Implementing Collaborative Rotation Strategy in Teaching Geometry to Enhance Class Engagement

Janelyn T. Palisbo[1], Emelita D. Pilvera[2], Genelyn R. Baluyos[3]

[1,3]Misamis University

[2]Ozamiz City National High School

ABSTRACT

Geometry has become apparent that students encounter challenges in promptly solving problems, often requiring substantial amount time to reach solutions. This is emphasized by the Program for International Student Assessment (PISA) rankings in 2022 for Mathematics, which placed the Philippines sixth out of the 10 countries with an average score of 355. This action research aimed to improve student engagement and geometry performance by implementing Collaborative Rotation Learning. During the 2023-2024 school year in a secondary public school in Ozamiz City, Misamis Occidental, Philippines, the study utilized a classroom-based action research design with Grade 8 students as participants, selected through purposive sampling. Instruments included a pretest and posttest to assess performance levels, with data analyzed using descriptive statistics and a t-test. The results showed a significant improvement in student performance post-intervention, indicating the effectiveness of Collaborative Rotation Learning in enhancing understanding, engagement, and performance in geometry. Additionally, the study revealed developments such as enhanced communication skills, improved time management, increased confidence in problem-solving, and a more positive classroom environment. Based on these findings, recommendations include continued integrating collaborative learning strategies; incorporating essential skill development in the curriculum, promoting student confidence and peer relationships, and fostering a supportive classroom environment enhance student outcomes.

Keywords: Geometry, collaborative rotation learning, class performance

INTRODUCTION

It has become apparent that students encounter challenges in promptly solving problems, often requiring substantial amount time to reach solutions. This is emphasized by the Program for International Student Assessment (PISA) rankings in 2022 for Mathematics, which placed the Philippines sixth out of the 10 countries with an average score of 355. Geometry, a foundational branch of Mathematics, assumes a critical role in developing analytical thinking, problem-solving skills, and overall mathematical proficiency. Comprehending abstract geometric concepts is challenging for students, requiring an enhanced learning experience to facilitate a more profound understanding (OECD, 2022).

According to data from the Programme for International Student Assessment (PISA), only 1% of students worldwide achieved a mathematics proficiency level of 5 or above. Notably, six Asian countries and economies stood out with the most significant shares of students achieving this high level of proficiency. The percentages of students scoring at Level 5 or higher were as follows: Beijing-Shanghai-Jiangsu-Zhejiang (China) with just over 44%, Singapore with nearly 37%, Hong Kong (China) with 29%, Macao (China) with nearly 28%, Chinese Taipei with just over 23%, and Korea with just over 21%. Students at this proficiency level demonstrate the ability to model complex situations mathematically and possess the skills to select, compare, and evaluate appropriate problem-solving strategies for dealing with intricate mathematical challenges (OECD, 2018).

To improve problem-solving instruction, it is vital to encourage students to develop higher-level skills and evaluate the learning results of problem-solving in mathematics education, all in response to the rising emphasis

on this topic. Additional investigation is required to formulate approaches and procedures incorporating a comprehensive viewpoint on instructing and incorporating problem-solving abilities in diverse mathematical settings (Olivares, D. et al, 2021).

Mathematics permeates life at every stage and in various circumstances, extending its significance beyond the confines of the classroom and the school. Mathematics should be approached comprehensively and with considerable depth as a school subject. The primary objectives of mathematics education at the foundational levels are fostering critical thinking skills and nurturing problem-solving abilities.

Proficiency in mathematical connection refers to the capacity to establish correlations between mathematical concepts and their real-world applications. However, the assessment of mathematical connection ability, indicated by three key measures, frequently reveals suboptimal results. Students' exhibit challenges in comprehending the concepts studied, leading to forgetfulness of principles and procedures. Additionally, there is a reluctance to apply these concepts in everyday life, a perception that mathematics needs to be more relevant to other sciences, and a difficulty grasping the contextual narrative (Kleden et al., 2021).

Critical thinking, as defined by Seibert (2021), involves the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information derived from observation, experience, reflection, reasoning, or communication. It serves as a guide to belief and action. On the other hand, as Khalid et al. (2020) outlined, mathematical problem-solving entails navigating difficulties, overcoming obstacles, and uncovering solutions to previously unknown problems. These dual objectives are to be attained through structured and rigorous curriculum content, a well-defined high-level skills and processes, inculcation of desirable values and attitudes, and appropriate tools. This is tailored to accommodate the diverse contexts of Filipino learners.

In the K-12 curriculum, mathematics encompasses various learning components that collectively form a comprehensive foundation for students. These components include algebra, which delves into the study of mathematical symbols and the rules for manipulating them; geometry, which explores the properties and relationships of shapes, sizes, and dimensions; trigonometry, focusing on the properties of triangles and their applications; calculus, a branch that investigates change and motion through the concept of derivatives and integrals; statistics, involving the collection, analysis, interpretation, presentation, and organization of data; number theory, which explores the properties and relationships of numbers; and probability, addressing the likelihood of events occurring. Each of these components contributes uniquely to the development of students' mathematical proficiency, ensuring a well-rounded understanding of mathematical concepts and their applications throughout the K-12 educational journey (Comediero et al., 2022)

Geometry is one of the branches of math that focuses on measuring and understanding space. It covers basic shapes and their properties and more complex ideas like spatial relationships and dimensions. Geometry helps learners make sense of surroundings by measuring angles, lengths, areas, and volumes. It also explores transformations, congruence, and similarity, revealing the mathematical principles behind spatial configurations. Learning geometry is not just about solving problems; it enhances learners' awareness of space, benefiting fields like science, engineering, and art (Aini, 2020).

The current geometry teaching strategies, particularly in various challenges in problem-solving are indicated by the Program for International Student Assessment (PISA) rankings. The global proficiency data also emphasizes a need for more advanced-level students. Hence, despite recognizing the importance of critical thinking, challenges persist, such as difficulties in class engagement. To bridge this gap, the researcher would like to implement Collaborative Rotation Learning in teaching geometry to enhance class engagement during the school year 2023-2024 in one of a certain secondary public school in Ozamiz City, Misamis Occidental.

Strategy

The Collaborative Rotation Learning Strategy is a creative teaching method that combines two key ideas: station rotation and cooperative learning. The goal is to make the classroom lively and interactive. Students work together in small groups and move around different learning stations, each having different things to learn or do.

This strategy brings variety to the learning experience and encourages students to collaborate.

Collaborative Rotation Learning is a strategy wherein small groups of students collaborate to achieve shared learning goals. Research indicates that Collaborative Learning (CL) positively impacts academic performance, motivation, and social skills, especially among pre-service teachers (Gillies, 2016). Abramczyk and Jurkowski (2020) emphasize the benefits of CL for both academic and social learning, offering personalized learning experiences. Additionally, CL has been found to enhance language proficiency (Namaziandost et al., 2020), facilitate disciplinary integration, and simplify teaching methods (Li et al., 2022). Studies also show that CL significantly improves students' critical and creative thinking abilities (Silva et al., 2022). A well-structured CL approach ensures fairness, social justice, and equal learning opportunities, fostering an inclusive educational environment (Muñoz-Martínez et al., 2020). Furthermore, CL contributes to building a learning community, promoting collegiality, establishing shared learning goals, encouraging open discussions, enhancing dedication, facilitating focused teaching preparation, and fostering adaptability (Niemi, 2021). These findings underscore the numerous advantages of CL practices for learners and educators.

Steps on How to Implement Collaborative Rotation Learning Strategy

To implement Collaborative Rotation Learning in teaching geometry, identify specific learning objectives for the geometry concepts to be covered. Design a set of learning stations that address different aspects of geometry, such as angles, shapes, spatial reasoning, and proofs.

Form small groups with diverse skill levels and learning styles. Establish a rotation schedule, ensuring that each group moves through all stations. Develop engaging activities for each station that encourage collaborative problem-solving and discussion. Emphasize the importance of teamwork and peer support.

Integrate regular reflection sessions where groups discuss their findings. Implement formative assessments that are aligned with the learning objectives, assessing individual and group performance. Be flexible and adaptable, adjusting activities based on student needs. Provide guidance and support during the rotation, and conclude with a synthesis session to reinforce critical concepts. Gather feedback for continuous improvement, ensuring that Collaborative Rotation Learning enhances the learning experience for geometry students.

ACTION RESEARCH QUESTIONS

This action research aims to address the engagement of students in geometry using collaborative rotation learning strategy. This study sought answers to the following research questions:

1. What is the level of performance of the learners before the collaborative rotation learning strategy?

2. What is the level of performance of the learners after the collaborative rotation learning strategy?

3. Is there a significant difference in the academic performance of the students before and after implementing collaborative rotation learning strategy?

4. What other developments among the learners after Implementing Collaborative Rotation Learning?

ACTION RESEARCH METHODS

This chapter includes the methodology employed to underscore the significance of the present study. It encompasses the research design, study setting, participants, research tools, data collection techniques, and ethical considerations.

Research Design

The study used a classroom-based action research design to improve students' engagement in geometry by implementing a collaborative rotation learning strategy. Action Design Research (ADR) has become a prominent

research methodology within information systems (Cronholm & Göbel, 2022).

Research Setting

The research will take place at the junior high school level, focusing on Grade 8 students at a selected secondary school in Ozamis City, Misamis Occidental. It stands prominently as a secondary school within a specific public school in Ozamiz City, serving as one of the two primary educational institutions in the area.

Research Respondents

The study's participants will be Grade 8 learners from a specific secondary school in Ozamiz City, chosen through purposive sampling. The selection criteria include students enrolled in a public high school as Grade 8 learners during the school year 2023–2024, those demonstrating lower academic performance, and students expressing willingness to take part in the study. The researcher would diligently verify that the criteria were met before initiating the survey. However, the researcher did not include other sections of the same grade level in this study.

Research Instrument

Paper and Pencil Test. At the beginning of the class, students will be assessed on their performance through a paper-and-pencil test. This type of test is presented on paper and requires responses to be recorded with a pencil. Each student will receive a 5-item questionnaire focused on problem-solving. This questionnaire aims to ascertain their performance level before the intervention takes place.

Collaborative Rotation Strategy. The Collaborative rotation learning strategy in teaching geometry for Grade 8 learners is designed as an engaging and interactive approach to enhance class engagement in geometry.

Data Gathering Procedure

Pre-Implementation Phase

The researcher would first examine the difficulties students currently encounter when learning geometry. They would review existing studies to grasp the research topic better. Next, the researcher would start planning the research proposal and then ask the principal of the public Junior High School Department for permission to proceed with the study. The data collection and the intervention would be done in person, using direct face- to-face communication.

Implementation Phase

In the implementation phase, data collection would commence with a pre-test administered to the participants. The researcher would then introduce the planned intervention to the participants over a specified period. Ongoing monitoring of the participants' performance would take place, followed by a post-test assessment. The data analysis phase would assist the researcher in gauging the strategy's effectiveness and overall impact.

Post-Implementation Phase

The researcher would draw conclusions, offer recommendations, and meticulously review, edit, and finalize the study. Furthermore, the research findings would be deliberately shared with a targeted audience.

Ethical Considerations

The study's ethical standards secured subject consent prior to survey. As a part of ethical practice, the researchers provided participants with a comprehensive briefing on the Data Privacy Act of 2012 to underscore their commitment to safeguarding personal information and ensuring accountability in handling sensitive data.

Throughout the process, participants received precise information about the study's objectives, potential benefits,

and the significance of their participation. The researchers also highlighted the confidentiality of the gathered data, assuring participants that their anonymity would be strictly maintained throughout the study.

Data Analysis Plan. The researcher computed descriptive statistics to determine the mean and standard deviations of the level of performance before and after the intervention. The following statistical tools were utilized:

Mean and Standard Deviation: Used to summarize students' performance levels before and after Implementing Collaborative Rotation Learning Strategy.

T-Test: This test explores the significant difference in students' performance before and after implementing the Collaborative Rotation Learning Strategy.

Thematic Analysis: Used to create themes from the interview data, facilitating a qualitative analysis of the participants' experiences and attitudes with the aid of Thematic Software.

RESULTS AND DISCUSSION

Learners' Performance Before Implementing Collaborative Rotation Strategy

Incorporating collaborative rotation learning into teaching geometry to Grade 8 students has enhanced their understanding, engagement, and performance. Implementing this strategy provided learners with an enjoyable and meaningful experience. A careful analysis of the students' pre-test and post-test results demonstrated the significant positive impact of collaborative rotation, showing substantial improvements in students' geometry scores, from not meeting expectations to being outstanding. This feedback offers valuable insights for educators, enabling them to refine their teaching methods and effectively improve student outcomes.

Based on the data provided in Table 1, it is evident that learners' performance before implementing the Collaborative Rotation Learning Strategy could have been better. These results highlight a critical need for intervention. The learners' low scores suggest that the existing teaching methods may not be effectively support their understanding and mastery of the material. Consequently, implementing a new strategy, such as Collaborative Rotation Learning, could be essential in addressing these deficiencies and improving overall student performance.

Additionally, the pre-intervention data demonstrates that the current educational approach needs to be revised. All students fail to meet the minimum expectation, which sets a strong case for adopting innovative teaching strategies to enhance learner outcomes.

One teaching technique with evidence behind it is cooperative learning. Teachers guide student interactions and help them become cooperative in cooperative learning so that students collaborate in small groups to support one another's learning. Teachers concurred that cooperative learning helps students learn both academically and socially, and it can offer them individualized support for their learning. Teachers employed cooperative learning sparingly despite these encouraging attitudes. The ideals of cooperative learning were adhered to by teachers as they arranged and assisted students in their interactions (Abramczyk et al., 2020).

Learning through collaborative problem-solving (CPS) is becoming increasingly recognized because it helps students develop higher-order thinking skills. Although role scripts are frequently used in CPS, little is understood about how roles affect learners' cognitive processes and how goal orientation affects roles (Lu, Y., 2023).

Incorporating Collaborative Rotation Learning into Grade 8 geometry classes significantly improved student understanding, engagement, and performance, as evidenced by substantial score improvements from pre-test to post-test. This strategy's success underscores the inadequacy of traditional teaching methods and highlights the need for innovative approaches like cooperative learning, which fosters both academic and social growth. Despite positive attitudes towards cooperative learning, it remains underutilized. Emphasizing collaborative

problem-solving can further enhance higher-order thinking skills, making it a critical component for educational improvement. The findings provide valuable insights for educators to refine teaching methods and better support student outcomes.

Table 1. Performance of the Learners Before Implementing Collaborative Rotation Strategy

Performance	Frequency	Percentage	M	SD
Did Not Meet Expectation (DME)	39	100	15.385	3.521

Note: Scale: 42-50 (Outstanding); 38-41 (Very Satisfactory); 34-37 (Satisfactory); 30-33 (Fairly Satisfactory); 1-29 (Did Not Meet Expectation)

Learners' Performance After Implementing Collaborative Rotation Strategy

Table 2 presents learners' performance after implementing the Collaborative Rotation Learning Strategy. The data reveals a significant improvement in student outcomes compared to the pre-intervention period.

The distribution of scores post-intervention shows a promising trend toward better performance. No students reached the "Outstanding" category. However, the presence of students in the "Very Satisfactory," "Satisfactory," and "Fairly Satisfactory" categories indicates that the Collaborative Rotation Learning Strategy has positively impacted many students. The increase in the overall mean score and the reduction in the SD suggests that student performance has become more consistent and less dispersed.

In addition, while nearly half of the students still did not meet expectations, implementing the Collaborative Rotation Learning Strategy has improved student performance. The strategy has helped some students achieve higher performance levels, moving from the lowest category into more satisfactory ranges. Continued use and refinement of this strategy could help even more students achieve better results in the future.

When comparing pupils who utilized the teacher assessment method to those who used the peer assessment system, it is evident that the former had worse learning achievement. Learners who exhibited more vital problem-solving skills outperformed those who lacked such skills in learning achievement. Additionally, pupils with stronger problem-solving tendencies outperformed those with weaker tendencies regarding learning accomplishment while using peer assessment as the learning system (Zhang, D., & Hwang, G. J., 2023).

Since mathematics is a fundamental subject in the sciences and other spheres of human endeavor, effective instruction is necessary to promote learning and correct comprehension. The Station Rotation Model of instruction, which was employed in this study to teach mathematics to secondary school pupils, was inspired by this concept (Akinoso, et al., 2020).

Implementing the Collaborative Rotation Learning Strategy led to notable improvements in student performance, evidenced by higher mean scores and reduced score variability. However, no students reached the "Outstanding" category. This suggests that the strategy effectively elevated many students from lower performance to more satisfactory ones. Comparing teacher assessment with peer assessment, learners demonstrated better problem-solving skills and higher learning achievements. Effective mathematics instruction is crucial, as highlighted by the success of the Station Rotation Model. These insights underscore the need for innovative teaching methods to enhance student outcomes in mathematics.

Table 2. Performance of the Learners After Implementing Collaborative Rotation Strategy

Performance	Frequency	Percentage	M	SD
Very Satisfactory (VS)	4	10.26	39.250	0.957

Satisfactory (S)	3	10.26	34.500	1.000
Fairly Satisfactory (FS)	13	33.33	31.538	1.127
Did Not Meet Expectation (DME)	18	46.15	24.167	3.854
Overall Performance	39	100	29.231	5.887

Note: Scale: 42-50 (Outstanding); 38-41 (Very Satisfactory); 34-37 (Satisfactory); 30-33 (Fairly Satisfactory); 1-29 (Did Not Meet Expectation)

Significant Difference in the Learners' Performance Before and After Implementing Collaborative Rotation Strategy

Table 3 illustrates the difference in the performance of learners before and after the implementation of the Collaborative Rotation Learning Strategy. The results are compelling, showing a notable improvement in student performance following the intervention.

This suggests not only an improvement in overall performance and a broader spread in the performance scores post-intervention, indicating varying degrees of effectiveness among different learners. Consequently, we reject the null hypothesis (Ho), which states that there is no significant difference in the learners' performance before and after implementing the Collaborative Rotation Learning Strategy.

The analysis proves that the Collaborative Rotation Learning Strategy significantly improves student performance. The increase in the mean score and the statistical significance of the results support the continued use and potential further development of this educational approach to benefit more learners in the future.

Collaborative Rotation Learning Strategy suggested that cooperative learning approaches, including Collaborative Rotation, can significantly elevate learner outcomes. The compelling results highlight a clear difference in student performance before and after the intervention, reinforcing the positive impact of collaborative learning methodologies (Namaziandost et al., 2020.)

The analysis of Table 3 reveals a significant improvement in student performance following the implementation of the Collaborative Rotation Learning Strategy, evidenced by an increased mean score and broader spread in performance scores. This supports rejecting the null hypothesis, indicating a clear difference in performance pre- and post-intervention. The findings align with Namaziandost et al. (2020), demonstrating the effectiveness of cooperative learning approaches in enhancing learner outcomes. These results advocate for the continued use and further development of the Collaborative Rotation Learning Strategy to benefit more students. The compelling evidence underscores the positive impact of collaborative learning methodologies on student performance.

Table 3. Difference in the Performance of the Learners Before and After Implementing Collaborative Rotation Learning Strategy

Variables	M	SD	t-value	p-value	Decision
Before Implementing Collaborative Rotation Learning Strategy	15.385	3.521	17.43	0.000	Reject Ho
After Implementing Collaborative Rotation Learning Strategy	29.231	5.887			

Ho: There is no significant difference in the performance of the learners before and after implementing collaborative rotation learning strategy.

Note: Probability Value Scale: **p<0.01 (Highly Significant); *p<0.05 (Significant); *p>0.05 (Significant); p>0.05 (Not Significant)

Improvement Observed Among the Learners after Implementing Collaborative Learning Strategy

Introducing group work in classrooms has made a big difference for students. They like it because it helps them work together and share the workload, making things less stressful and fun. Also, they have learned new skills like talking better with others, managing time, and solving problems together. This has made them feel more confident and connected with their classmates. Plus, when they solve problems together, they get different ideas and perspectives, making learning more enjoyable. Group work has made their classroom a happier and more supportive learning place.

Preference for Group Work

Many participants now prefer working in groups instead of alone. They found group work less stressful because everyone helps each other. It also made tasks easier and faster to complete. Sharing the workload allowed each person to focus on what they do best. Learning from classmates and supporting each other made group work more enjoyable.

"I like working in groups now. It's less stressful because we help each other." (P1)

"I prefer groups because we can divide the work and support each other." (P2)

"Working in groups is great because I learn from my classmates and we get things done faster." (P3)

Students found group work less stressful due to mutual support and collaboration. This shared workload enables individuals to focus on their strengths, making tasks easier and faster. Consequently, the learning from classmates and supporting each other enhances group work's overall enjoyment and effectiveness (Li et al., 2022).

Sharing the workload allows individuals to focus on their strengths, enhancing overall efficiency. This cooperative approach fosters an enjoyable learning environment where students learn from and support each other, reflecting the positive outcomes observed in the study (Abramczyk and Jurkowski, 2020).

Development of New Skills

Through collaborative learning, participants have developed many new skills. They have learned to communicate better and listen to others' ideas. They have also become good at compromising and finding common ground. Time management has improved as they organize tasks more efficiently. Working together has taught them patience and how to work well with others.

"I learned how to communicate better and listen to others' ideas." (P1)

"I have learned how to compromise and find common ground with others." (P2)

"I have become better at organizing tasks and managing my time." (P6)

Collaborative learning has enhanced their communication and listening abilities and capacity for compromise and finding common ground. Participants have also improved their time management by organizing tasks more efficiently. Overall, working together has fostered patience and effective teamwork. These skills are crucial for creative problem solving, reinforcing the value of collaborative learning in developing essential competencies in students (Khalid et al., 2020).

The study emphasizes that collaborative learning enhances communication and listening skills, enabling participants to effectively share and consider diverse ideas effectively. It also fosters abilities to compromise and find common ground, which is essential for inclusive education.

Additionally, time management improves as tasks are organized more efficiently. Overall, the collaborative approach teaches patience and teamwork, reinforcing the skills development observed in the participants (Muñoz-Martínez et al., 2020).

Increased Confidence

Many participants felt more confident sharing their ideas and opinions in group work. They felt supported because their classmates listen and gave feedback, which made them feel like their contributions mattered. Knowing their input is valued has boosted their confidence. The supportive group environment has helped them feel more comfortable speaking up.

"I felt more confident sharing my ideas because my classmates would listen and give feedback." (P1)

"I am more confident because my contributions matter." (P3)

"My confidence has grown because my contributions are valued." (P10)

The cooperative learning environment, where classmates listen and provide feedback, fosters a sense of support and validation. This supportive atmosphere made participant's feel that their contributions matter, significantly boosting their confidence. Overall, the group environment has enhanced their comfort in speaking up, mirroring the positive effects on speaking fluency observed in the study (Namaziandost et al., 2020).

The cooperative learning environment emphasized in the study fosters a supportive atmosphere where classmates actively listen and provide feedback. This validation made participant's feel that their contributions mattered, boosting their confidence. Overall, the supportive group environment enhances comfort in speaking up, reflecting the positive effects on critical and creative thinking development observed in the study (Silva et al., 2022).

Enhanced Problem-Solving Approach

Participants have adopted a more collaborative approach to problem-solving. They now consider different perspectives by discussing issues with their group. Brainstorming together helps them find better solutions. They ensure that everyone in the group understands the problem and the solution. This teamwork makes solving problems more effective and inclusive.

"Yes, I now think about different perspectives and work together with others to find solutions." (P1)

"I approach problems by discussing them with my group first to get different perspectives." (P5)

"I now work with my group to find the best solutions and ensure everyone understands." (P8)

Collaborative brainstorming led to more effective solutions, ensuring all group members understood the problem and the solution. This inclusive teamwork approach enhanced problem-solving effectiveness and fostered creativity and comprehensive understanding among participants, reflecting the benefits observed in the study (Khalid et al. 2020).

This collaborative brainstorming leads to better solutions and ensures all group members understand the problem and solution. Such teamwork enhances the effectiveness and inclusivity of problem-solving, reflecting the benefits of collaborative learning observed in the participants (Lu et al., 2023).

Improved Classroom Relationships and Environment

Participants have noticed stronger relationships with their classmates. They have made more friends and feel more connected. The class environment is now more united and collaborative. This supported atmosphere makes learning more enjoyable for everyone. Overall, the classroom has become a better place to learn and interact.

"I have made more friends and feel more connected to my classmates. Class is more fun now." (P1)

"We are more united and collaborative, making the class a better learning environment." (P7)

"We have become closer and more supportive, making the classroom a better learning place." (P9)

The collaborative nature of peer assessment and problem-solving activities has fostered new friendships and a greater sense of student connection. This has led to a more united and collaborative class environment, making learning more enjoyable and the classroom a better place to learn and interact. The supported atmosphere enhances both social and academic experiences, mirroring the positive outcomes observed in the study (Zhang and Hwang, 2023).

Collaborative approaches and method integration in learning environments foster stronger interpersonal connections and friendships among students. This leads to a more united and collaborative class environment, where the supportive atmosphere makes learning more enjoyable for everyone involved. Overall, these dynamics transform the classroom into a better place for learning and interaction, reflecting the positive social outcomes observed in the participants (Cronholm and Göbel, 2022).

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study is rooted in the need to tackle challenges in problem-solving, particularly in geometry, as evidenced by global proficiency data and PISA rankings. Incorporating innovative teaching strategies like Collaborative Rotation Learning aims to enhance students' critical thinking skills, problem-solving abilities, and overall mathematical proficiency.

The study's primary purpose is to improve students' understanding, engagement, and performance in geometry through the implementation of Collaborative Rotation Learning. This study is rooted in the need to tackle challenges in problem-solving, particularly in geometry, as evidenced by global proficiency data and PISA rankings. By incorporating innovative teaching strategies like Collaborative Rotation

Learning aims to enhance students' critical thinking skills, problem-solving abilities, and overall mathematical proficiency. The study will take place during the school year 2023-2024 in a specific secondary public school in Ozamiz City, Misamis Occidental, Philippines. It will focus on Grade 8 students, targeting enhancing their geometry learning experience through implementing Collaborative Rotation Learning.

Findings

The learners' performance levels varied before implementing the Collaborative Rotation Learning Strategy; some students struggled to engage with the material and often worked in isolation, leading to limited understanding and retention of concepts. Others managed to perform adequately, but there was room for improvement in collaboration and critical thinking skills.

After implementing Collaborative Rotation Learning, the learners' performance improved noticeably. Group work facilitated a deeper understanding of the material through active discussion and collaboration. Students became more engaged in the learning and demonstrated increased confidence in sharing ideas and opinions.

Statistical analysis revealed a significant difference in the student's academic performance before and after implementing the Collaborative Rotation learning Strategy. The post-implementation performance showed a consistent upward trend, indicating the effectiveness of the collaborative learning approach in enhancing student outcomes.

Alongside academic improvements, several other developments were observed among the learners after implementing Collaborative Rotation Learning. These included enhanced communication skills, improved time

management, increased confidence in problem-solving, and a more positive classroom environment characterized by stronger peer relationships.

Conclusion

Before working in groups, some of us struggled to understand things, and we often studied alone. This made it challenging for some students to learn everything well, but some did okay. However, there was still room for improvement in how we worked together and thought critically about things.

After we started doing group work, things got better. We talked more and helped each other understand things. We felt more involved in learning, and sharing our thoughts and ideas was easier.

When we compared our grades before and after group work, we saw a big difference. Our grades increased significantly after working together, which showed that group work helped us learn better.

Besides improving our grades, we also learned other essential skills. We improved our communication, time management, and problem-solving skills. Our class also felt friendlier, and we got along better.

Recommendations

Based on the findings and conclusions drawn from implementing Collaborative Rotation Learning, several recommendations can be made to enhance student learning outcomes and overall classroom experience. It is evident that collaborative learning strategies, such as group work, significantly improve academic performance and foster a more engaging learning environment. Therefore, educators may continue integrating collaborative learning methods into their teaching practices. They can further support this by providing guidance on effective group collaboration techniques and fostering a positive and supportive classroom culture.

Additionally, the observed improvements in communication skills, time management, and problem-solving highlight the importance of integrating these skills into the curriculum. Educators can incorporate activities and assignments that specifically target the development of these skills, allowing students to further enhance their abilities in these areas further.

Furthermore, the findings indicate the importance of creating opportunities for students to communicate confidently their thoughts and views. Educators can facilitate this process by encouraging class discussions, debates, and presentations. Regular feedback and encouragement can also help build students' confidence in expressing themselves and contribute to a more inclusive learning environment.

Moreover, fostering strong peer relationships and a positive classroom atmosphere is crucial for student engagement and well-being. Educators may continue to promote collaboration and teamwork among students inside and outside the classroom. Group projects, team-building exercises, and peer mentoring programs can strengthen student relationships create a supportive learning community.

In conclusion, by incorporating collaborative learning strategies, fostering the development of essential skills, and promoting a positive classroom environment, educators can create a more effective and enjoyable learning experience for students. These recommendations aim to build on the successes observed with Collaborative Rotation Learning and further enhance student outcomes in the classroom.

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