Effectiveness of Jigsaw Classroom Strategy in Learning Mathematics

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Abstract— This study aims to determine the effectiveness of the Jigsaw Classroom Strategy in Learning Mathematics for Grade 7 students of Gabao National High School. Two strategies, the Jigsaw Classroom Strategy, and the Traditional Method were compared to determine the effect on the mathematics performance level of the students. A descriptive-developmental method was employed in the study to utilize Modified Lessons on the selected topics in Geometry 7. The Modified lessons were developed and used for the Jigsaw Classroom Strategy with features: contextualization, independent learning, and personal responsibility. The content, format, presentation and organization, accuracy, and up-to-datedness of information of the modified lessons passed the validation of the 6 experts from the different schools in Irosin, Sorsogon, Philippines. Also, using a quasi-experimental design, data from the 60 Grade 7 students through pre-test and post-test were analyzed using an independent sample t-test. Thematic analysis was conducted to interpret the journals of the students engaged in the Jigsaw Classroom Strategy. Overall, the student's performance Improved using the Jigsaw Classroom Strategy compared to the traditional method. With the findings of the study, further study of Jigsaw Classroom was recommended.

Keywords— Jigsaw Classroom Strategy, Modified Lesson, Contextualization, Independent Learning

INTRODUCTION

Nowadays, students are no longer satisfied with only listening to the teachers instead students want to be involved in the teaching and learning process. Scholars have argued that the student-centered approach fits 21st-century learners as these students desire to be controlled (International Education Advisory Board, 2008). This means that the students must have a voice as to why, what, and how learning experiences develop (McCarthy, 2015). According to Varghese (2020), Society demands more globally competitive students who possess 21st-century skills. Today, it must acknowledge and accept that 21st-century education is the foundation of the economy's competitiveness. Therefore, all levels of education - pre-primary to senior secondary education, teacher, training programs, etc.- must be aligned to prepare a generation with 21st-century skills.

Teachers were encouraged to develop new strategies to increase student academic achievement and encourage student exploration and participation in the teaching and learning process. On June 7, 2016, the Department of Education issued DepEd Order 25, a series of 2016 titled The Learning Action Cell as a K to 12 Basic Education Program School-Based Continuing Professional Development Strategy for the improvement of teaching and learning.

Mathematics is one subject in school that many students have trouble understanding. It is perceived by many as a very serious subject and, therefore, quite boring (Casing, 2018). This impression leads to the low performance of the students in the matter of mathematics. This is supported by the claims of Mbugua (2012), that one of the factors that affect the low performance of students was because of the attitude toward the subject of mathematics.

Geometry, which is the branch involved in this study, was defined by Biber (2013) as a branch of mathematics concerned with points, straight lines, plane figures, space, spatial figures, and the relationship between them. According to Ochuenwike et al., (2020), geometry develops and promotes the power of thinking and reasoning and helps study different subjects. Additionally, it was stated that the student's inability to answer geometry questions in mathematics examinations may have contributed to their low mathematics achievement.

In the 2022 Program for International Student Assessment (PISA), results showed that Filipino students performed poorly in Mathematics, obtaining a score of 355 which is below the average of the scores of other participating OECD countries (DepEd, 2023). The report further showed that only 16 percent of Filipino

students reached at least Level 2 proficiency in the subject (Bautista, 2023). Furthermore, the Trends in International Mathematics and Science Study (TIMSS), 2019, shows the Philippines scored 'significantly lower than any other country participating in grade 4 math and science assessments.

Recent research has shown that teachers focus more on the activities that put the students at the center of the learning process. The most remarkable technique is cooperative learning (Ellala & Alslaq, 2017). This was demonstrated by the study by Columbano (2019) who found that incorporating cooperative learning and structured or unstructured grouping improved students' math performance. Cooperative learning helps the students enhance their achievement in Mathematics Junior intermediate students (Chinna,2017). According to Jainal & Shahrill (2021), with cooperative learning, students with various learning styles can cooperate in the same setting while also being considerate of one another's interests. The Structural Approach, Group Investigation, Student Team Investigation, Curriculum Package, Learning Together, and Jigsaw are just a few examples of the many models of cooperative learning.

The Jigsaw Classroom Strategy, one of the cooperative learning models, has various benefits, including enhanced academic achievement, increased self-esteem, and a more favorable perception of school (Winslow, 2020). The Jigsaw Strategy was developed by Elliot Aronson in 1972 as a way for students to interact in the classroom in a way that would reduce suspicion and distrust. Educators have utilized the jigsaw strategy since the 1970s for various classroom, lab, and field contexts at all levels, from elementary school to graduate education. In Jigsaw, the whole class can be divided into small groups consisting of 4 to 6 members, each with diversity in terms of gender, race, ethnicity, and ability, and these groups are called base groups. The lesson can be divided into 4 or 6 segments; each student is assigned to learn one segment. Once the students become familiar with their assigned segments, each meets with the students of the other groups with the same assigned segments and forms an expert group. This expert group learns the material together and shares their learned information. After an appropriate amount of time, the students regroup with the original groups, and one by one, they teach others what they have learned (Suresh & Reddy, 2017).

According to Johnson & Johnson (1991), there are five key elements of the Jigsaw Strategy: Positive Independence, Individual Accountability, promoting interaction, Interpersonal and small-group skills, and Group processing. In the Jigsaw Strategy, to evaluate the teams can develop the effectiveness of the jigsaw technique by working with each learner to have a sense of responsibility for their team's performance in the classroom (Aydin & Biyikli, 2017). In Jigsaw Classroom, each learner prepares a part of the assignment outside the lesson. Later they turn their teams and peer transform knowledge of other individuals (Abed et al, 2020).

In the recent result of the Albay Numeracy Assessment tool (ALNAT) 2022, Gabao National High School scored 37.16% for Grade 8, 36.30% for grade 9, and 32.98% for Grade 10, the result shows that the skill level of the students in Gabao National High School Needs Major Support. This leads to the idea that the students in Gabao National High School's performance did not meet the standard.

With this result, the researcher conducted a study to apply the Jigsaw Classroom Strategy and assess its effectiveness on the learning performance of Grade 7 students of Gabao National High School, Irosin, Sorsogon in Mathematics. With limited studies that focus on the effectiveness of this method, especially locally, the researcher has considered conducting a study that is deemed to contribute significant information to the academic field.

Statement of the Problem

This study aimed to determine the effectiveness of the Jigsaw Classroom Strategy in learning Mathematics for Grade 7 students of Gabao National High School, Division of Sorsogon, for S.Y. 2022 -2023.

Specifically, it sought to answer the following questions:

1. What modified lessons with the use of the Jigsaw Classroom Strategy may be designed with the following features:

- Contextualization
- Independent Learning;
- Personal Responsibility?

2. What is the validity of the modified lesson in terms of the following:

- Content

- Format
- Presentation and Organization
- Accuracy and Up-to-datedness of information?

3. What is the performance level of the control and experimental groups in the pretest and posttest?
4. What are the students' learning experiences through the Jigsaw Classroom Strategy?
5. How effective is the Jigsaw Classroom Strategy in improving student performance?

METHODOLOGY

This study aimed to determine the effectiveness of the Jigsaw Classroom Strategy on students' learning performance in Mathematics, this research was conducted using experimentation. The study employed the descriptive-developmental research design utilizing content and thematic analysis. The pre-test and post-test scores of the students were subjected to descriptive statistics analysis. Moreover, the modified lessons were developed intended to be used in the Jigsaw Classroom Strategy (JCS).

Before utilizing the Jigsaw Classroom Strategy, six (6) Mathematics Experts from different public schools in Sorsogon validated the developed modified lessons. The instruments used to validate the modified lessons were the Evaluation Rating Sheet of the Learning Resources Management and Development System (LRMDS) and the checklist for the features of contextualization and independent learning adapted from the study of Madrazo (2020). The mathematics experts validated the modified lesson based on the acceptability level of the following factors: Content, Format, Presentation and Organization, Accuracy and Up-to-datedness of information as well as the three features: contextualization, independent learning, and personal responsibility.

The scores obtained using the LRMDS were interpreted using the numerical rating scale 1.00-4.00. For content, format, presentation, and organization, and the features contextualization, independent learning, and personal responsibility. The rating scales falling between 3.50-4.00 are classified as "Very Satisfactory", ratings between 2.50-3.49 is "Satisfactory", falling between 1.50-2.49 is "Poor" and lastly, 1.00-1.49 is "Not Satisfactory".

For accuracy and up-to-datedness of information, the rating scale from 3.50- 4.00 "Not Present", between

2.50-3.49 "Present but very minor & must be fixed", for 1.50-2.49 "Present & requires major Redevelopment" finally, 1.00-1.49 labeled "Poor/Do not evaluate further."

To test the effectiveness of the Jigsaw Classroom Strategy (JCS) 60 students were randomly selected, thirty (30) which was in the control group, and another thirty (30) in the experimental group. A teacher-made test questionnaire serves as a pretest and posttest for both the control and experimental groups. The numerical data was interpreted using frequency percentage, weighted mean, t-test, and Cohen's D.

To determine the student's experiences, a journal entry was used. The journal entries were collected, organized, and coded until several patterns of meaning (themes) resurfaced.

RESULTS AND DISCUSSION

Modified lesson with the use of Jigsaw Classroom Strategy

This study developed a modified lesson used in the Jigsaw Classroom Strategy. The lessons included were based on the most essential learning competencies in Mathematics 7 such as:1. represents point, line, and plane using concrete and pictorial models (M7GE-IIIa-1), illustrates subsets of a line (M7GE-IIa-2), Classification of different kinds of angles (M7GE-IIIa-3) 2). Derives relationships of geometric figures using measurements and inductive reasoning: supplementary angles, complementary angles, congruent angles, vertical angles, adjacent angles, linear pairs, perpendicular lines, and parallel lines (M7gE-IIIb-1) 3). Derives relationships among angles formed by parallel lines cut by a transversal using measurement and inductive reasoning (M7GE-IIIc-1).

The modified lesson contained the basic parts of the LAS based on the Region Memorandum No.86 s.2020 such as the Introductory Concepts, Learning Skills from MELC, objectives, activities, and answer key and references. However, in addition to the usual parts of the LAS, the modified lesson contains the code, experts' activity worksheets, and group activity worksheets.

Code. Found on the left side of the modified lessons contains a number and a letter, the number of the code represents the number of students who received specific modified lessons. The code was needed for the teachers to avoid confusion when dividing the modified lessons.

In this manner of using codes, the teacher can easily identify which modified lessons will be handled by the students.

Introductory Concepts. Provided an overview of the ideas and concepts covered in the modified lesson. In this section, fundamental concepts and procedures are taught in an incredibly simple way.

Learning skills from the MELCs. The section that displays the objective derived from the most essential learning competencies. The MELC code from the curriculum guide is also included.

Learning Objectives. Part of the modified lesson provides the specific statements the learners are expected to make at the end of the lesson because of the activities.

Activities. The most important part of the modified lesson is this part, you can see the activities that would answer the objectives deduced from the most essential learning competency.

Answer key. Contained the solutions and answers in the various activities in the modified lesson. Students may confirm whether their answers were correct or not.

Reference. Displays the different sources that offer background knowledge or brief details about the subject at hand. Additionally, it enables students to ascertain which reference books are required to access kinds of information.

Expert Worksheet. Consists only of activities intended to validate the students' learning and to determine if the students were able to master the topic given to them.

Group Activity Worksheet. This part of the modified lesson consists of all the topics combined in one worksheet. This worksheet was utilized to determine if the students were able to understand all the topics included in the modified lesson. Moreover, the modified lessons include the three features of contextualization, independent learning, and personal responsibility.

Contextualization or localization were integrated into some of the parts of the modified lessons. Some of the parts of the modified lessons include landmarks, maps, and tourist spots of Irosin. The modified lesson features independent learning is intensified and considered especially in today's new normal form of education. In other words, students must not only learn the concept but most importantly improve their attitude toward learning the concept on their own. Lastly, since the modified lesson was developed intended to be used as material in the Jigsaw Classroom Strategy, students need to cooperate and share what they have understood in the modified lesson and share it with their members. Using the modified lesson, helps the students construct their learning and be responsible for the information they gained from the modified lesson.

The Jigsaw Classroom Strategy is a cooperative learning in which the students take responsibility for one chunk or piece of content. This means that the required learning material can be divided into learning content with the same number of students for each team, in this case, five members per group.

The first modified lesson titled "Introduction to Geometry" was divided into. 5 topics: a) Point, Lines, and Plane b) Collinear, Non-Collinear, Coplanar, and Non-coplanar, c) Subset of Lines, d) Measuring of angles and e) Kinds of angles. Each of the topics uses representations like pizza, the hand of the clock, a ruler, and paper as examples of the topic.

The second modified lesson is titled " Lines and Angles", There are 5 topics in modified lesson 2 titled: a) Adjacent angles, b) Supplementary Angles, c) Complementary Angles, d) Vertical Angles, and e) Parallel and Perpendicular Lines. Each type of pair angle was introduced using different objects like a "Parol", Flagpole, clock, compound wall, and a bridge. This helps to catch the student's attention and provides real-life examples for the students to relate the concepts.

The third modified lesson is titled "Parallel Lines Cut by Transversal Lines. The modified lessons divided the lesson into five topics a) Corresponding angles, b) Alternate Interior Angles, c) Alternate Exterior Angles, d) Same-Side Interior Angles, and lastly e) Same-Side Exterior Angles. The modified Lesson 3 includes problem-solving, illustration, and pictures to deepen the understanding of the topics.

Validation of the Modified Lessons (ML) based on (LRMDS)in terms of a) Content, b) Format, c) Presentation and Organization, d) Accuracy and Up-to-datedness of information.

Table 1 shows the obtained scores of the modified lesson using the Jigsaw Classroom Strategy. As shown, the modified lessons were able to pass the required points needed to be considered valid.

Table 1. Acceptability Level of the Modified Lessons

Indicators	Points to Pass	Acceptability Level		
		ML1	ML2	ML3
Content	At least 21 of 28	27.3	27.5	27.5
Format	At least 54 of 72	71.17	71	71
Presentation and Organization	At least 15 of 20	19.67	19	19.67
Accuracy and up-to-datedness of Information	At least 18 of 24	23.	23.69	23.34

Legend: ML1, ML2, ML3- Modified Lesson

This infers the level of development was suitable for the students. It provides students with problems that develop their higher-order thinking skills. Moreover, it also arouses the student's interest. (DepEd,2016). The format of the modified lessons shows that the modified lesson prints, illustrations, Design, and Layout as well as paper and binding suit the modified lessons. According to the Propello Crew (2022), good-quality learning materials have the following characteristics: up-to-date, readily accessible, and easy to use. It is also highly engaging and designed to meet the needs of the students across a spectrum of cultures and abilities. It means that even with minor issues, the modified lessons can be considered good quality. Table 2 presents the summary of the experts along with the features of contextualization, Independent Learning, and Personal Responsibility. It means that the experts were satisfied with the modified lessons with the features of contextualization, independent learning, and personal responsibility.

Table 2. Presence of the features of Modified Lesson

Features	Mean Score of Modified Lesson			
	ML1	ML2	ML3	OVERALL
Contextualization	3.75 (VS)	3.79 (VS)	3.88(VS)	3.81 (VS)
Independent learning	3.88 (VS)	3.88 (VS)	3.79 (VS)	3.85(VS)
Personal Responsibility	3.91(VS)	3.96 (VS)	3.91 (VS)	3.93(VS)

Legend: ML1, ML2,ML3- Modified Lessons VS-Very Satisfactory

In the feature contextualization, the modified lessons 1,2, and 3 earned points of 3.75, 3.79,3.88, and overall, 3.81 with a remark of very satisfactory. This means that the three modified lessons contain contextualization. According to Gaña (2022), contextualized learning activity sheets help students to improve their performance. The contextual learning approach utilized in the learning activity sheets provides opportunities for students to play a vital role in the learning procedure. In the independent learning, the modified lessons 1,2, and 3 overall obtained points of 3.88, 3.88, 3.79, and 3.85 respectively with the remark of very satisfactory. This denotes that the modified lessons consist of independent learning. In the study of Hate (2022), self-learning materials or learning activity sheets are intended for individualized instruction that allows learners to utilize self-contained packages of learning tasks and activities. To sum up, the modified lesson with similar characteristics to the learning activity sheets also encourages the students to learn independently with less guidance from their teacher. In Personal responsibility, the three modified lessons 1,2,3, and overall scored 3.91, 3.96, 3.91, and 3.93 respectively, with remarks of very satisfactory. This means that the modified lessons include personal responsibility. According to Eliasa (2013), responsibility forces people to fulfill their obligation, the task given to the students in answering the expert activity forces the students to be responsible for their learning as well as the learning of others. With the scores obtained by the three modified lessons along with the features contextualization, independent learning, and personal responsibility all three modified lessons contain the three features.

The performance level of the control and experimental groups in the pretest and post-test

Table 3 shows the performance Level results in the pretest of the control and experimental group along with the three modified lessons.

Table 3. *Performance Level Results in Pre-test and post-test along with the three Modified Lessons*

Topic	Group	PRETEST		POSTTEST	
		PL	Description	PL	Description
1	CG	69.4%	Did Not Meet Expectations	71.9%	Did Not Meet Expectations
	EG	69.3%	Did Not Meet Expectations	76.1%	Fairly Satisfactory
2	CG	69.6%	Did Not Meet Expectations	71.7%	Did Not Meet Expectations
	EG	71.1%	Did Not Meet Expectations	76.6%	Fairly Satisfactory
3	CG	69.4%	Did Not Meet Expectations	71.5%	Did Not Meet Expectations
	EG	70.4%	Did Not Meet Expectations	74.6%	Did Not Meet Expectations
Overall	CG	69.2%	Did Not Meet Expectations	71.2%	Did Not Meet Expectations
	EG	69.9%	Did Not Meet Expectations	75.0%	Fairly Satisfactory

Legend: PL-Performance Level CG-Control Group, EG-Experimental Group

It shows that in Modified Lessons 1, the control and experimental group obtained scores of 69.4 and 69.3 in the pretest denoted as did not meet expectations. However, in the posttest, the control group and experimental gain 71.9 and 76.1 in only the experimental group reached above 75% which is fairly satisfactory. In the modified lesson 2, the control and experimental group scored 69.6 and 71.1 which falls under did not meet the expectation. However, in the posttest, the control and experimental groups scored 71.7 and 76.6 which means only the experimental made it fairly satisfactory. In the modified lesson 3, the control group and experimental group scored 69.4 and 70.4 in the pretest which falls under did not meet expectations. However, in the post-test, the control and experimental groups scored 71.5 and 74.6 which both the two groups reached only did not meet expectations. The overall, control and experimental groups obtained 69.2 and 69.9 which both did not meet expectations. In the posttest the control and experimental group gain 71.2 and 75.0 which only the experimental group falls fairly satisfactory. During the post-test, the experimental group's performance level showed improvement compared to the pre-test. This was due to an intervention applied by the researcher utilizing the Jigsaw Classroom Strategy, which aided the students in achieving the desired outcome. This was supported by the study by Noreen & Rana, (2019) which concluded that students taught with activity-based teaching improved their performance in the post-test. This is also backed by Mohammadjani & Tonkaboni, (2015) presented that cooperative learning has a higher effect on the students in the experimental group. This indicates that implementing teaching interventions has a positive impact on student performance.

Table 4 presents the difference between the level of performance in the pretest and post-test of the control and experimental group.

Table 4. *Difference between the posttest and pretest of the control and experimental group*

Statistical Bases	Statistical Analysis								
	Modified Lesson 1		Modified lesson 2		Modified lesson 3		Overall		
	CG	EG	CG	EG	CG	EG	CG	EG	
Computed t-value	2.26	4.84	1.64	4.11	1.97	4.27	2.22	4.59	
Decision on Ho	R	R	DNR	R	DNR	R	R	R	
Conclusion	S	S	NS	S	NS	S	S	S	

*** $\alpha=0.05$ df-29 t0.05=2.045 Legend: CG-Control Group, EG-Experimental group, R-Reject, DND-Do not Reject, S-Significant, NS-not significant

The table shows that in the modified lesson 1 first, the computed t-value of the control group was 2.26 which is higher than the critical t-value of 2.045 with a significant difference of 0.05 at a degree of freedom 29, This means that there's a significant difference between the pretest and posttest of control group therefore, the null hypothesis was rejected. Similarly, in modified lesson 1, the calculated t-value of the experimental group was

4.84 which is higher than the critical value, therefore null hypothesis was rejected and there was no significant difference between the pretest and posttest of the experimental group.

In the modified lesson 2, the computed t-value of the control was 1.64 which is lower than the critical value therefore, the null hypothesis was rejected and there is no significant difference between the pretest and posttest of the control group. In the experimental group, the computed value was 4.11 which is higher than the critical value therefore, the null hypothesis was rejected. Thus, there's no significant difference between the pretest and posttest of the experimental group.

In the modified lesson 3, the control group obtained a computed value of 1.97 which is lower than the critical value, which means that the null hypothesis was accepted thus, there's a significant difference between the pretest and posttest of the control group. In the third modified lesson, the computed value of the experimental group was 4.27 which is higher than the critical value, therefore the null hypothesis was rejected and there's a significant difference between the pretest and posttest of the experimental group.

Lastly, the overall computed value of the control group was 2.22 which is greater than the critical value, the null hypothesis was rejected and there's a significant difference between the pretest and posttest of the control group. In addition, the computed t-value of the experimental group was 4.59 which is more than the critical value, therefore the null hypothesis was rejected and there's a significant difference between the pretest and posttest of the experimental group. The result implies that the Jigsaw Classroom strategy was able to make the students learn. However, it can also observe that the level of performance of the student's modified lessons improved compared to using the traditional method.

Based on the results of the control and experimental groups, it can be inferred that both the experimental and the control groups improved the performance of the students, and both interventions were appropriate for teaching mathematics. Prabhu, N., S (1990) states that the best method varies from one teacher to another. The search for an inherently best method should perhaps give way to a search for ways in which teachers' and specialists' pedagogic perceptions can most widely interact with one another so that teaching can become most widely and maximally real.

Experiences of the students in learning through the Jigsaw Classroom Strategy

After the decoding of the journals of the students the following themes that have emerged from the students' experiences during the encounters of Jigsaw Classroom Strategy: Eight themes were observed: (1)Enhancing Understanding, (2)Meeting New Friends, (3)Enjoyment,(4)peer tutoring, (5)boosting oneself confidence, (6)Environment-related convenience, (7)absenteeism, and (8)Inactive Members.

The first theme that emerged was Enhancing Understanding. It refers to the process of improving the student's understanding of the topics. Students expressed that they were able to understand the lesson more easily. This experience is backed by the study of Tran (2012); according to his study, students most liked working with others and getting help, discussing, sharing information with others, teaching others, helping one another, and enjoying the jigsaw context. The study was also supported by Timayi et al., (2015), who stated the jigsaw strategy was friendly and effective in teaching and learning geometry. It can improve the performance of the learners in the experimental group.

Another theme also appears during the conduct of the Jigsaw Strategy meeting new friends which means that the students were able to increase their interaction with their classmates. Students were able to socialize with others and promote a bigger set of friendships. According to (Azmin, N. 2016), students benefit from the Jigsaw method by developing social skills. It means that the Jigsaw Strategy improved the social skills of the students but also broadened their connection with other peers.

Another experience that the Jigsaw Classroom Strategy offered was enjoyment. Enjoyment refers to the positive impression due to positive stimuli, or otherwise feeling of satisfaction (Hernik & Jaworska, 2018). According to the students they were able to enjoy the task given to them. The Jigsaw Strategy also promotes a learning environment where the students enjoy learning. Many students in the experimental groups expressed in their Journal entries that they enjoyed the activities. This result was backed by the study (Tran, V., 2012) that jigsaw strategy students enjoy cooperative learning because they are in a comfortable learning environment.

It means that the Jigsaw Strategy promotes a learning environment in which the students can learn while enjoying it.

The next common entry in the Journal was about Peer Tutoring. According to Clapp (2022), peer tutoring means that peer tutoring is when students from similar social groups help and teach each other the materials to increase learning, which in turn helps them learn through teaching. The Jigsaw Strategy is a strategy that requires the students to act as teachers. Students were tasked to discuss topics they were assigned to them. Students who had a hard time during the classroom activities sought help from their fellow students. According to Jainal et al., (2021), during the Jigsaw intervention, the students showed positive interaction as they listened to their peers who were experts. Simsek,

U., & Baydar, A. (2019) stated that the Jigsaw Strategy contains more constructed peer tutoring. It emphasizes that the Jigsaw Strategy allows the students to share ideas and listen to one another.

The last theme for positive experience focuses on how the Jigsaw Classroom Strategy improves self-confidence. Self-confidence is a feeling of trust in one's abilities, qualities, and judgment (Marlborough.org, 2024). One of the effects of using the Jigsaw Strategy in teaching was the boost of confidence of the students when it comes to sharing ideas and dealing with activities. The students were able to express their thoughts and opinions to the members of the group. These findings were supported by Azmin (2015); and Tran (2012), in which the respondents increased their confidence level when the Jigsaw Strategy was utilized. According to previous studies, students feel more confident communicating knowledge to their peers by providing a friendly environment where they are free to express themselves and cooperate. Research has shown that utilizing cooperative learning techniques like the Jigsaw Strategy can boost students' confidence levels and reduce feelings of nervousness. Additionally, it can increase students' willingness to engage in discussion with their peers.

Although there are positive views regarding the Jigsaw Classroom Strategy, there are also some negative views that resurface during the analysis of the Journal Entries. These themes were Environment-Related Inconvenience, Absenteeism, and Inactive members. One of the negative experiences of the students during the conduct of the Jigsaw Classroom Strategy was the unnecessary noise known as classroom noise. Classroom noise pertains to any unwanted or disruptive sound that interferes with the teaching-learning process within the classroom setting (Svantek Academy, 2024). One of the challenges in the Jigsaw Strategy was the noise created by the students during the activity. Some of the students were interrupted during the lecture because of the noise. Jolliffe, W. (2007) proposed that in dealing with this kind of problem, students can sit closer together to minimize the noise. Having students sit close together helps reduce the noise level but also helps foster cooperation and minimizes the chance of someone being left out. Another negative experience of the students was the absenteeism of their groupmates. Since Jigsaw Classroom Strategy requires the cooperation of the members. Having a groupmate who is constantly absent also affects the performance of the whole group. Absenteeism was one of the difficulties that the students in the experimental group encountered. Some students are constantly absent and fail to finish the given task which results in a lowering of the scores of the students. (Walker, 2018) Cutting Class reduces the overall productivity of the team, reducing the ability of group members to learn from each other in collaborative learning environments. According to Walker, a collaborative-learning attendance policy would require the student who misses multiple cooperative learning activities to eject the student who is constantly absent to be permanently removed from the group. The last negative theme was Inactive Members. Some students experienced that their group members were unable to share their knowledge about the lesson assigned to them. In a cooperative learning setup, students were most likely to experience having a freeloader group member. Having a freeloader is common to the Jigsaw Method (Slish, 2005). Because one slacker can cause the group to miss out on important information (Azmin, 2015), to avoid this kind of issue, Joyce (1999) believes that the freeloader issue can be solved by rotating the group's members. Therefore, teachers must consider the planning and construction of every aspect of the Jigsaw Strategy that can affect the teaching-learning process. In that way, students who utilize the Jigsaw Strategy can fully achieve the positive effects that the Jigsaw Strategy offers.

Effectiveness of the Jigsaw Classroom Strategy in improving students' performance

Table 5 presents the level of performance of the control and experimental group in the post-test.

Table 5. Level of Performance of the control and experimental group in Post-test

Statistical Bases	Statistical Analysis			
	Modified Lesson 1	Modified Lesson 2	Modified Lesson 3	Overall
Degree of Freedom	58	58	58	58
Computed t-value	2.20	2.74	2.27	2.73
Decision on Ho	Reject	Reject	Reject	Reject
Conclusion	Significant	Significant	Significant	Significant
Cohen's D	0.57	0.71	0.59	0.71
Effect Size	Medium	Medium	Medium	Medium

It can be observed that in Table 5, the three modified lessons and the overall obtained a computed t-value of 2.20, 2.74, 2.27, and 2.73. The computed t-value of the three modified lessons and the overall were greater than the critical value of 2.002 when the degree of freedom is 58 and the level of significance of 0.05. Therefore, there is a significant difference between the posttest of the control and experimental group hence, the null hypothesis was rejected. The computed Cohen's D of the three modified lessons overall attained 0.57, 0.71, 0.59, and 0.71 the effect size of the three modified lessons falls under medium.

This result suggested that the students were performers in a collaborative learning environment and worked with their classmates who shared a common goal. It also indicated that using the Jigsaw Classroom Strategy effectively created an environment for students to learn. Therefore, the Jigsaw Classroom Strategy was more effective than the traditional teaching strategy.

This result was supported by previous studies by Tabiolo, J.L, & Rogayan, D.V(2019); Salubayba, P. et al., (2018); Suresh C., & Reddy., D, (2017) which provide that the Jigsaw Strategy can improve the performance of the students and significantly effective than the traditional method.

FINDINGS

1. The modified lessons focused on the three (3) lessons anchored to the most essential competencies (MELCs)which were Introduction to Geometry, Lines, and Angles, and Parallel Lines cut by a transversal line. It also includes the feature contextualization, individual learning, and personal responsibility. Each lesson in Geometry was divided into 5 topics that each member of the group needed to focus on and understand.

2. The three modified lessons were able to gain scores of 27.33, 27.5, and 27.5 in the factor content. The modified lessons also earned 71.17, 71, and 71 points in terms of format, 19.67, 19, and 19 points in terms of Presentation and Organization. In addition, the modified lessons also earned scores of 23.34, 23.69, and 23.34 in terms of Accuracy and Up-to-datedness of information. Lastly, the modified lessons were able to achieve very satisfactory remarks in the three features such as contextualization, Independent Learning, and personal responsibility.

3. The computed performance level of the control and experimental group. According to the calculated value, the performance level of the control group in the pretest in the three modified lessons 1,2 3 and the overall were 69.4, 69.6, 69.4, and 69.2, respectively, which means that the group did not meet the expected competencies in the selected topics in Geometry. In the posttest of the control group, the calculated performance levels were 71.9, 71.7, 71.5, and an overall score of 71.2, which means that the control did not meet the expected competencies in the selected topics in Geometry. While the experimental group obtained a performance level of in the pretest were 69.3, 71.1, 70.4, and an overall 69.9 and 75.1%. It means that the pretest in the experimental group did not meet the expected competencies in the selected topics in Geometry. However, in the post-test, the experimental group obtained 76.1, 76.6, 74., and an overall of 75 means that the performance level of the experimental group in the post-test already attained fairly satisfactory remarks.

There is no significant difference between the performance level of the control and experimental groups in the pretest. Therefore, both the control and experimental groups have equal footing regarding the topic of Geometry.

According to the difference between the level of performance in pretest and posttest of the control and experimental group. The computed t-values of the control group in the three modified lessons were 2.26, 1.64, 1.97, and an overall 2.22. In modified 2

and 3 the computed value was lower than the t-critical value of 2.05 when the degree of freedom was 29 at a 0.05 level of significance. Thus, the null hypothesis was accepted. Therefore, the control group's performance level in the pre-test and post-test in modified lessons 2 and 3 had no significant differences. However, in the first modified lesson, the overall computed t-value was higher than the t-critical value of 2.05 thus, the null hypothesis was rejected. Therefore, the control group's performance level in both the pretest and post-test in modified lesson 1 and the overall had significant differences.

The t-computed value of the experimental group in the three modified and overall were 4.83, 4.11, 4.27, and 4.59, which was much greater than the t-critical value of 2.05. It means that the null hypothesis was rejected. This means that there was a significant difference between the level of performance of the experimental to the pretest and posttest.

4. The experience of the students in a Jigsaw Classroom Strategy resulted in several results such as: In the theme Enhance Understanding the students were able to understand the topic by engaging in the discussion. Students could understand the topics/ lesson by sharing information, seeking help, working with others, and teaching others. Meeting new friends, Students can create a much bigger social group, and they can communicate with their classmates they don't usually interact with. In Enjoyment, the students enjoyed cooperative learning because they were in a comfortable learning environment. In peer tutoring students act as a teacher, students are tasked to discuss topics they were assigned. Students who had a hard time during the classroom activities sought help from their fellow students. Boost of confidence, students were able to express their thoughts and opinions to the members of the group, and they were more confident in sharing their ideas with their peers. However, there were also negative themes that emerged in the study. These themes were Environment-Related Inconvenience, Absenteeism, and Inactive members. Environment-Related Inconvenience, during cooperative learning, it was unavoidable for the students to create unnecessary noise that distracted the students during the activities. Absenteeism was one of the difficulties that the students in the experimental group encountered. Some students are constantly absent

and fail to finish the given task which results in a lowering of the scores of the students. Lastly were Inactive members, in a cooperative learning setup, students were most likely to experience having a freeloader group member that didn't participate in the discussion.

5. In the three modified lessons the overall obtained a computed t-value of 2.20, 2.74, 2.27, and 2.73. The computed t-value of the three modified lessons and the overall were greater than the critical value of 2.002 when the degree of freedom is 58 and the level of significance of 0.05. Therefore, there is a significant difference between the posttest of the control and experimental group hence, the null hypothesis was rejected. The computed Cohen's D of the three modified lessons and overall attained 0.57, 0.71, 0.59, and 0.71. This result falls under the effect size of medium.

CONCLUSION

1. The Modified lessons that were developed consist of lessons in Geometry such as Introduction to Geometry, Lines, and Angles, and Parallel Lines cut by a transversal line along with the feature contextualization, Independent Learning, and personal responsibility.
2. The modified lessons validated and rated by the experts passed the different factors such as content, format, presentation and organization, accuracy, and up-to-date information. It also contains the features of contextualization, independent learning, and personal responsibility.
3. The performance level in the pretest of both the control and experimental groups did not meet the expected competencies in the selected topics in Geometry. While in the posttest, only the experimental group performed at least at a fairly satisfactory level. In addition, in the posttest, only the experimental group improved in their performance during the posttest.
4. The students' experiences were divided into positive and negative experiences. Students who fully utilized the Jigsaw Classroom Strategy achieved positive experiences.
5. The Jigsaw Classroom Strategy was more effective than the traditional method in teaching selected topics in Geometry.

RECOMMENDATION

1. Teachers may develop additional modified lessons that may be used in the Jigsaw classroom strategy.

2. Revisions and improvements of the developed modified lessons may be done by utilizing Jigsaw Classroom Strategy in teaching mathematics.

3. Secondary teachers may consider the Jigsaw Classroom Strategy as one of the strategies utilized in the classroom to improve students' performance levels.

4. Conduct a much more systematic interview with the students to gather the experiences of the students who utilized the Jigsaw Classroom Strategy.

5. Future researchers should study the factors affecting the Jigsaw Classroom Strategy.

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