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Impact of Collaborative Approach in Improving Learning of Grade 8 Students in Mathematics

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Abstract

This study examined the perceived impact of the collaborative approach on the learning of Grade 8 students in mathematics at Dabubu High School, San Agustin, Isabela, Philippines. Specifically, it investigated the perceived positive and negative effects of collaborative learning, the roles assumed by students during collaborative activities, and the teaching strategies employed to address challenges associated with its implementation. A descriptive survey research design was employed involving 50 Grade 8 students selected through purposive sampling during School Year 2022–2023. Data were gathered using a researcher-developed and validated survey questionnaire and analyzed using frequency and percentage distributions and weighted means. Findings revealed that students generally perceived collaborative learning positively, with an overall weighted mean of 4.14. The most highly rated benefits included the opportunity to assess the strengths and weaknesses of different solution methods, increased motivation to participate and learn, and opportunities to explain mathematical concepts to peers. Students also strongly recognized their roles in collaborative learning, obtaining an overall weighted mean of 4.62, particularly in guiding group discussions, documenting ideas and solutions, and identifying and solving problems. Nevertheless, important challenges were identified, particularly difficulties in assessing individual contributions and ensuring individual accountability. Teaching strategies intended to address these concerns were reported as often implemented, with an overall weighted mean of 3.57; presenting simple exercises involving familiar situations and demonstrating multiple approaches to problem solving received the highest ratings. The findings suggest that collaborative learning can promote student engagement, communication, participation, and mathematical understanding when supported by clearly defined group roles, appropriate assessment mechanisms, differentiated activities, and effective teacher facilitation. The study recommends strengthening individual and group assessment procedures and providing teachers with continuing professional development in collaborative teaching and classroom management.

Keywords: Collaborative Learning, Mathematics Education, Grade 8 students, Student Engagement, Collaborative Approach, Teaching Strategies

1. Introduction

Mathematics is a broad discipline that includes several branches and it is an integral part of education and it is a required subject in the curriculum across levels in the basic education level.

Learning the subject enhances the logical reasoning and helps students develop critical thinking skills and analytical abilities in solving difficult problems effectively. It also helps students understand mathematical concepts in practical applications.

Understanding mathematics concepts enable students to make informed decisions and manage career opportunities. Therefore, being proficient in math opens wide range of career opportunities among students because of having strong mathematical background.

Therefore, effective teaching approach are paramount in learning mathematics because it directly impacts students' understanding and engagement in the learning process.

Learning mathematics, often perceived by students as a challenging subject because it requires a pedagogical approach that fosters conceptual understanding. An effective approach considers diverse learning styles and the critical thinking skills of students. Therefore, without effective teaching approach, students may struggle to understand fundamental concepts in math, leading to academic failure.

The teaching approach used by teachers significantly influences students' motivation to learn the different mathematical concepts. A well-designed approach creates a supportive learning environment where diverse students collaborate and actively participate during teaching and learning process

However, ineffective teaching methods can hinder students' learning progress and potentially creating a lifelong dislike to mathematics. Therefore, determining effective teaching approaches is importance for ensuring that all students have the opportunity to succeed in mathematics.

Collaborative learning is one of the approaches used by teachers in teaching mathematics. The approach offers strategy where students work together to achieve a common learning goal.

In a traditional lecture-based method, the needs of diverse students often fail to be accommodated. In contrast, collaborative learning encourages students' active participation in the learning process. This active engagement promotes better understanding of mathematical concepts.

The effectiveness of collaborative learning addresses multiple learning needs of diverse students. This learning collaboration not only strengthens students understanding but also develops communication skills.

However, implementing a collaborative approach requires careful planning. Teachers are to structure group activities that cater diverse students effectively, and provide clear guidelines in monitoring group activities. Also, teachers need to provide opportunities for students to share their feedback, and determine strengths and weaknesses among group members. Implementing collaborative learning approach shifts the role of teacher from lecturer to a facilitator.

Therefore, a collaborative approach to teaching mathematics offers a multifaceted strategy to improve student learning. This approach not only enhances numeracy skills but also allows students enhance collaborative skills. It is in this premise that the research is motivated to determine the how collaborative approach improve the learning of Grade 8 students in mathematics.

2. Statement of the Problem

This study aimed at evaluating how collaborative approach improve the learning of Grade 8 students of Dabubu High School in mathematics.

Specifically, it aimed to answer the following questions:

1. What is the personal profile in terms of:

1.1 Gender;

1.2 Age;

1.3 Parent's Educational Attainment;

1.4 Parent's Occupation; and

1.5 Socioeconomic Status of Family?
2. What is the impact of collaborative approach in learning mathematics?
3. What is the role of students during collaborative learning?
4. What strategy is used to address the negative impact of collaborative approach?

3. Methodology

Research Design

This study employed a descriptive research design, aiming to describe a phenomenon and its characteristics, as defined by Gall, Gall, & Borg (2007). Focusing on "what" rather than "how" or "why," the study used observation and surveys to collect data, often analyzed quantitatively using statistical methods to identify relationships. This design was deemed appropriate for the research objectives.

Respondents of the Study

In determining the total number of participants, the researcher employed the Purposive Sample Technique. Ashley Crossman. (2020) defined the sampling techniques as a non-probability sample that is selected based on characteristics of a population and the objective of the study.

Since the sampling is known as judgmental, selective, or subjective sampling, this type of sampling was considered appropriate because the researcher needed to reach the target respondents accurately.

Data Gathering Instrument

This study employed a descriptive survey questionnaire as the primary tool for collecting data from the target respondents. A survey questionnaire is a research instrument that includes a series of questions and prompts designed to gather the necessary information for the study. The items in the questionnaire were developed by the researcher through a review of various research materials and related studies pertinent to the research problems.

The content of the questionnaire was validated by experienced teachers. It consists of two parts: Part 1 collects personal information from the respondents, while Part 2 gathers specific information, with some items adapted from previous studies to address the specific issues outlined in chapter 1 of this research.

Data Gathering Procedure

Data collection from teacher respondents followed a structured process. Initial approval was obtained from the Schools Division Superintendent, facilitated by the researcher's school principal.

Also, respondent cooperation was secured, emphasizing data confidentiality and anonymity to ensure smooth data collection, respecting respondent preferences for questionnaire completion.

Finally, the researcher closely supervised questionnaire administration to ensure accurate completion of all items.

4. Results

This section of the paper presents a discussion and analysis of Grade 8 students' perceptions of how the collaborative approach enhances their learning in mathematics, as assessed by the Likert scale.

Table 1. Positive Impact of Collaborative Approach in Learning Mathematics

Particulars	WM	QD	R
1. Allows students to explain concepts to each other	4.48	SA	3
2. Encourages students to approach challenges from multiple per-	4.34	SA	4

spectives			
3. Boosts students' motivation to participate and learn	4.56	SA	2
4. Improves both verbal and written communication skills	4.04	A	7
5. Boosts students' confidence in their mathematical abilities.	4.08	A	6
6. Assess the strengths and weaknesses of various methods	4.84	SA	1
7. Fosters teamwork, cooperation, and respect for diverse perspectives	4.22	SA	5
8. Improves metacognitive awareness	3.74	A	8
9. Fosters a more inclusive learning environment	3.46	A	10
10.Involves rea-world scenarios	3.64	A	9
Average Weighted Mean	**4.14**	**A**	

The data presents the positive impacts of a collaborative approach in learning mathematics, measured through a weighted mean (WM), qualitative descriptor (QD), and ranking (R).

As seen in the table, the top positive impacts, where respondents strongly agreed, are as follows: assessing strengths and weaknesses of methods (WM: 4.84, Rank 1). This is viewed as the most significant benefit, suggesting that students value the ability to critically analyze different problem-solving approaches collaboratively.

Also, the boosting motivation to participate and learn (WM: 4.56, Rank 2) that indicates that students feel motivated when working in collaborative settings, which can enhance their overall learning experiences; and allowing students to explain concepts (WM: 4.48, Rank 3) where peer explanations are crucial for understanding, highlighting the importance of communication in learning.

For items that students gave a qualitative description of “Agreed” improving communication skills (WM: 4.04, Rank 7) and boosting confidence (WM: 4.08, Rank 6) are noted as important but rank lower than the top factors. This suggests that while beneficial, these impacts are not as strongly perceived as the highest-ranked benefits.

Lastly, aspects that received lower scores include improving metacognitive awareness (WM: 3.74, Rank 8), fostering an inclusive learning environment (WM: 3.46, Rank 10), and involving real-world scenarios (WM: 3.64, Rank 9). These lower scores may suggest that while these factors are recognized, they are not seen as significant benefits of collaborative learning compared to others.

Table 9. Negative Impact of Collaborative Approach in Learning Mathematics

Particulars	**WM**	**QD**	**R**
1. Dominating students	4.76	SA	3
2. Unequal workload	3.78	A	8
3. Off-task behavior	4.56	SA	5
4. Lack of individual accountability	4.80	SA	2
5. Dependence on others	4.64	SA	4
6. Social conflicts	3.60	A	9
7. Time constraints	3.40	A	10
8. Ensuring equitable participation	4.20	A	6
9. Difficulty with diverse learning style	4.10	A	7

10. Assessment challenges	4.90	SA	1
Average Weighted Mean	**4.74**	**A**	

The data reveals a significant concern regarding the negative impacts of collaborative learning in mathematics. As illustrated in the table, respondents strongly agreed that assessment challenges (WM 4.90, rank 1) are critical issue because effective assessment is essential for both student learning and teacher feedback, as well as in the lack of individual accountability (WM 4.80, Rank 2). Difficulty in assessing individual contributions accurately makes it hard to identify learning gaps and provide targeted support.

Another significant negative impacts of collaborative approach are as follow: dominating students (WM 4.76, Rank 3) where active students may overshadow quieter peers and can create an uneven learning experience and potentially reinforces existing inequalities; the dependence on others (WM 4.64, Rank 4) that can hinder the development of independent problem-solving skills, a crucial aspect of mathematical proficiency; and the possibility of exhibiting off-task behavior (WM 4.56, Rank 5) by reducing the time dedicated to actual learning.

Other negative impacts perceived as less impactful than the top four are: ensuring equitable participation (WM 4.20, Rank 6) among students with diverse learning styles and abilities presents a challenge; and having difficulty with diverse learning styles (WM 4.10, Rank 7) may struggle to find a collaborative approach that works effectively for everyone.

The least significant concerns, according to this data, are: unequal workload (WM 3.78, Rank 8) that it is less prominent than other issues; the social conflicts (WM 3.60, Rank 9) that appears to be a less frequent concern; and the time constraints (WM 3.40, Rank 10) and ranked last.

The high average weighted mean (4.74) and the predominantly "Strongly Agree" (SA) qualitative descriptors indicate widespread acknowledgement of these challenges.

Table 3. Role of Students During Collaborative Learning

Particulars	**WM**	**QD**	**R**
1. Guides the group's discussion	4.90	SA	1
2. Documents the group's ideas, solutions, and decisions	4.80	SA	2
3. Presents the group's findings or conclusions to the class	4.56	SA	7
4. Monitors the group's progress	4.48	SA	8
5. Shares relevant information from resources.	4.76	SA	4
6. Asks clarifying questions	4.32	SA	10
7. Focuses on identifying and solving the problem	4.78	SA	3
8. Summarizes key points and conclusions	4.64	SA	5
9. Creates a positive and supportive group atmosphere	4.34	SA	9
10. Organizes the resources needed	4.58	SA	6
Average Weighted Mean	**4.62**	**SA**	

The data strongly indicates that students perceive a wide range of roles as highly valuable within collaborative learning environments. The exceptionally high average weighted mean (4.62) and the consistent "Strongly Agree" (SA) qualitative descriptor across all roles demonstrate agreement on their importance.

While all roles are viewed favorably, some stand out as particularly crucial: Guiding group discussions (WM 4.90, Rank 1): This suggests a strong preference for structured group work where leadership and facilitation are clearly defined and valued.

Documenting group work (WM 4.80, Rank 2): Thorough record-keeping is considered essential, implying an understanding of the importance of clear communication and accountability within collaborative projects.

Focusing on problem-solving (WM 4.78, Rank 3) and sharing relevant information (WM 4.76, Rank 4): These high rankings emphasize the core purpose of collaborative learning: tackling complex problems and leveraging collective knowledge.

Roles such as summarizing key points, organizing resources, and creating a positive atmosphere also receive high ratings, indicating a good understanding of the importance of effective communication, organization, and positive group dynamics. The slightly lower scores for presenting findings, monitoring progress, and asking clarifying questions, while still strongly agreed upon, suggest these roles might benefit from more explicit instruction or support to ensure their effective execution.

The overall data strongly supports the multifaceted nature of successful collaborative learning, highlighting the importance of both task-focused and relationship-focused roles for optimal outcomes.

Table 4. Teaching Strategies to Address Negative Impact of Collaborative Approach

PARTICULARS	**WM**	**QD**	**R**
1. The teacher creates an effective class opener	4.32	A	4
2. The teacher introduces topics using multiple representations	4.04	O	5
3. The teacher solves the problems in many ways	4.72	A	2
4. The teacher shows sequential achievement of the lesson	3.86	O	6
5. The teacher presents simple exercises involving familiar situations	4.86	A	1
6. The teacher discovers a pattern suited to the learning styles of students	3.72	O	8
7. The teacher presents an intellectual challenge based on the determined learning styles of students	3.74	O	7
8. The teacher introduces a practical application of genuine interest to the class at the beginning of a lesson	3.66	O	9
9. The teacher uses recreational mathematics	3.32	O	12
10. The teacher gets students actively involved in justifying mathematical curiosities	3.44	O	11
11. The teacher processes the task/activities presented by students	3.56	O	10
12. The teacher uses various instructional materials to illustrate the lessons.	4.42	A	3
Average Weighted Mean	**3.57**	**O**	

The data evaluates various teaching strategies related to instructional effectiveness, with an average weighted mean of 3.57, indicating that these practices are implemented "Often."

Among the strategies assessed, the highest-rated activity is the presentation of simple exercises involving familiar situations, which received a score of 4.86, suggesting that this approach effectively engages students and enhances their understanding.

Closely following is the strategy of solving problems in multiple ways, rated at 4.72, highlighting the teacher's commitment to fostering diverse problem-solving skills.

Other noteworthy strategy includes the creation of an effective class opener (4.32) and the use of various instructional materials to illustrate lessons (4.42), both of which contribute to creating a dynamic and engaging learning environment.

However, several strategies received lower ratings, indicating areas for improvement. For example, the discovery of patterns suited to students' learning styles (3.72) and the introduction of practical applications of genuine interest (3.66) were rated lower, suggesting that these strategies may need more focus to better align with student engagement and learning preferences.

Additionally, practices such as using recreational mathematics (3.32) and actively involving students in justifying mathematical curiosities (3.44) were rated the lowest, indicating a potential gap in stimulating curiosity and deeper mathematical understanding among students.

Overall, while the data reflects a generally positive implementation of effective teaching practices, there are clear opportunities for enhancement, particularly in strategies that engage students' interests and learning styles more effectively.

5. Discussion

The study evaluates the impacts of collaborative learning in mathematics, highlighting both positive and negative aspects, as well as the roles of students and teaching strategies involved.

The positive impacts reveal that assessing strengths and weaknesses of various methods (WM: 4.84) is the most significant benefit of collaborative learning, followed by boosting student motivation (WM: 4.56) and allowing peer explanations (WM: 4.48).

In contrast, the negative impacts are prominently centered around challenges in assessment (WM: 4.90) and lack of individual accountability (WM: 4.80), indicating concerns about measuring individual contributions within group settings.

Students perceive a variety of valuable roles in collaborative environments, with guiding discussions (WM: 4.90) and documenting ideas (WM: 4.80) being the most critical.

Additionally, the study assesses various teaching strategies, yielding an average weighted mean of 3.57, indicating that these strategies are often implemented. The most effective strategies include presenting familiar exercises (WM: 4.86) and solving problems in multiple ways (WM: 4.72).

However, areas for improvement were identified, particularly in discovering patterns suited to diverse learning styles and engaging students in recreational mathematics.

Overall, the findings underscore the importance of both collaborative approaches and effective teaching strategies in enhancing mathematics learning while also recognizing the need for ongoing refinement to address inherent challenges.

Conclusion

The study highlights the multifaceted nature of collaborative learning in mathematics and its significant impacts on student engagement and comprehension. The findings indicate that while collaborative

approaches foster essential skills such as communication and motivation, they also present challenges, particularly in assessment and individual accountability.

Teaching mathematics helps students think analytically and have better reasoning abilities. In doing so, teachers are to observe teaching practices and effective learning activities to motivate students respond positively during the teaching and learning process.

The significance of understanding how students learn the subject is to effectively determine appropriate teaching practices as well as learning activities suited to their understanding to fully attain the learning objectives of the subject

The study also emphasizes the crucial roles students play in collaborative settings, such as guiding discussions and documenting ideas, which contribute to a productive learning environment.

Furthermore, the evaluation of teaching strategies shows a generally positive implementation, with certain methods significantly enhancing student understanding. Nevertheless, there remains a clear need for improvement in engaging students' diverse learning styles and interests.

In conclusion, the study suggests that educators should continue to refine collaborative learning strategies and teaching methods to maximize their effectiveness, ensuring that all students can benefit from a supportive and inclusive learning environment. By addressing the identified negative impacts and building on the strengths of collaborative approaches, teachers can foster deeper mathematical understanding and a more enriching educational experience for their students.

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