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All author's name and affiliations are given below, after references

Impact of peer teaching on mathematics achievement among grade 8 students in a secondary school in Guyana

Andre Indardat, Lakhnarayan Kumar Bhagarathi, Nicholas De France, Phillip NB Da Silva, Bibi Rafeena Ally-Charles, Ferial Pestano, Rahaman Balkarran, Rajendra Dasratt, Lacram Kokil, Bissessar Persaud, Yunita Arjune, Maria A Fraser, Chalasa Cossiah and Sushmita Kalika-Singh

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Abstract
This study investigates the comparative effectiveness of peer teaching and expository teaching methods on the academic performance of Grade 8 students in Mathematics at a secondary school in Region 6, Guyana. Using a quasi-experimental design, two groups of students with comparable baseline abilities received instruction through either peer teaching or traditional expository methods, guided by detailed lesson plans. Pre- and post-tests measured learning gains, while statistical analyses evaluated differences in outcomes. Results showed that both groups improved significantly from pre-test to post-test. The expository group's mean score increased from 9.33 (23.33%) to 26.13 (65.31%), reflecting a 42%-points gain. The peer teaching group, however, achieved a greater improvement from 9.25 (23.13%) to 30.75 (76.88%), a 53.75 percentage point increase. The difference in post-test performance between groups was statistically significant ($t=-8.26$, $p<0.001$), indicating superior academic achievement with peer teaching. Additionally, the peer teaching group's higher variance suggested wider individual gains and deeper engagement. While both groups began at similar knowledge levels, only the peer teaching group reached a "good" performance category post-intervention, surpassing the expository group's "satisfactory" level. These findings support the hypothesis that peer teaching promotes enhanced understanding, retention, and student confidence compared to traditional direct instruction. The findings highlight the benefits of interactive, student-centered learning environments while acknowledging the role of structured teacher-led instruction, thereby informing best practices for improving mathematics achievement among Grade 8 learners.

Keywords: Guyana, peer teaching, mathematics, academic achievement, student engagement, expository teaching methods

1. Introduction
Peer teaching has emerged as a powerful pedagogical strategy that fosters deeper comprehension and long-term retention of subject matter among students. It involves students teaching and learning from each other, often breaking down complex concepts into simpler, more manageable components. This collaborative approach not only reinforces the tutor's understanding but also enhances the tutee's ability to grasp difficult content [9, 12]. Observations within classroom environments indicate that students frequently turn to their peers for clarification when teacher explanations fall short, particularly in challenging subjects such as Mathematics. Despite teacher interventions, some students continue to struggle with conceptual understanding, yet through peer explanations and collaborative problem-solving, they demonstrate remarkable improvements in comprehension and performance.

Beyond academic achievement, peer teaching cultivates critical soft skills such as teamwork, communication, empathy, and collaborative problem-solving. Kondrat (2024) [16] emphasizes that peer learning environments promote personal and professional growth by engaging students in meaningful social interactions.

Corresponding Author:
Lakhnarayan Kumar Bhagarathi
M.D.R.M., C.G., M.Sc., Post Graduate Diploma, B.Sc., Institute for Marine and Riverine Ecologies and Economies, University of Guyana, Berbice Campus, John's Science Centre, Corentyne, Berbice, Guyana

Shy or introverted students, who might otherwise refrain from participating in class discussions, often find peer learning settings more comfortable and stimulating [19]. Additionally, peer collaboration allows students to recognize and compensate for each other's strengths and weaknesses, fostering a cohesive and supportive classroom culture [12]. Classroom observations further reveal that group study sessions, where high-achieving students assist underperforming peers, can lead to notable improvements in academic outcomes, as students engage in shared learning experiences that make studying both effective and enjoyable. A critical aspect of peer teaching is its role in identifying knowledge gaps and facilitating the exchange of constructive feedback. Through peer assessments and collaborative discussions, students develop metacognitive awareness, enabling them to critically evaluate their understanding and refine their learning strategies [5, 23]. This reflective process nurtures higher-order thinking skills and empowers students to take ownership of their learning. Peer tutoring sessions, particularly in Mathematics, often involve high-performing students guiding their peers through complex, multi-step problems, leading to simplified explanations and enhanced conceptual clarity for both parties involved.

The theoretical underpinnings of peer teaching are grounded in Vygotsky's Zone of Proximal Development (ZPD), which posits that cognitive development is significantly influenced by social interactions and peer collaboration. Peer tutors employ instructional techniques such as scaffolding, feedback provision, and interactive engagement to facilitate learning within the ZPD [6]. Educators, therefore, incorporate peer teaching methodologies, including group projects, discussions, one-on-one tutoring, and peer mentoring, tailored to accommodate diverse student learning preferences [2].

Empirical studies further underscore the multifaceted benefits of peer tutoring, which include fostering creativity, enhancing problem-solving skills, and promoting student autonomy in managing their own learning processes [3, 11]. Additionally, peer teaching has been shown to mitigate behavioral and social issues in diverse educational settings by fostering inclusivity and student engagement [17]. Given the persistent challenges of teacher shortages and budgetary constraints, peer tutoring emerges as a pragmatic solution, allowing educational institutions to leverage the capabilities of former students and volunteers. Moreover, peer teaching strategies have been associated with increased participation among underperforming students, contributing to reduced school dropout rates [24].

Despite the growing body of literature supporting the efficacy of peer teaching, there remains a need for context-specific research, particularly within the Caribbean educational landscape. This study examines the effectiveness of peer teaching on the academic performance and knowledge retention of Grade eight students in Mathematics. Specifically, it investigates whether students taught using peer teaching methodologies demonstrate superior academic performance and retention compared to those taught via traditional expository methods.

2. Methodology

2.1 Research Design

A quasi-experimental design utilizing a non-equivalent control group model was employed to investigate the effectiveness of peer teaching on students' academic performance and retention in Mathematics.

2.2 Description of the Population and Sample

The study was conducted among Grade eight students from secondary school An in Region 6. From a cohort of five Grade eight classes, two classes were selected for participation in the research. One class was designated as the experimental group, while the other served as the control group. Each group comprised 24 students, with ages ranging from 14 to 16 years.

2.3 Instrumentation

A pre-test and post-test methodology was implemented to collect quantitative data. The experimental group engaged in peer teaching activities, while the control group was instructed through the traditional expository method. The post-test was administered the day after the instructional sessions to assess immediate learning outcomes.

The primary instrument for data collection was a Mathematics assessment, designed to evaluate students' comprehension and retention of concepts in Mathematics. The assessment comprised two sections: Section A included ten (10) multiple-choice questions targeting foundational knowledge and conceptual understanding, while Section B consisted of structured application questions assessing students' problem-solving abilities and graphical interpretations. The instrument was reviewed for content validity by subject matter experts and aligned with the local Grade Eight Mathematics curriculum.

2.4 Implementation

The intervention spanned a three-day instructional period, followed by a post-test on the fourth day. Both groups were seated in classrooms arranged uniformly in three columns and four rows to ensure environmental consistency. Within the experimental group, six students were selected as peer tutors based on their top six scores in the pre-test. These peer tutors were each randomly assigned to one of six groups, facilitating peer teaching sessions during the lessons.

Both the experimental and control groups were taught identical content using standardized lesson plans. In the experimental group, lessons were delivered through peer-led collaborative learning, while the control group received teacher-centered instruction through the expository method. On the fourth day, a post-test was administered to both groups to assess their comprehension and retention of the material taught. The test scores from both groups were then collected and used for comparative analysis.

Lesson plans were carefully structured to promote clear understanding and active engagement in key mathematical topics for Grade 8 students. Each plan focuses on a specific subtopic and includes clear learning objectives that guide the teaching process. The lessons incorporate examples and exercises designed to reinforce students' skills through practical application, ensuring they can confidently solve problems independently. Time allocations and step-by-step content delivery foster an organized classroom flow, while the inclusion of varied teaching methods, such as peer teaching and expository approaches, aims to accommodate different learning styles and improve overall comprehension. These plans serve as a comprehensive guide

to achieving targeted academic outcomes within a structured time-frame.

2.5 Data Analysis

Data obtained from the pre-test and post-test assessments were analyzed using Microsoft Excel 365 and the Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics were calculated to summarize student performance in both groups. Inferential statistical analyses were conducted to determine the significance of differences in academic performance and retention between students taught through peer teaching and those instructed via the expository method. The findings were presented using appropriate tables and graphical representations to facilitate interpretation and comparison. An independent samples t-test was conducted to determine if the observed differences in post-test scores between the two groups were statistically significant.

3. Results and Discussion

3.1 Academic Performance of Students Taught Using the Expository Method

Table 1 presents the raw test scores for the students in the expository (control) group. The pre-test total score for the group was 224, yielding a mean score of 9.33 and a percentage of 23.33%. Following the intervention, the post-test total score increased to 627, translating to a mean score of 26.13 and a percentage of 65.31%. This indicates a performance improvement of 42 percentage points from the pre-test to the post-test. The difference in scores for individual students ranged from 11 to 23 marks, suggesting that while learning gains were observed across the group, the level of improvement varied among students.

Table 1: Raw test scores obtained from the Expository Group for all test items

Student	Pre-test	Post-Test	Difference
1	10	25	15
2	9	24	15
3	8	27	19
4	12	28	16
5	13	26	13
6	12	26	14
7	5	28	23
8	7	27	20
9	11	28	17
10	10	26	16
11	13	25	12
12	6	26	20
13	12	23	11
14	12	27	15
15	3	26	23
16	10	26	16
17	7	26	19
18	4	25	21
19	11	24	13
20	9	25	16
21	9	29	20
22	12	29	17
23	9	26	17
24	10	25	15
Total	224	627	403
Mean	9.33	26.13	
%	23.33	65.31	

Chintya & Efendi (2021) [7] investigated the influence of the expository learning method on elementary students' mathematics outcomes (multiplication and division) in a single-school sample of 32 third-grade students. Using test and documentation methods, the authors reported a large and statistically significant positive effect of expository instruction on students' immediate learning outcomes based on the reported t-test results. The study concluded that, for the sample and content tested, a direct systematic expository approach produced substantial gains, particularly for learners who benefit from clear, teacher-directed explanations and recommended expository delivery as a viable method for teaching basic arithmetic when lessons are well structured.

An EduLine (2022) [10] experimental study comparing Student Team Achievement Division (STAD, a cooperative approach) with the expository method on a secondary school mathematics topic found that students taught via STAD, significantly outperformed those taught using the expository method. The study used intact classes and reported that cooperative group work produced higher post-test means than teacher-centered exposition, leading the authors to conclude that cooperative strategies like STAD enhance achievement more than conventional lecture-style instruction in the contexts studied. The authors recommended integrating cooperative structures into mathematics lessons to raise student performance.

Khasawneh *et al.* (2023) [15] conducted a quasi-experimental comparison of inquiry-based learning versus traditional lecture-based instruction in a college algebra course. After controlling for readiness/pretest scores via ANCOVA, students in the inquiry (student-centered) sections obtained significantly higher post-test mathematics achievement than those in the traditional lecture sections. The authors concluded that for algebra, a gateway course with high failure rates, inquiry-based approaches produced superior learning gains compared with pure lecture, and recommended that college algebra instructors incorporate inquiry and active problem-solving in lieu of exclusive reliance on expository lectures.

In 2020, Oribhabor [21] evaluated an activity-based approach against the lecture method for Nigerian secondary-school mathematics students and reported that the activity-based group significantly outperformed the lecture (expository) group on post-test scores. The quasi-experimental study (intact classes, ANCOVA) found a large effect size favoring the activity method; the author concluded that sustained use of activity-based pedagogy could markedly improve secondary mathematics achievement and recommended teacher professional development to scale these active methods in schools where lecture remains dominant.

In 2024 a study by Ijeh [14] compared concrete manipulative (hands-on) instruction with lecture approaches in secondary mathematics reported that students exposed to manipulative-based lessons achieved higher post-test scores and demonstrated better conceptual understanding than students taught with lecture alone. The researchers argued that physical representations reduce cognitive load and provide scaffolds that make abstract mathematical ideas more accessible; they concluded that lecture can transmit information efficiently but is less effective than manipulative-supported instruction for deep conceptual learning in mathematics.

Comparative research by Isa & Mamman (2019) [28] on guided-discovery versus expository methods consistently shows that discovery approaches produce larger gains in secondary mathematics achievement than purely expository lessons. In this study in Kano State, Nigeria, students whom were taught by the discovery methods performed better than peers taught by expository/lecture methods. The authors concluded that discovery approaches, when properly scaffolded, encourage deeper reasoning and problem solving than lecture alone and recommended training teachers to implement discovery sequences effectively [28].

An Atlantis Press conference paper by Farisi *et al.* (2018) [29] compared the discovery and expository methods and reported an average post-lesson score of 74.32 for students taught via the expository method but used a t-test to show significant differences between approaches in favor of the student-centered method. The paper's finding suggests that while expository instruction can yield respectable average scores, student-centered alternatives produced more favorable gains in the contexts studied; the authors therefore recommended blending exposition with discovery tasks rather than relying exclusively on lecture.

A ResearchGate preprint by Yehezky & Hidayani (2025) [27] evaluated an "Intensive Mathematics Class Program" that used an expository model aimed at low-ability tenth graders affected by pandemic learning losses. The quasi-experimental pre-test/post-test evaluation reported measurable improvements in basic mathematics skills after targeted expository instruction, suggesting that short, intensive, teacher-led expository remediation can produce quick gains for struggling cohorts. The authors concluded that expository remediation programs remain a practical option for rapid catch-up instruction, while also noting the need to follow up with active learning for durable understanding [27].

Idama & Ajaja (2024) [13] compared mathematical games, instructional analogies, and the lecture method among secondary students in Delta State, Nigeria. Their experiment found that both game-based and analogy-based instruction produced higher mathematics achievement and interest than the lecture method; the lecture group scored lower on post-tests and showed less interest in mathematics. The authors concluded that lecture alone is unlikely to maximize achievement or motivation and recommended integrating brief games or analogy exercises into expository segments to boost learning and engagement.

Obeidat (2019) [20] examined the effects of lecture-based versus cooperative learning methods (team-based learning) and found significantly higher achievement for students taught with cooperative/team approaches than for those taught with lecture alone. Although the study was conducted with university student teachers and not exclusively in a mathematics classroom, the paper's results align with mathematics-specific research that cooperative and peer-interactive models typically outperform pure lecture on achievement outcomes; the author recommended replacing or supplementing lectures with structured cooperative tasks to improve academic performance.

3.2 Academic Performance of Students Taught Using Peer Teaching Method

Table 2 illustrates the raw test scores obtained from students in the peer teaching (experimental) group. This group achieved a total pre-test score of 222, corresponding to a mean score of 9.25 and a percentage of 23.13%. In the post-test, the total score rose to 738, yielding a mean score of 30.75 and a percentage of 76.88%. The improvement in individual student scores ranged from 14 to 27 marks, with several students exhibiting notably high gains. The experimental group's performance increased by 53.75 percentage points, outperforming the control group.

Table 2: Raw test scores obtained from the peer teaching group for all test items

Student	Pre-test	Post-Test	Difference
1	10	32	22
2	12	31	19
3	9	34	25
4	15	29	14
5	9	33	24
6	8	30	22
7	12	32	20
8	6	32	26
9	11	31	20
10	10	29	19
11	9	29	20
12	8	30	22
13	7	30	23
14	9	27	18
15	8	31	23
16	6	29	23
17	8	28	20
18	13	29	16
19	9	35	26
20	8	30	22
21	7	30	23
22	12	28	16
23	6	33	27
24	10	36	26
Total marks	222	738	516
Mean	9.25	30.75	
%	23.13	76.88	

Ullah *et al.* (2018) [26] conducted a study on peer tutoring in biology at the secondary level. The experimental group, which engaged in peer tutoring, showed significantly higher post-test scores compared to the control group. The study concluded that peer tutoring effectively enhances academic achievement in biology and recommended its incorporation into teaching methodologies.

In 2024, Al Yahyaei *et al.* [1] examined the impact of peer tutoring on first-year nursing students and found improvements in academic performance, psychological empowerment, and student satisfaction among participants. It was recommended that peer tutoring be integrated into nursing education to support student success.

Topping in 2005 [25] reviewed research on peer tutoring and its effects on academic achievement. The findings indicated that peer tutoring leads to significant academic gains and promotes collaborative learning. The study advocated for the widespread adoption of peer tutoring across various educational levels.

Bowman & Perrott (2015) [4] conducted a meta-analytic review of peer tutoring studies. The analysis revealed a moderate to large effect size (0.75), indicating substantial academic benefits from peer tutoring. The review suggested that peer tutoring is effective across subjects and educational settings.

3.3 Comparative performance between peer teaching and expository groups

Figure 1 compares the pre-test and post-test results of both groups. The pre-test scores for the expository group (23.33%) and the peer teaching group (23.13%) were relatively similar, indicating that both groups started at comparable performance levels. However, in the post-test, the peer teaching group achieved a percentage score of 76.88%, surpassing the expository group, which attained 65.31%. This difference of 11.57 percentage points suggests that the peer teaching method resulted in greater academic improvement compared to the expository approach.

According to Scholaro Database (2024) [23], scores below 60% are classified as "fail." Both groups' pre-test scores fell within this category. In the post-test, the expository group reached a "satisfactory" performance level (60-69%), while the peer teaching group advanced to a "good" performance level (70-79%). This indicates that the peer teaching strategy was more effective in elevating students' academic achievement to a higher performance category.

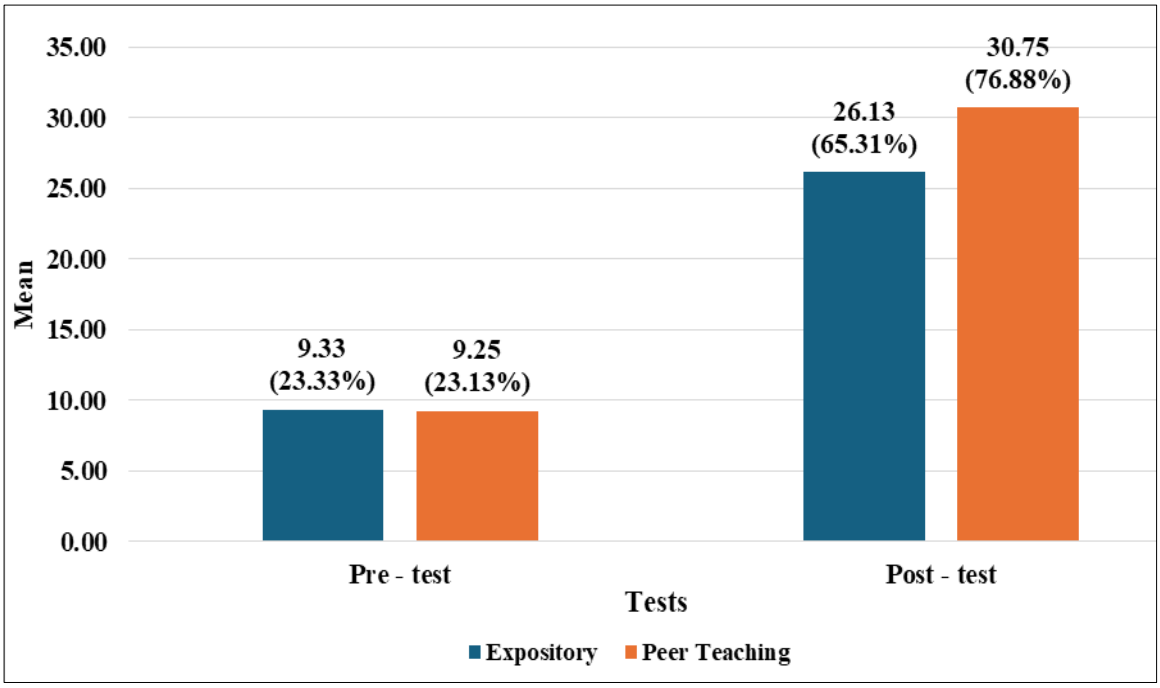

Fig 1: Pre-Test and post-test scores between groups

3.4 Statistical Analysis of Group Differences

The results, shown in Table 3, indicate that the peer teaching group had a higher mean score (M=30.75) compared to the expository group (M=26.13). The variance in scores was also greater in the peer teaching group (5.15) than in the expository group (2.38), reflecting a wider range of performance gains among students who participated in peer teaching. The t-test produced a two-tailed t-statistic of 2.02 with a p-value of 3.5×10^{-10}, which is well below the significance threshold of 0.05. Therefore, the difference in academic performance between students taught using peer teaching and those taught using the expository method is statistically significant.

Table 3: Independent samples t-test (assuming unequal variances) for post-test scores

Statistic	Expository Group	Peer Teaching Group
Mean	26.13	30.75
Variance	2.38	5.15
Standard Deviation	1.54	2.27
Observations	24	24
Degrees of Freedom (D.F)	46	
t-Statistic	-8.26	
p-Value (Two-Tailed)	3.54×10^{-10}	

In Figure 2, the pre-test results indicate that the peer teaching group achieved a total percentage score of 40.42%, while the expository group attained 42.08%. This minimal difference suggests that both groups began the intervention at a comparable level of performance, indicating no significant difference in their initial understanding of the content. However, in the post-test, the peer teaching group exhibited a substantial improvement, outperforming the expository group by 30.83%. This notable disparity in post-test performance suggests that students in the peer teaching group demonstrated a higher rate of knowledge retention compared to their counterparts in the expository group. The observed difference underscores the potential effectiveness of peer teaching strategies in facilitating deeper conceptual understanding and long-term retention of subject matter.

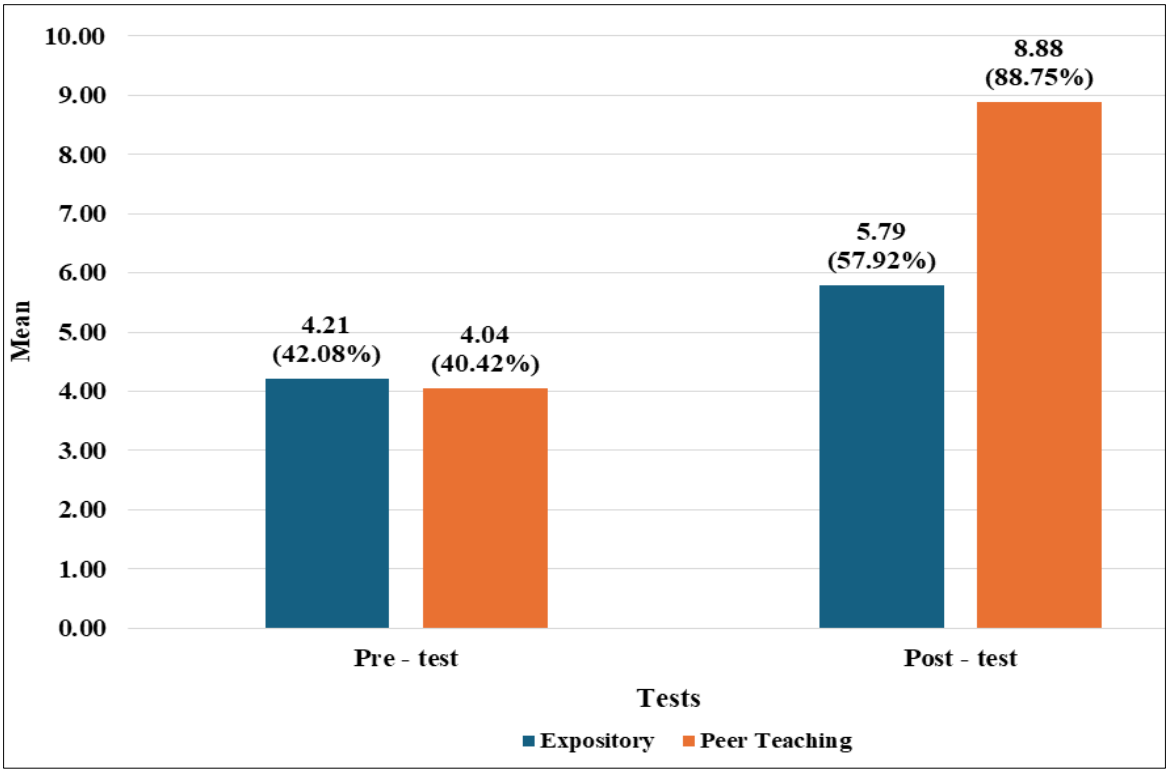

Fig 2: Test results obtained from both groups

This research has provided valuable insights for the teacher, emphasizing the importance of peer collaboration in addressing individual learning differences within the classroom. One of the key challenges faced by the researcher was the difficulty of providing individualized attention to students who struggle with understanding complex concepts during limited instructional time. The incorporation of peer assistance emerged as an effective strategy to bridge this gap, allowing students to seek support from their peers, thereby minimizing the likelihood of students being overlooked during class sessions.

Additionally, the study highlighted that engaging students in structured peer learning activities contributes to increased engagement, reduced distractions, and the cultivation of a more stimulating and interactive learning environment. Students were more inclined to participate actively when learning alongside their peers, fostering a sense of shared responsibility and collaborative problem-solving. Overall, this research underscores the potential of peer collaboration as a pedagogical tool to enhance student learning experiences, promote inclusivity, and support differentiated instruction in diverse classrooms.

These findings align with Dewey's (2023) philosophy of learning as an inherently social process, wherein interactions with peers and the surrounding environment play a pivotal role in facilitating meaningful learning. Dewey's emphasis on experience, reflection, and active participation [18] resonates with the observed benefits of peer teaching in this study, affirming the value of learner-centered, collaborative educational practices.

4. Conclusion

The findings of this study demonstrate that peer teaching is a highly effective pedagogical strategy for improving students' academic performance and retention in Mathematics. While both the expository and peer teaching methods resulted in notable learning gains, students in the peer teaching group achieved significantly higher post-test scores, advancing from a "fail" category to a "good" performance level. The statistical analysis confirmed that these differences were not only meaningful but also significant, underscoring the superiority of peer teaching over traditional instructional methods in fostering deeper conceptual understanding and long-term retention of mathematical concepts.

Beyond academic achievement, the study highlighted the broader benefits of peer teaching, including enhanced engagement, collaboration, and inclusivity within the classroom. Peer learning created an environment in which students could actively participate, clarify misconceptions, and support each other's growth. This was particularly valuable in addressing the challenge of limited teacher-student interaction time, as peer tutors effectively supplemented instruction and provided personalized support. Such findings reinforce the notion that learning is inherently social, aligning with Vygotskian theory and Deweyan perspectives on education. Given these outcomes, peer teaching emerges as a viable and impactful instructional strategy for secondary schools in Guyana and similar educational contexts. It not only improves academic outcomes but also cultivates essential skills such as communication, teamwork, and problem-solving.

4.1 Concerns

One concern arising from this study relates to the process of selecting peer tutors. The study identified tutors solely on the basis of their pre-test performance, which may not fully capture essential attributes such as communication skills, patience, and the ability to explain concepts effectively. As a result, the quality of peer teaching delivered could vary considerably, depending on the personal characteristics of the selected tutors.

Another concern is the short duration of the intervention, which spanned only three instructional days. This raises

questions about whether the observed improvements in student performance would persist over a longer period or diminish once the novelty of peer teaching wears off.

Additionally, the generalizability of the findings is limited because the research was confined to a single school in Region 6, Guyana, with a sample of only two classes. This may restrict the applicability of the results to other schools with different student demographics, resources, or teaching cultures.

Furthermore, the success of peer teaching depends heavily on peer dynamics, including cooperation, attitudes, and relationships among students. Situations where stronger students dominate discussions or weaker students disengage could undermine the collaborative benefits of the method.

Finally, the assessment tool, though aligned with the curriculum, focused largely on foundational concepts and problem-solving. Higher-order skills such as reasoning, critical thinking, and creativity in Mathematics may not have been adequately captured.

4.2 Limitations

The study faced several methodological and contextual limitations. First, the quasi-experimental design employed a non-equivalent control group, which introduced the possibility of selection bias and reduced the internal validity of the findings. Since random assignment was not feasible, it is difficult to attribute improvements solely to the teaching strategy without considering other confounding variables.

A second limitation was the reliance on short-term outcome measurement, as the post-test was administered only one day after the intervention. While this design captured immediate learning gains, it did not adequately assess long-term knowledge retention.

Another limitation was the small sample size, with only 24 students in each group. This reduced the statistical power of the analysis and limits the robustness of conclusions drawn from the data. Contextual limitations also exist, as the findings are specific to one secondary school in Region 6 and may not be generalizable to other schools with different educational settings or cultural backgrounds.

Finally, the researcher's involvement in structuring lesson plans and organizing the groups may have inadvertently influenced the implementation of both teaching strategies, introducing potential researcher bias into the study.

4.3 Recommendations

Based on the findings and limitations, several recommendations can be made for future research and practice. To strengthen the evidence base, future studies should extend the duration of peer teaching interventions, ideally across several weeks or an entire school term, to evaluate whether improvements in performance are sustained over time. Research should also be expanded to include multiple schools across Region 6 and other regions of Guyana to enhance the generalizability of the results and determine whether peer teaching is consistently effective across different educational contexts.

Moreover, future studies should diversify assessment tools by incorporating delayed post-tests, formative evaluations, and qualitative approaches such as interviews and student reflections. This would allow for a more comprehensive understanding of the impact of peer teaching, including its effects on higher-order thinking and student motivation.

In terms of practical recommendations, it is advisable to refine the process of selecting peer tutors. Rather than relying solely on test scores, teacher recommendations and peer evaluations should be considered to identify students who demonstrate strong interpersonal and communication skills in addition to academic proficiency. Furthermore, providing structured training for peer tutors would enhance their ability to deliver effective explanations, scaffold learning, and support weaker peers in inclusive ways. Longitudinal studies are also recommended to track the performance of students exposed to peer teaching across different grade levels and standardized examinations, thereby establishing whether the benefits extend beyond immediate test outcomes.

Finally, at the instructional level, teachers should consider formally integrating peer teaching into their lesson plans as a complementary strategy to traditional expository methods. This blended approach could help address individual learning differences, foster active engagement, and improve overall classroom outcomes, particularly in Mathematics where conceptual challenges are common.

Further, educators integrate structured peer teaching methodologies alongside traditional instruction to maximize student learning experiences, promote inclusivity, and strengthen overall classroom dynamics. Future research should expand on these findings by examining peer teaching across multiple subjects, grade levels, and cultural contexts to further establish its applicability and long-term impact within the Caribbean educational landscape.

5. Compliance with Ethical Standards

Acknowledgment

The authors would like to express their sincere gratitude to the University of Guyana for providing this valuable opportunity and for supporting the successful completion of this research. A heartfelt thank you is extended to the anonymous participants; whose valuable contributions were instrumental in completing this study. Additionally, the authors wish to acknowledge the Ministry of Education for its generous support, consideration, and assistance in facilitating this research at the secondary level.

Statement of Ethical Approval

Permission to conduct the study was formally obtained by the researcher from the Headmaster of the participating Secondary School A. The study was designed to adhere strictly to its stated research questions, with no element of deception involved. Ethical principles of voluntary participation, confidentiality, and academic integrity were maintained throughout the research process.

Confidentiality of Participants

Student participants were not required to provide any identifying information, such as their names, signatures, contact numbers, or any details that could trace back to them. The school involved in this research was not identified but is referred to as "Secondary School A" throughout the study to ensure anonymity and confidentiality.

6. Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

7. Disclosure of conflict of interest

The authors certify that this submission is original work and is not under review at any other publication. The authors hereby declare that this manuscript does not have any conflict of interest.

8. Statement of informed consent

The authors declare that informed consent was obtained from all individual participants included in the study. All work utilized in this study was fully cited and referenced so authors of prior researches are given their due credentials for their work.

9. Data Availability

Data will be made available on request.

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All Author's Name and Details

Andre Indardat
Post Graduate Diploma, B.Sc., Faculty of Education and Humanities, University of Guyana, Turkeyen Campus, Greater Georgetown, Guyana

Lakhnarayan Kumar Bhagarathi
M.D.R.M., C.G., M.Sc., Post Graduate Diploma, B.Sc., Institute for Marine and Riverine Ecologies and Economies, University of Guyana, Berbice Campus, John's Science Centre, Corentyne, Berbice, Guyana

Nicholas De France
Post Graduate Diploma, B.Sc.
Faculty of Education and Humanities, University of Guyana, Turkeyen Campus, Greater Georgetown, Guyana

Phillip NB Da Silva
M.Ed., M.Sc., Post Graduate Diploma, B.Sc., Institute for Marine and Riverine Ecologies and Economies, University of Guyana, Berbice Campus, John's Science Centre, Corentyne, Berbice, Guyana

Bibi Rafeena Ally-Charles
M.Sc., Post Graduate Diploma, B.Sc., College of Medical Sciences, University of Guyana, Turkeyen Campus, Greater Georgetown, Guyana

Ferial Pestano
M.Sc., B.Sc., Faculty of Natural Sciences, University of Guyana, Berbice Campus, Tain, Corentyne, Guyana

Rahaman Balkarran
B.A., Baruch College, Lexington Ave, New York, United States of America

Rajendra Dasratt
M.Sc., B.Sc., School of Entrepreneurship and Business Innovation, University of Guyana, Turkeyen Campus, Greater Georgetown, Guyana

Lacram Kokil
M.Sc., B.Sc., Faculty of Agriculture, University of Guyana, Berbice Campus, Tain, Corentyne, Guyana

Bissessar Persaud
M.D.R.M., C.G., M.Sc., B.Sc., Faculty of Agriculture, University of Guyana, Berbice Campus, Tain, Corentyne, Guyana

Yunita Arjune
M.Sc., Post Graduate Diploma, B.Sc., Faculty of Natural Sciences, University of Guyana, Berbice Campus, Tain, Corentyne, Guyana

Maria A Fraser
M.Sc., B.Sc., Faculty of Natural Sciences, University of Guyana, Berbice Campus, Tain, Corentyne, Guyana

Chalasa Cossiah
M.Ed., Post Graduate Diploma, B.Sc., Faculty of Natural Sciences, University of Guyana, Berbice Campus, Tain, Corentyne, Guyana

Sushmita Kalika-Singh
Ph.D., M.Sc., B.Sc., Faculty of Natural Sciences, University of Guyana, Berbice Campus, Tain, Corentyne, Guyana