Exploring the Influence of Peer Teaching Method on Students' Achievement of Statistics in Mathematics Subject in Public Secondary Schools in Iringa Municipality

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Abstract

This study explored the influence of the peer teaching method on students' performance in statistics in public secondary schools in the Iringa Municipality. The study adopted a qualitative research approach and used a case study design. A sample of 32 participants was purposively selected, including four heads of schools, four mathematics teachers, and 24 Form Four students from four public secondary schools. Data were collected through face-to-face interviews and focus group discussions (FGDs), and analyzed using thematic analysis. The findings revealed that peer teaching enhances students' self-assessment, increases classroom engagement and participation, boosts self-confidence, and improves knowledge retention. The study concludes that peer teaching is a valuable instructional strategy for improving academic achievement and promoting a deeper understanding of statistical concepts. Based on these findings, it is recommended that teachers play an active role in monitoring and guiding peer teaching sessions.

Additionally, teachers should establish structured peer teaching programs—such as subject clubs and group discussions—and provide sufficient teaching and learning materials to support this method in public secondary schools.

Keywords: peer teaching method, public secondary schools, statistics, students' achievement

1.0 Introduction

There are two contrasting perceptions regarding the learning of mathematics. One group of scholars and students believes that mathematics is simple and accessible. This perspective is supported by Male and Lumbantoruan (2020), who noted that some mathematics majors find it easy to comprehend and apply statistical concepts. Pointing out further benefits of learning the subject, Lulu (2024) argued that students achieve greater future success when they possess strong quantitative skills. Conversely, another group views mathematics as highly difficult and complex. This view is supported by Zussette et al. (2017), who asserted that mathematics is often perceived as the most challenging subject by students. Because of this negative perception, many students struggle and perform poorly even in basic mathematical operations.

Students who perform poorly in mathematics often struggle with statistics as well, since both areas require similar cognitive and problem-solving skills (Garfield & Ben-Zvi, 2008; Franklin et al., 2015). Researchers frequently link poor performance to negative student attitudes, anxiety, and low motivation (Audu &Oyelekan, 2020), alongside ineffective teaching methods that fail to engage learners or connect abstract concepts to

practical, real-world applications (Batanero, Burrill, & Reading, 2016; Chance et al., 2007).

Globally, statistics is a fundamental discipline that enables individuals to collect, analyses, and interpret data for informed decision-making across various fields like education, geography, and general mathematics (Garfield & Ben-Zvi, 2008; Rumsey, 2010). However, student performance in statistics which is typically taught within the broader mathematics curriculum remains low (Chance et al., 2007). This low performance is often attributed to the continuous use of teacher-centered traditional methods that fail to engage learners, combined with a general lack of student interest (Audu &Oyelekan, 2020; Franklin et al., 2015).

Similarly, Auliga (2018) reported that some students find statistics difficult because current teaching methods do not actively involve them in their own learning. Such experiences lead to reduced motivation, increased anxiety, and disinterest, resulting in a poor understanding of core concepts and low academic achievement. In Europe, teaching statistics continues to present challenges. A study by Mata et al. (2020) revealed that mathematics teachers face numerous difficulties when teaching statistical topics like probability, variables, and correlation coefficients. These challenges hinder teachers' ability to explain complex concepts in an engaging way, often because they lack training in modern pedagogical methods. Consequently, this directly impacts student comprehension and contributes to poor performance in mathematics.

Furthermore, persistent challenges in many secondary schools such as inadequate teacher training and cultural barriers mean that students continue to face significant difficulties in understanding statistics (Audu &Oyelekan, 2020; Batanero, Burrill, & Reading, 2016). These challenges prevent students from developing the essential analytical and problem-solving skills required to succeed in statistical mathematics (Garfield & Ben-Zvi, 2008; Franklin et al., 2015). The peer teaching method has emerged as a promising solution to these challenges, as it allows students to learn from one another, share knowledge, and solve problems collaboratively. To address low performance, educators are increasingly exploring innovative approaches like peer teaching, which has been shown to improve both academic achievement and student engagement (Stigmar, 2016).

Peer teaching refers to an instructional method where students teach other students (Basil, Degeng, Setyousar, & Sulton, 2021). It is a collaborative learning approach that emphasizes active student participation and knowledge exchange (Sallem et al., 2021). In this method, students act as teachers by presenting specific topics to their classmates. Through this collaboration, they share insights and perspectives, which reinforces learning for both the tutors and the tutees. As Chandra (2015) explains, peer teaching boosts academic achievement by allowing students to learn from each other.

According to Rusli (2021), peer teaching is widely recognized as a valuable pedagogical tool that contributes significantly to academic success. It creates an interactive, participatory classroom environment where students actively engage with the content

and their peers (Topping, 2021). Therefore, adopting this method in statistics classes is crucial for fostering a deeper understanding of the subject. Additionally, Vipinder (2022) argues that peer teaching improves student performance because it allows learners to share knowledge, clear up doubts, and build on each other's strengths within a supportive environment. By working together, students can break down complex ideas into simpler terms, making difficult statistical concepts easier to grasp. This method encourages active learning, critical thinking, and analytical skills. Research consistently shows that learning from peers significantly enhances academic achievement (Rusli et al., 2021).

Peer teaching also keeps students engaged. Olpak et al. (2018) note that this approach allows students to take charge of their learning process. By explaining concepts to peers, they deepen their own understanding, share ideas, and resolve misunderstandings in a supportive, collaborative space. Despite these benefits, there is a growing concern regarding the poor performance of students in mathematics within public secondary schools in Iringa Municipality (MoEST, 2022; Komba &Mwandanji, 2021). While teachers use a variety of instructional methods (Mlama, 2020; Nyambo & Joseph, 2023), education stakeholders and students continue to ask: why does academic performance remain low when teachers are using diverse teaching methods? To address this gap, this study explored the influence of the peer teaching method on students' performance in statistics within mathematics classes in public secondary schools in Iringa Municipality, Tanzania.

2.0 Material Methods

This section outlines the research approach, design, participant selection, data collection, and data analysis methods used in this study.

2.1 Research Approach and Design

This study used a qualitative research approach to capture the real-life experiences and perspectives of participants. Qualitative research is well-suited for exploring the deeper meanings and motivations behind human experiences that cannot be easily measured using numbers (Creswell & Poth, 2018; Hamed, 2022). This approach allowed the researcher to gather rich, detailed, and contextual descriptions of students' experiences learning statistics through peer teaching.

Additionally, the study adopted a case study design, which facilitates an in-depth investigation of a specific phenomenon within its real-world context (Coombs, 2022). This design was appropriate for providing a comprehensive exploration of how peer teaching is implemented and its effects on students learning statistics.

2.2 Participants

A target population represents the entire group of individuals or elements that a researcher wants to study and draw conclusions about (Cohen, Manion, & Morrison, 2018). In this study, the target population consisted of 36 potential participants across four public secondary schools. Out of these, a sample of 32 participants was purposively selected, including: Four (4) heads of schools, who supervise all academic and

administrative activities. Four (4) mathematics teachers, who are responsible for choosing classroom methods and can provide feedback on the practical application of peer teaching. Twenty-four (24) Form Four students, who have direct experience learning statistics through peer teaching. Including these different groups provided a well-rounded perspective on the implementation and impact of peer teaching in the classroom.

2.3 Data Collection Methods

The study used semi-structured interviews and focus group discussions (FGDs) to collect primary data (Creswell & Poth, 2018). Interviews were conducted with the four heads of schools to gather their views on how the peer teaching method influences students' performance in statistics (Kvale & Brinkmann, 2015). Similarly, the four mathematics teachers were interviewed to learn about their firsthand experiences implementing peer teaching in their classrooms. Each interview lasted between 10 to 15 minutes. These sessions provided rich qualitative insights into how peer teaching is managed and its perceived effects on student achievement.

FGDs were held with the 24 Form Four students. A total of four FGD sessions were conducted (one at each school), with each group consisting of six students. The researcher acted as the moderator for all sessions. These discussions encouraged natural, interactive conversations where students openly shared their feelings, opinions, and experiences regarding peer teaching. As noted by Krueger and Casey (2015), FGDs are

highly effective for gathering rich, interactive qualitative data, which in this study helped clarify how peer teaching influences student performance in statistics.

2.4 Data Analysis and Ethical Considerations

The data collected from the interviews and FGDs were analyzed using thematic analysis, following the six-step framework proposed by Braun and Clarke (2006): familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and writing the final report. The key themes that emerged included self-assessment, student engagement/participation, and knowledge retention. The researcher categorized and coded the data systematically to draw meaningful insights from the participants' experiences.

Ethical standards were strictly maintained throughout the research process. First, the researcher obtained official research clearance from the Director of Postgraduate Studies at Ruaha Catholic University. This clearance letter was presented to the Regional Administrative Secretary and District Administrative Secretary to secure permission to conduct the study in the municipality. Written informed consent was also obtained from all heads of schools, teachers, and students before starting data collection. Participants were fully informed about the study's purpose, its procedures, and their right to voluntary participation, meaning they could withdraw at any time without penalty. Confidentiality was ensured by using pseudonyms to protect the identities of the participants and their respective schools. Finally, the researcher properly cited all academic sources to ensure scholarly integrity and avoid plagiarism.

3.0 Findings and Discussion

The field data revealed that the peer teaching method positively influences students' achievement in statistics. Below is a detailed presentation and discussion of these findings.

3.1 Enhancement of Self-assessment

The study found that the peer teaching method helps students self-assess and understand their individual strengths and weaknesses in statistics. It enables them to identify which concepts they understand well and which areas require more work, promoting self-awareness and academic growth. By recognizing these areas, students can build on their strengths and seek peer support to address their weaknesses. Additionally, peer feedback offers diverse explanations that help simplify complex statistical concepts. During the interviews, one head of school described this process:

> Peer teaching method helps students to identify challenging areas during learning, which can be resolved by supporting one another more effectively. That is, a student may realise there is a certain area they have not well-understood, but their friends understand it better. In that case, they can ask for help and be guided more by their fellow students than by their teachers (Interview, HSC: 14th July 2025).

This response highlights how peer teaching allows students to recognize gaps in their understanding and resolve them through collaborative learning. It creates a comfortable

space where students can ask peers for explanation, which is sometimes more relatable and effective than traditional teacher-led instruction.

3.2 Increasing Students' Engagement and Participation

The peer teaching method proved to be highly effective in encouraging active participation in statistics classes. Through this approach, students take charge of their learning, resolve personal academic doubts, and build a stronger grasp of statistics, which ultimately improves their performance. During the interviews, one mathematics teacher shared:

> Peer teaching method makes students to be active in classrooms, because it allows their fully participation. In my class I always choose randomly any student to teach others in front of the class. This makes other students to be more active because they know they can be selected any time to teach others (Interview, MTSB1: 15 July 2025).

This finding shows that peer teaching encourages students to remain attentive and focused, especially when they know they might be randomly selected to present a topic to their peers. These results match those of prior studies, such as Ra'ed and Reem (2016) and Ozgur and Bahattin (2022), which reported that peer teaching helps students clarify misunderstandings, address knowledge gaps, and tackle complex topics confidently, leading to better academic performance.

3.3 Boosting Students' Confidence

The findings indicate that peer teaching boosts students' self-confidence in statistics. When students explain mathematical concepts to their classmates and receive constructive feedback, they develop a sense of mastery and competence, which translates into stronger problem-solving skills. This increased confidence has a positive influence on their motivation and overall performance. During a focus group discussion, one student remarked: *"This method helps us to build confidence and recognise that we are all equal, enabling us to participate together in learning mathematics. This contributes to improving our performance in mathematics subject"* (FGD, STBG2: 17th July 2025).

This feedback demonstrates that peer teaching helps reduce academic anxiety, encourages self-belief, and creates a supportive, collaborative learning environment where students feel safe to participate.

Furthermore, students reported that they often feel more comfortable asking for help from classmates than from their teachers. This comfort stems from the relaxed, non-threatening relationship among peers, who view each other as equals rather than authority figures. Sharing similar struggles allows them to seek help without the fear of being judged. During an FGD, a student from School D noted: *"I feel comfortable being helped by another student than I could be helped by the teacher. The reason is that my colleague [referring to student] can use normal tone to make me understand easily"* (FGD, STDG1: 17th July 2025).

This outcome aligns with research by Elizabeth et al. (2016), who pointed out that peer teaching not only increases student engagement in mathematics but also deepens their conceptual understanding and builds long-term academic confidence.

3.4 Knowledge Retention

The peer teaching method also improves students' ability to retain statistical knowledge over time. Actively recalling and applying statistics concepts during peer sessions strengthens mental connections and promotes long-term retention. By explaining topics to classmates, students reinforce their own learning and identify concepts they still need to practice. One student explained this benefit during an FGD:

> This method [peer teaching] is more effective, because it greatly helps us to retain and memorize what we learn in statistics. When we teach each other, there is more repetition of some statistical components in mathematics subject. For instance, teach measures of dispersion through statistics can make one to understand calculation related to range, variance, and standard deviation. Ultimately, we perform better in mathematics subject (FGD, STAG1: 17th July 2025).

This quote shows that peer teaching fosters retention through active repetition and engagement. Explaining topics like range, variance, and standard deviation to classmates reinforces the steps in calculations, helping students remember them better during assessments. These findings match the work of Kavita and Khirtish (2024) and Vipinder

(2022), who argued that peer teaching improves academic achievement in mathematics by reinforcing fundamental concepts.

3.0Conclusion

Based on the study findings, peer teaching is an effective and valuable method for teaching statistics in secondary school mathematics. It improves students' self-assessment, active participation, confidence, and overall performance. By creating a supportive, non-intimidating environment, the method allows students to comfortably ask questions and seek help from their peers. Furthermore, peer teaching promotes a deeper, long-term understanding of statistics. Integrating this collaborative approach into daily mathematics instruction can create a dynamic learning environment that addresses diverse student needs.

4.0Recommendations

Based on the conclusions, the following recommendations are made:

(a) Mathematics teachers should play an active role in monitoring and guiding peer teaching sessions to ensure that students share accurate information and remain focused on academic goals. Adopting this method can serve as a valuable tool for both teachers and students to improve outcomes in mathematics.

(b) Schools should establish structured peer teaching programs, such as subject clubs and organized study groups. These activities provide a clear framework for collaborative learning. Public secondary schools should also set clear guidelines and schedules for

peer teaching (including group assignments and topics) and integrate these sessions into the formal school timetable to ensure consistency.

(c) The government, through the Ministry of Education, Science and Technology (MoEST), should ensure that public secondary schools are equipped with sufficient learning resources, such as relevant mathematics textbooks and digital learning materials, to support the effective implementation of peer teaching.

References

Audu, I., &Oyelekan, O. S. (2020). Challenges affecting the teaching and learning of statistics in secondary schools: Implications for science education in Africa. *Journal of Education and Practice, 11*(12), 45–53.

Auliga, R. N. (2018). Can mathematics and statistics perception explain students' statistical literacy? *Journal of Research and Advances in Mathematics Education, 3*(2), 86–96.

Basil, M. D., Degeng, N. S., Setyosari, P., & Sulton. (2021). Peer teaching: Students teaching students to increase students' academic performance. *Teaching Theology and Religion, 24*(1), 17–27.

Batanero, C., Burrill, G., & Reading, C. (2016). *Teaching statistics in school mathematics: Challenges for teaching and teacher education*. Springer.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101.

Candelario-Aplaon, Z. (2017). Needs assessment of senior high school mathematics teachers in teaching statistics and probability. *International Forum Journal, 20*(2), 143–159.

Chance, B., Ben-Zvi, D., Garfield, J., & Medina, E. (2007). The role of technology in improving student learning of statistics. *Technology Innovations in Statistics Education, 1*(1), 1–26.

Chandra, R. (2015). Collaborative learning for educational achievement. *IOSR Journal of Research & Method in Education, 5*(2), 4–7.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.

Coombs, H. (2022). *Case study research: Single or multiple* [White paper]. Southern Utah University. https://doi.org/10.5281/zenodo.7604301

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Franklin, C., Kader, G., Mewborn, D., Moreno, J., Peck, R., Perry, M., & Scheaffer, R. (2015). *Statistical education of teachers*. American Statistical Association.

Garfield, J., & Ben-Zvi, D. (2008). *Developing students' statistical reasoning: Connecting research and teaching practice*. Springer.

Hamed, A. (2022). *Qualitative research methods: Exploring human experiences*. Academic Press.

Komba, W. L., &Mwandanji, G. (2021). *Factors influencing students' academic performance in Tanzanian secondary schools*. Dar es Salaam University Press.

Krueger, R. A., & Casey, M. A. (2015). *Focus groups: A practical guide for applied research* (5th ed.). SAGE Publications.

Kvale, S., & Brinkmann, S. (2015). *Interviews: Learning the craft of qualitative research interviewing* (3rd ed.). SAGE Publications.

Male, H., &Lumbantoruan, J. H. (2020). Student perception and attitudes towards statistics. *Advances in Social Science, Education and Humanities Research, 5*, 507–513.

Mata, M. L., Monteiro, V., & Peixoto, F. (2020). Attitudes towards mathematics: Effects of individual, motivational, and social support factors. *Child Development Research, 2*, 11–19. https://doi.org/10.1155/2012/876028

Ministry of Education, Science and Technology. (2022). *Basic education statistics in Tanzania (BEST), 2022*. MoEST.

Mlama, J. P. (2020). *Effectiveness of peer teaching strategies in improving students' performance in mathematics: A case of Tanzanian secondary schools* [Master's thesis, Open University of Tanzania].

Nshimiyimana, A., & Cartledge, P. (2020). Peer teaching at the University of Rwanda—A qualitative study based on self-determination theory. *BMC Medical Education, 20*, Article 370, 1–12. https://doi.org/10.1186/s12909-020-02142-0

Nyambo, M., & Joseph, E. (2023). Teaching methods and learners' academic achievement in mathematics among Tanzanian public schools. *African Journal of Educational Studies, 15*(2), 45–58.

Olpak, Y. Z., Bartaci, S., & Arican, M. (2018). Investigating the effect of peer instruction on pre-service mathematics teachers' achievement in statistics and probability. *Education and Information Technologies, 23*(4), 1–18.

Rumsey, D. J. (2010). *Statistics for dummies* (2nd ed.). Wiley Publishing.

Rusli, M., Degeng, N. S., Setyosari, P., & Sulton, K. (2021). Peer teaching: Student teaching student to increase academic performance. *Teaching Theology & Religion, 24*(1), 17–27.

Saleem, A., Kausar, H., & Deeba, F. (2021). Social constructivism: A new paradigm in teaching and learning environment. *Perennial Journal of History, 2*(2), 403–421.

Stigmar, M. (2016). Peer-to-peer teaching in higher education: A critical literature review. *Mentoring & Tutoring: Partnership in Learning, 24*(2), 124–136. https://doi.org/10.1080/13611267.2016.1178963

Tarehdoost, H. (2021). Data collection methods and tools for research: A step-by-step guide to choose data collection technique for academic and business research projects. *International Journal of Research in Management, 10*(1), 7–11.

Topping, K. J. (2021). Peer learning in higher education: Learning from and with each other. *Education Sciences, 13*, Article 326. https://doi.org/10.3390/educsci13040326

Vipinder, N. (2022). Effect of peer tutoring in achievement on mathematics among secondary school students. *Journal of Emerging Technologies and Innovative Research, 9*(6), 777–780.