in pairs.

Moreover, peer tutoring was described by Bukari and Kuyini (2015) as a collaborative learning strategy in which students actively collaborate with teachers to solve any questions or issues that may come up in addition to sharing desired skills and knowledge with their peers. However, a teacher must always be there in order to quickly resolve any problems that may come up with students.

Peer support and tutoring, according to Cropp (2017), is essential for improving the learner experience as a whole and for building learning communities that affect students' motivation, self-assurance, and retention in the long run. According to Deshler et al. (2019), motivation and heightened self-assurance are crucial factors that influence engagement and promote the formation of a cohesive learning community. Fuadiah and Suryadi (2019) emphasised the significance of modifying instructional strategies to support students' social and cognitive development through a positive, customised approach, irrespective of their academic standing. According to Vygotsky's theory - which Abdelkarim and Abuiyada (2016) cite - dialogue and interaction between people are characteristics of effective learning. Peer tutoring is an acknowledged pedagogical method that facilitates student engagement, which has led to its increasing recognition and implementation in educational contexts. Research by Abdelkarim and Abuiyada (2016) and Debbag and Yıldız (2021) confirms that peer contact is more important than academic motivation and accomplishment. Peer tutoring is also a viable way to meet the requirements of kids with a range of skills from various age groups and socioeconomic backgrounds because of the variable performance levels that are seen among students in classroom, grade-level, or school settings. According to Lam (2019), peer tutoring is a way for a student who is struggling in the same academic subject to communicate with another student who is more advanced in the subject and has shown mastery or recent success in it. Under this arrangement, students who have a better comprehension of the lecture assume the position of tutors and help their fellow pupils, who are called tutees. Encouraging a natural and dynamic setting is the key to enhancing the mathematics education process and enabling pupils to pick up critical skills from their peers. This idea, which is based on Vygotsky's social constructivism theory, shows how students exchange basic methods or approaches for handling mathematical issues in order to participate in mutual learning. Peer tutoring is a useful approach that is consistent with Albert Bandura's social learning theory. In this approach, students, or mentees, model the behaviours of their mentors, or peers, and then integrate and replicate those behaviours.

Understanding Peer Teaching Strategy in Mathematics

Peer teaching is an effective way to increase students' mathematics achievement. Through reciprocal teaching dynamics, students take part in cooperative learning procedures that help solidify mathematical ideas and promote deep understanding. Peer tutoring also fosters a cooperative learning environment that supports knowledge synthesis and problem-solving, which enhances the academic conversation on mathematics education (Chong et al., 2020). Orland-Barak and Wang (2021). "Peer tutoring's positive effects on both advanced and struggling students highlight its importance." Proficiency in a subject gives pupil the opportunity to grasp it, which improves their confidence in speaking about it. At the same time, students who face difficulties make significant progress and gains in their academic performance, which results in a greater comprehension of the material covered in class. For both advanced and struggling learners, this approach promotes important qualities including self-discipline, self-worth, and sharing (Abdelkarim & Abuiyada, 2016).

Jibrin and Zayum (2012) found in an independent study that participants who received peer tutoring exhibited significantly higher achievement levels than those who received traditional instructional methods. Regardless of their age or academic standing, students can gain from the insights given by their peers through peer tutoring, which promotes collaborative learning. Thus, this method goes beyond some of the issues that are frequently brought up by depending solely on teacher-centered training. Peer tutoring also referred to as peer leadership, cooperative learning pairs, peer-assisted learning, peer education, child-teach-child, mutual instruction, partner learning, and peer teaching, is an instructional strategy that is highly versatile and adaptable in a variety of educational contexts. (Zhang & Bayley, 2019; Fisher et al., 2020) uses a variety of terms. Furthermore, in addition

to other elements like student engagement, readiness, material relevancy, and access to educational resources, the effectiveness of teaching and learning is highly dependent on the teacher's influence. As the knowledge and commitment of educators are inextricably tied to the calibre of education, educators are seen as the keepers of the educational system. Peer tutoring, an educational strategy that involves pairing students to learn or practise academic tasks, is another student-centered technique examined in this study. Olulowo, Ige, and Ugwoke (2020) point out that these student pairs might have comparable or dissimilar skill sets and/or age ranges. Peer tutoring includes a variety of teaching approaches, including Reciprocal Peer Tutoring (RPT), Peer Assisted Learning Strategies (PALS), and Cross-Age Tutoring. Different peer teaching approaches show differences. However, their fundamental ideas emphasize the importance of peer contact in the learning process and are derived, among other things, from Vygotsky's socio-cultural theory of learning. Peer tutoring refers to a situation when a youngster takes on the role of a teacher and provides direction and support to another child in an educational environment. (Okeke et al., 2019). In order to increase students' academic accomplishment in financial accounting concepts, Olulowo et al. (2020) conducted an empirical study in the Ondo North Senatorial District of Ondo State, Nigeria, utilising peer tutoring. The findings confirmed that, in comparison to the traditional lecture approach, peer tutoring is a more effective instructional strategy for raising students' academic progress in financial accounting concepts.

Bryan, referenced in Peter (2017), looked at how peer tutoring affected Georgian university students' academic performance. His findings showed that kids who took part in peer tutoring performed better academically than their peers who did not attend these tutoring sessions.

Significance of Peer Relationship

The social development of learners is affected by their homes and schools. Be that as it may, the classroom is most importantly a "social" place, where students consistently collaborate. As a matter of fact, for some students, spending time with friends is a higher priority than doing classwork. Students in the lower grades of elementary school see their friends basically as a source of entertainment; subsequently, their relationship with their friends is shallow. Friendship has a component of trust as students enter the later phases of grade school. Peers will quite often figure they can trust one another. As children share their fantasies and deepest privileged insights, they foster increasingly close fellowships (Ormrod, 2011). In the midst of trouble and confusion, students frequently go to their friends for daily emotional support. Particularly in optional school, peers likewise convey a feeling of the local area - a feeling of "having a place" at a grouping.

Furthermore, close friendships support confidence and assist students with a better understanding of others. By sharing their considerations and sentiments, students might find that they are not generally as interesting as they once suspected. Most students need to be acknowledged by their classmates. They request their classmate's approval and change their way of behaving likewise. A student's peers will generally encourage specific ways of behaving and beat others down. Luckily, peers frequently support helpful characteristics like honesty, reasonableness, participation, and a sense of humour. Yet, you can encourage students to take stereotypical gender-specific ways of behaving (Shamir and Tzuriel, 2008).

This similarity causes what is happening in which a child can start to foster a helpful way of behaving, a feeling of correspondence, and compromise techniques. At the point when students frequently annoy or estrange others, their peers seldom give them productive criticism that would assist them with working on their conduct in later circumstances (Ormrod, 2011).

Problems with Peer Teaching

Despite being regarded as a novel approach, peer teaching has some challenges that have been documented in the literature that may impede the process of teaching and learning. The planning and implementation of a peer teaching technique may reveal expected entanglements, necessitating revisions to certain angles along the way. To stay away from a portion of these entanglements, it is essential to orchestrate suitable partners and focus on preparing peer teachers also, to explain common sense courses of action (Ross and Cameron, 2007).

Free riding is an additional factor that could impede the process of learning. According to Aggarwal (2008), free riding occurs when members of a group neglect their duties with the hope of benefiting from others in the group. Typically, this happens when the size of the group is excessively enormous individuals in the group are not recognizable or group individuals remain unassessed independently.

Advantages of Peer Teaching

Here are some advantages of peer teaching;

1. Motivation for Student-Tutors:

Learning by teaching is taught to students who become peer teachers for their friends since when they are approached to teach, they attempt to master the material to teach other people. They additionally figure out how to show their class fellows. For this situation, it will develop confidence and make a deep satisfaction in helping other people, create relational abilities, give encounters and foster a feeling of responsibility.

2. Instructive Advantages for the Students Tutees:

Peer teaching likewise enjoys benefits for the tutees in education including more dynamic, intuitive, participative learning, prompt criticism, brought down tension, and more noteworthy student responsibility for growing experience. According to Gaies (1985) small groups of tutored students can provide extra exposure to material for even the most advanced students. Gaies also suggested that peer teaching strategies benefit less proficient individuals.

3. Tutee Attitude and Motivation

This serves as inspiration which can incorporate extraordinary responsibility, confidence, self-assurance and sympathy with others. Chime laid out intricate ordered progressions by which in each class there were pairings of peer teachers and students, commonly 12 additional capable students matched with 12 less capable, with an associate teacher who taught and managed guides. Thusly, the classmates were generally regulated by a teacher's responsibility regarding student progress and classroom discipline. Nevertheless, the assistants and instructors themselves reached adulthood between the ages of 7 and 14. Sub-endlessly, the ushers completed the commands, finally paying attention to the headmasters. Chime was a truly remarkable educator who recognised the several advantages of peer teaching in terms of students' academic advancement, their increased self-confidence, and the group's contribution to the improvement of classroom and school-wide discipline.

Mentor Chime discovered that, rather than being hindered in his academic pursuits, the guide learns from his example far more successfully than if he had not given it to another. Through demonstrating his strong educational background.

4. Peer teaching's social, financial, and political aspects

The aforementioned encourages students to be aware of their social lives. According to Topping (n.d.), when using a peer teaching technique, pupils may become less socially isolated, demonstrate the value of the material, and express aspirations while combating an excessive amount of personal competition. According to a study by Moust and Schmidt, students were now more focused on evaluation and were more interested in their lives and characters. They were also less dictatorial. Peer tutoring may provide financial advantages such as the potential to teach more students more effectively and free up staff time for other uses. Peer teaching takes a political approach by allowing the administration to decide how to proceed based on a vote, aims to empower students rather than de-expertise them through imitation of an expert culture, and may reduce student dissatisfaction and distress.

Conclusion

This study provides a significant contribution in the literature, regarding the duo of inquiry-based and peer tutoring strategies in Mathematics education. It proposes that the two methods have a significant effect on attitude and achievement. It is crystal clear that inquiry-based and peer tutoring methods are superior to the conventional strategies. Thus, as the study revealed, the two methods provide students with a better learning environment thereby enhancing their achievement of Mathematics. Inquiry-Based and Peer Tutoring methods were seen to build students' confidence in Mathematics thus instilling a positive Mathematics attitude that promotes a high level of academic achievement in the subject. This research henceforth posits that inquiry-based learning and peer tutoring methodologies stand as profoundly effective and feasible approaches. Their widespread adoption is advocated for the enrichment of students' active learning experiences and the collaborative construction of knowledge among peers. Students have the opportunity to autonomously delve into the pedagogies of inquiry-based learning and peer tutoring, thereby transcending the confines of traditional classroom instruction and lectures in their pursuit of mathematical knowledge. Tailored learning strategies can be offered to accommodate diverse learning backgrounds, fostering a milieu conducive to successful learning experiences. The researchers firmly believe that the tandem of inquiry-based learning and peer tutoring holds promise as a fundamental solution to the longstanding challenges of negative attitudes towards and low achievement in Mathematics, evident in both internal and external examinations.

Suggestions

Based on the review, it is suggested that:

- i.) Integrating Inquiry-Based Learning, Peer Tutoring, and Lecture Techniques with strategic timing and preparation for effective implementation". This will help to boost students' achievement in Mathematics.

- ii.) Mathematics teachers are advised to attend workshops to learn innovative instructional strategies, including inquiry-based and peer tutoring methods, for effective teaching.
- iii.) Mathematics teachers should adopt inquiry-based, peer tutoring strategies and lectures during secondary school classroom instruction.
- iv.) Government and non-governmental organizations should conduct workshops, seminars, and lectures on the effective use of inquiry-based and peer tutoring methods.

References

- Abdelkarim, R., & Abuiyada, R. (2016). The effect of peer teaching on mathematics academic achievement of the undergraduate students in Oman. *International Educational Students*, 9(5),124 -132.
- Adejo, O. L. (2015). Effects of inquiry method on academic performance of chemistry students in senior secondary schools in Kaduna State, Nigeria. An unpublished MEd thesis, Ahmadu Bello University, Zaria.
- Abdi, A. (2014). The effect of inquiry-based learning method on students' academic achievement in science course. *Universal Journal of Educational Research*, 2(1),37-41.
- Aditomo, A., & Klieme, E. (2019). Forms of inquiry-based science instruction and their relations with learning outcomes: Evidence from high and low-performing education systems.
- Aggarwal, Y.P. (2008). *Statistics of education*. (2nd ed.) Delhi: Sterling.
- Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? *Journal of Educational Psychology*, 103(1),1–18.
- Ananda, T., & Prabawanto, S. (2020). Implementation inquiry model with examples and non-examples to enhance the mathematical conceptual understanding of primary school students. *Proceedings the 2nd International Conference on Elementary Education*, 2(1),879–888.
- Avsec, S., & Kocijancic, S. (2016). A path model of effective technology-intensive inquiry based learning. *Journal of Educational Technology & Society*, 19(1),308.
- Avsec, S., Rihtaršič, D., & Kocijancic, S. (2014). A predictive study of learner attitudes toward open learning in a robotics class. *Journal of Science Education and Technology*, 23(5),692–704.
- Ayua, G. (2017). Effective teaching strategies. Science Education Unit, Department of Curriculum and Teaching.
- Bukari, M., & Kuyini, A. (2015). Exploring the role of tutoring in the quality of teacher training in Ghana. *International Journal of Learning & Development*,5(1),46-66.
- Chong, J. Y., Ching, A. H., Renganathan, Y., Lim, W. Q., Toh, Y. P., Mason, S., et al. (2020). Enhancing tutoring experiences through e-tutoring: a systematic scoping review of e-tutoring programs between 2000 and 2017. *Advances in Health Sciences Education*, 25(1), 195-226.
- Cockerill M, Craig N, Thurston A. (2018). Teacher perceptions of the impact of peer learning in their classrooms: Using social interdependence theory as a model for data analysis and presentation. *International Journal of Education and Practice*, 6(1):14–27. <https://doi.org/10.18488/journal.61.2018.61.14.2735>.
- Cornelius, K. E., & Sandmel, K. N. (2018). Early career special education teachers perceived value of being mentored by general education teachers. *The Journal of Special Education Apprenticeship*, 7(3).
- Cropp, I. (2017). Using peer tutoring to reduce mathematical anxiety. *Research Papers in Education*, 32(4), 481-500.
- Cross, R., Lowcock, D., Fiave, J., Agyeniwah, S., & Kafui-Annan, G. (2020). 'Feeling part of a network of learning in health promotion: An evaluation of a postgraduate peer tutoring scheme in Ghana. *Innovations in Education and Teaching International*, 57(2), 175-185.
- Debbağ, M., & Yıldız, S. (2021). Effect of the flipped classroom model on academic achievement and motivation in teacher education. *Education and Information Technologies*, 26(3), 3057-3076.
- Deshler, J., Fuller, E., & Darrah, M. (2019). Supporting students through peer tutoring in developmental mathematics. *Learning Assistance Review*, 24(1), 87-112.
- Duran, M., & Dökme, İ. (2016). The effect of the inquiry-based learning approach on student's critical-thinking skills. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(12), 2887-2908.
- Ezeugwu, E. N. (2007). Effects of self-regulated and lecture method on students' achievement in Biology. *Nigerian Journal of Functional Education*, 5(1), 82- 91.
- Federal Republic of Nigeria (2014). National Policy on Education, Government Press, Lagos, Nigeria, 6th edition.
- Federal Republic of Nigeria (2004). National Policy on Education, Nigerian Educational Research and Development Council (NERDC), Lagos, Nigeria, 4th edition.
- Fisher, M. H., Athamanah, L. S., Sung, C., & Josol, C. K. (2020). Applying the self- determination theory to develop a school-to-work peer tutoring programme to promote social inclusion. *Journal of applied research in intellectual disabilities*, 33(2), 296-309.

- Fuadiah, N. F., & Suryadi, D. (2019). Teaching and learning activities in classroom and their impact on student misunderstanding: A case study on negative integers. *International Journal of Instruction*, 12(1), 407-424.
- Gaies, J. S. (1985). *Peer involvement in Language Learning*. Prentice Hall, Inc.
- Gimba, R. W. (2016). Effects of 3-dimensional instructional materials on the teaching and learning of mathematics among senior secondary schools in Minna metropolis. 2nd SSSE Annual National Conference, Federal University of Technology, Minna. Held between 19th – 2nd November, 2006.
- Guido, M. (2017). Inquiry-based learning definition, benefits & strategies. Retrieved October 26, 2017, from <https://www.prodigygame.com/blog/inquiry-based-learning-definition-benefits-strategies>.
- Hastuti Noer, S. (2017). Strategi Pembelajaran Matematika (pertama). Matematika.
- Ifeanyi-Uche, U. P. (2013). The effect of inquiry based method on academic achievement of secondary school students in Home Economics in Umunze, Anambra State. *Journal of Educational and Social Research*, 3(4), 109-113.
- Iwendi, B. C. (2019). The influence of gender and age on the mathematics achievement of secondary school students in Minna metropolis, Niger State. Unpublished Master's thesis, Science Education Dept. FUT, Minna, Nigeria.
- Jibrin, A. G., & Zayum, S. D. (2012). Effects of peer tutoring instructional method on the academic achievement in Biology among secondary school students in Zaria metropolis, Nigeria. *Journal of Research in Education and Society*, 3(2), 13-17.
- Lam, R. (2019). What students do when encountering failure in collaborative tasks. *NPJ science of learning*, 4(1), 1-11.
- Mackenzie, T. (2016). *Dive into inquiry: Amplify learning and empower student voice*. California: EdTechTeam Press.
- Topping K. (2018). Using peer assessment to inspire reflection and learning: Learning by judging and discussing the work of other students. Routledge. <https://doi.org/10.4324/978135125688936>.
- Okeke, J.N, Ezegbe, B.N, Okwugha, C.N.A, Ome, S.O, Ejah, A, and Panden, P.E (2019). Effect of peer tutoring instructional strategy on students' achievement and interest in Economics in Awka Education Zone, Anambra State. *International Journal of Studies in Education*. 16 (1):122-138.
- Olulowo, T.G, Ige O.A, and Ugwoke, E.O (2020). Using peer tutoring to improve students' academic achievement in financial accounting concepts. *Hindawi Education Research International*. Available at <https://downloads.hindawi.com/journals/edri/2020/8871235.pdf>
- Orland-Barak, L., & Wang, J. (2021). Teacher tutoring in service of preservice teachers' learning to teach: Conceptual bases, characteristics, and challenges for teacher education reform. *Journal of Teacher Education*, 72(1), 86-99.
- Ormrod, J.E. (2011). *Educational Psychology: developing learners*. 7th ed. Boston, Pearson/Allyn & Bacon.
- Peter, I. O. (2017). Effects of peer tutoring strategy on academic achievement of senior secondary school students in technical drawing. *British Journal of Education, Society and Behavioural Sciences*, 19(1), 1-10.
- Prince, M. J. and R. M. Felder (2006). Inductive teaching and learning methods: Definitions, comparisons, and research bases. *Journal of Engineering Education* 95, 123-138.
- Razali, Halim, A., Haji, A. G., & Nurfadilla, E. (2020). Effect of inquiry learning methods on generic science skills based on creativity level. *Journal of Physics: Conference Series*, 1460(1). <https://doi.org/10.1088/1742-6596/1460/1/012118>.
- Ross, M.T. & Cameron, H.S. (2007). Peer assisted learning. A planning and implementation framework: AMEE Guide no. 30, *Medical Teacher*, 29(6), pp. 527- 545. <http://www.ncbi.nlm.nih.gov/pubmed/17978966>. Accessed July 23, 2024.
- Shamir, A., and Tzuril, D. (2008). Children's mediational teaching style as function of intervention for cross age peer interaction. *School Psychology International*.
- Topping K. (2018). Using peer assessment to inspire reflection and learning: Learning by judging and discussing the work of other students. Routledge. <https://doi.org/10.4324/978135125688936>.
- Wang, J. (2018). *Teacher tutoring in service of beginning teachers' learning to teach*. The Wiley handbook of educational supervision, 281.
- Whitehead, A. N. (2017). *An introduction to mathematics*. Mineola, New York: Courier Dover Publications.
- Yadav S. (2019). Role of mathematics in the development of society, *International Journal of Research and Analytical Reviews, IJRAR*, 6(4); 295-298 www.ijrar.org
- Zhang, Z., & Bayley, J. G. (2019). Peer learning for university students' learning enrichment: Perspectives of undergraduate students. *Journal of Peer Learning*, 12(5), 61-74.