



Power – of – 2 Strategic Intervention Material in Proving Statements on Triangle Congruency

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Abstract: The study developed and used the researcher-made strategic intervention material (SIM) in Proving Statements on Triangle Congruency named “Power-of-2” as a remediation and supplementary material to improve the mathematics performance of Grade 8 students of Rodriguez National High School, Division of Camarines Sur, school year 2024-2025. This study employed a descriptive-comparative and Research and Development method involving 90 Grade 8 students, forty-five (45) students from each control and experimental group. Data gathering tools include teacher-made tests and evaluation checklists utilizing statistical tools such as mean, standard deviation, proficiency level, weighted mean, t-test for independent samples, t-test for dependent samples, and Cohen's D comparative. The computation was done using statistical software. This study determined the status of the mathematics proficiency of the students on triangle congruency; the design of Power-of-2 strategic intervention material; the curricular validity of Power-of-2 strategic intervention material; the level of the mathematics proficiency of the control and experimental group after using the Power-of-2 strategic intervention material; the significant difference between the mathematics proficiency of the control and experimental group in proving statements on triangle congruency; and the effectiveness of the Power-of-2 strategic intervention material in improving the mathematics proficiency of students in triangle congruency. Results revealed that the status of the mathematics proficiency of Grade 8 students, along proving statements on triangle congruency, did not meet the criterion prescribed by the Department of Education. The design of the Power-of-2 strategic intervention material was suited to the learners and aligned with the competencies prescribed by the Department of Education. The curricular validity of Power-of-2 strategic intervention material in terms of face, content, and construct was very highly valid. The mathematics performance of the experimental and control group did not meet the criterion set as prescribed by the Department of Education, but showed higher mathematics proficiency after the implementation of the SIM and the teaching learning process. There is a significant difference between the mathematics proficiency of the control and experimental groups in the post-test. The Power-of-2 strategic intervention material has a large effect and is effective in improving the mathematics proficiency of the grade 8 students.

Index Terms: Strategic Intervention Material, Learners, Mathematics Proficiency

I. Introduction

Mathematics is one of the most challenging subjects for most learners, yet it is interesting when a learner learns and appreciates the subject. Students themselves are struggling to fully understand the concept being taught and are finding difficulty in understanding the ideas that underpin the learning process in the subject. Improving proficiency in mathematics is essential for students to be more proficient in it. Through this, teachers must provide these learners with various mathematical problems through various learning materials and interventions to cater to the learning needs of the learners. These intervention materials enhance and

improve learners' mathematics proficiency since Mathematics is a subject that can be improved with consistent practice by solving mathematical problems through an effective intervention.

One of the challenges in teaching mathematics is finding appropriate methodologies, approaches, and strategies that make learning more meaningful, fun, and engaging. Learners find it difficult to fully understand the concept due to limited resources, lack of learning materials, and other factors that affect learning. Students often face challenges in proving two congruent triangles and struggle with various aspects, such as understanding concepts and applying principles. Factors contributing to these difficulties include a lack of understanding of problem meanings, low levels of problem identification, and carelessness in process skills (Wang et al., 2018).

In line with the Sustainable Development Goals 4 (SDG 4) Education 2030 for inclusive and quality education, it states, "*Ensure inclusive, equal and high-quality education and promote lifelong learning opportunities for all*". Students learn how educational projects and programs increase their chances of a better life. By being involved in the learning process, students can support academic initiatives and contribute to the dissemination of knowledge and skills. This can be done through students' exposure to the developed intervention material.

Moreover, mathematics is part of every curriculum around the world. In this regard, Filipino students' mathematics proficiency remains low and alarming. The most widely disseminated news about the crisis came from a report of the Program for International Student Assessment (PISA) of the Organization for Economic Cooperation and Development (OECD) in 2022 which showed that the Philippines showed no significant improvement from the country's proficiency in 2018 which ranked second to the last in both mathematical and scientific literacy (Chi, 2023). Released PISA results indicated that the Philippines' score in Mathematics went from 353 in 2018 to 355 in 2022.

The Department of Education (DepEd) has employed a solution for students' deteriorating academic proficiency in science and technology, including mathematics. As stated in DepEd Memorandum No. 39, series of 2012, the policy guideline in addressing learning gaps and implementing reading and writing programs in secondary schools states that:

DepEd recognized that most of the secondary schools had already put in place a remediation programs to address the deficiencies in learning. In order to systematize the process, the mentioned order advised the schools to frame their programs and interventions within the guidelines prescribed. The utilization of Strategic Intervention Materials aims to improve the least mastered skills of the students in a particular subject area.

Additionally, in line with the DepEd Memorandum No. 117, series of 2005, also known as the Training Workshop on Strategic Interventions for Successful Learning, states that:

Strategic Intervention Materials are materials prescribed by the Department of Education to improve the students' performance in Math. To promote successful learning in the said subject area both in elementary and secondary learners, the Department of Education provided the teachers' training and workshop on preparing these intervention materials to be used.

The teacher must develop strategic intervention material to improve students' conceptual understanding of mathematics, as it significantly impacts students' academic performance (Adonis, 2020). This implies that SIM can be utilized as instructional materials during the learning process as an effective teaching tool (Suarez & Casinillo, 2020). The same is given after regular classroom instruction to students who could not grasp the concepts of a subject matter (Dumigsi, 2019).

Low proficiency in Mathematics is evident in Rodriguez National High School, particularly among grade 8 students. During the school year 2022-2023 and 2023-2024, the school had these quarterly examinations, and almost 80% of students, based on their quarterly examination results, are below average, especially in one of the learning competencies, such as proving statements on triangle congruency for the 3rd Quarter. The said learning competency has a mastery level of 30.95% for school year 2022-2023 and 41.21% for school year 2023-2024, and is below the standard set of at least 75% by the Department of Education.

The Albay Numeracy Assessment Tool (ALNAT) result under proving and decision-making reflects and identifies that proving statements on triangle congruency is one of the least-learned competencies in Mathematics 8. Previous ALNAT results revealed that learners need major support in Mathematics.

Additionally, based on the consolidated results of the least mastered skills in the Pili West District for school year 2023-2024, proving statements on triangle congruency is one of the least learned competencies in Mathematics for the 3rd quarter. This raises a big concern about how students can maximize learning. The researcher believes that the teaching–learning process also involves addressing the skills that are least mastered. This situation prompted the researcher to conduct the study, which improved learners' mathematics proficiency by providing strategic intervention material that suited their learning needs.

Considering the low proficiency of Grade 8 students in Mathematics as evident in the various assessments conducted, the researcher is primarily interested to improve the mathematics performance of Grade 8 learners through teacher–made Strategic Intervention Material (SIM) in proving statements on triangle congruency entitled Power-of-2 in Rodriguez National High School, school year 2024-2025. Thus, using Power-of-2 SIM as a remediation and supplementary learning material is significant in mastering the learning competency and supplementing students' fundamental geometry literacy.

Mathematics Proficiency

Mathematics is a challenging subject for most students. This might be due to their attitude toward it or the strategies and minimal learning intervention materials that affect their proficiency. This section contains information on understanding mathematical proficiency. Relevant studies and literature were included to clarify the implications of mathematical proficiency for student achievement.

The Programme for International Student Assessment (PISA) is an international evaluation given every three years to a representative sample of 15-year-old students to assess their level of competency in Reading, Science, and Mathematics, and based on the latest results, there were worrying indications of an education crisis in the Philippines (Chi, 2023). The Department of Education (DepEd) reported the mathematics proficiency of Filipino students in the recent PISA 2022 results from the Organization for Economic Cooperation and Development (OECD), in which Filipino students ranked second to the last in Science and Mathematics and in the bottom four among the 64 participating countries. Released PISA results indicated that the Philippines' score in Mathematics went from 353 in 2018 to 355 in 2022 and was still considered below the OECD average score. This result speaks of a need to identify specific determinants of students' poor proficiency in Mathematics.

To address the learning gap in Mathematics, a systematic literature review of factors predicting mathematics proficiency in PISA conducted by Wang et al. (2023) entitled factors predicting mathematics achievement in PISA: a systematic review. The analysis uncovered five factors consistently associated with math achievement in PISA. These five factors are consistently negatively associated with math achievement: student absenteeism and lack of punctuality, school repetition and dropout rate, school prevalence of students' misbehavior, shortage of teachers and general staff, and student-centered instruction. These factors affect students' understanding of the concepts that merely affect their mathematics proficiency.

The least learned competencies require higher-order thinking skills (Laña, 2023). A teacher should address the identified least learned competencies by knowing the curriculum, subject, and level, and have mastery in spiralizing the materials required for the strategies and proper implementation. Teachers must provide students with more effective and efficient learning, instructional, and educational experiences. It is recommended that teachers adopt the crafted K to 12 Strategic Intervention Material as an additional learning material to address the learners' weaknesses and low proficiency in the identified least learned competencies in Mathematics.

On the other hand, Geometry is part of the core of mathematics. One of the essential topics in geometry is congruence because by learning congruence, several abilities, such as spatial ability, connection ability, and advanced thinking, can be developed. In the topic of congruence, students must have the ability to prove because proving congruence can develop formal proof-writing ability in mathematics (Hapizah & Scroll, 2020). For instance, Scristia et al. (2022) found that high school students often make errors in reasoning–based congruence proof problems due to a lack of symbol knowledge, misunderstandings, weak conceptual foundations, carelessness, and lack of precision. Students struggle to incorporate oral reasoning into written proofs, resulting in formalization and logical gaps when solving geometry proof problems.

Achieving a very satisfactory or outstanding performance in mathematics means students have a very positive attitude toward their study habits when learning Mathematics. Students felt that studying and learning Mathematics was essential. Students' success and academic growth depend heavily on their Mathematics proficiency (Abalde & Oco, 2023). The study entitled "Factors Associated with Mathematics Performance". The results showed that students agree with routines related to mastering Mathematics at a high level. There is a substantial positive association between the students' study habits and performance in terms of attitude. The study habits and learning techniques used by students were found to be important determinants of how well they performed in Mathematics. The researcher strongly suggested using the enhancement strategic intervention in teaching Mathematics to Junior High school students. It is essential for the students to master and comprehend the mathematical concepts through an effective intervention.

Students should be engaged in mathematical concepts to develop better performance in Mathematics through an effective intervention (Lapinid et al., 2022) in the study entitled "Addressing the Poor Mathematics Proficiency of Filipino Learners: Beyond Curricular and Instructional Interventions". Schools and teachers should identify students at risk of performing poorly in mathematics at the early stages of instruction, pay attention to their vulnerabilities and needs, and help mitigate the likelihood of failure in mathematics by providing appropriate intervention. Teacher development activities in mathematics should focus on strategies to help students who are not learning, which now comprise an overwhelming majority of the students in schools.

In the study of Abuda et al. (2019), Struggling Learners' Mathematics Achievement Level using Quick Response Embedded Strategic Intervention Material, assessing the learners' level of achievement in Mathematics before instruction will aid teachers in developing instructional tools and approaches suited to their scholastic needs. Mathematics teachers should be equipped with appropriate knowledge on the use of 21st-century teaching and learning resources such as Strategic Intervention Material to help a student who finds mathematics concepts challenging to comprehend, and a similar study should be conducted to cover other least-learned competencies in Mathematics.

In the study of Landicho (2023) entitled Factors Affecting Proficiency in General Mathematics of Grade Eleven Students in Talumpok Integrated School: Basis for Intervention Activities. The problem of low proficiency in mathematics appears to be pertinent at all levels of school education. The factors that affect student proficiency are study habits and interests, which are both under student-related factors. The proposed action is supplementary since respondents showed low interest in the subject. Supplementary activities that help students practice good study habits, such as games and other related activities, will boost student interest in the subject. In addition, the lack of workbooks/textbooks as instructional materials highly affects the academic proficiency of the respondents. Supplementary learning material, such as strategic intervention material, is necessary to improve the students' mathematical proficiency.

The researcher-made intervention materials effectively improved the students' mathematics proficiency (Cordova et al., 2019). The authors discussed the effectiveness of competency-based strategic intervention materials in English, which were given to learners to help improve proficiency. The study discovered that the pre-test mean scores are very poor, prompting the explanation behind the authors to build up the Strategic Intervention Materials. The author observed that the learners were enjoying and learning as they go along with the SIM. In this case, the learners had already developed and improved proficiency. They were able to combine logical ideas and sentences with the use of logical connectors appropriately. These led to the excellent proficiency of the learners.

Design and Curricular Validity of Strategic Intervention Material

Every teacher aims to improve learners' performance in every subject and help them understand and apply the lessons learned from the class. However, this goal may not be met if learners struggle to comprehend every lesson, especially in Mathematics. One way to help learners achieve success in learning is through the use of effective intervention materials.

Intervention material is an instructional material proposed by the Department of Education (DepEd) to improve the academic accomplishments of learners performing poorly in Science, Technology, including Mathematics, and other subjects as well (Santos, 2020). The intervention material assists students in developing fundamental knowledge, skills, and understanding of mathematics and aids them in the transfer

of learning. The Department of Education officials may institutionalize the use of SIM in reinforcing learners' difficulties in learning the least learned competencies in Mathematics. DepEd officials may formulate policies that will encourage teachers to develop SIMs for their classes to maximize teachers' potential in making more effective instructional materials, which can help save students who are academically at risk.

A Strategic intervention material, an intervention material for remediation purposes, is one of the solutions employed by the Department of Education (DepEd) to enhance the academic achievements of students performing low in the field of science and technology, including Mathematics (Sison, 2021). Using these printed strategic intervention materials, the teachers can capitalize on the strengths and improve the students' self-advocacy skills. The function of education is to teach one to think intensively and critically. Intelligence plus character—that is the goal of real education. As part of intensifying and developing strategic intervention materials as a tool for remediating poor performance in Mathematics.

Flores (2023) defined Strategic Intervention Material as an intervention material meant to reteach concepts and skills that students did not fully develop during regular classroom teaching. It contains several parts: a guide card, activity card, assessment card, enrichment card, reference card, and answer key card. The SIM should be based on the least learned skills of students and designed at a low cost. Teachers will create a SIM, which will be judged on criteria like subtasking, congruence, usability/functionality, and replicability.

Strategic Intervention Material effectively improves students' proficiency, particularly on the topic of the least mastered skills (Suarez & Casinillo, 2020). This study determined the significant effect of SIM on students' academic proficiency. This implies that SIM can be utilized as instructional materials during the learning process as an effective teaching tool. The researcher recommended that teachers should use strategic intervention materials made by the researcher to re-teach the concepts and skills and help the pupils master the competency-based skills.

In the study of Dumigsi & Cabrella (2019) about the strategic intervention material in mathematics as remediation for Grade 9 Students in solving problems involving quadratic functions showed that more learning has been taking place during the conduct of the study and that although there was a positive transfer of learning in the two groups, a higher mean was observed from the experimental group after the use of SIM as remediation tool. This study concludes that Strategic Intervention Material can help improve the academic achievement of Grade 9 students in Mathematics. Incorporating SIM into the delivery of the lessons with the least mastery develops mathematical skills for solving problems involving quadratic functions.

Moreover, in the study of Bastida & Bastida (2022) entitled Effectiveness of Strategic Intervention Material on the Learning Outcomes of Students, findings revealed that using SIM in the classroom has increased students' learning outcomes in science. An increase in grades in the experimental group was noted. The experimental group had a higher mean than the control group. Students in the non-SIM group maintained low proficiency before and after the intervention. Students in the experimental group improved their academic performance compared to the control group. Therefore, using SIM in teaching could increase students' learning outcomes.

The study of Jamandron & Comighud (2020) determines the effectiveness of Teacher-Made Strategic Intervention Material (SIM) as a tool for remediation through an experimental method. The validated SIMs that the researcher made were based on two topics: The human reproductive system and the classification of vertebrates. All respondents were the pupils who failed to master the proficiency level of 75% after the teacher delivered the lesson. Results showed that, for both SIMs, there is a significant increase in the Mean Percentage Score (MPS) in experimental groups compared to control groups. The experimental and control groups improved their proficiency level after remediation, but respondents who used the two SIMs during remediation performed better than the control group who did not use SIMs.

In the study of Orine et al. (2024) entitled Transformation City: A Pocket Strategic Intervention Material (SIM) for Science 6, the researchers developed Strategic Intervention Materials (SIM) that improve students' weak science skills. The SIM undergoes validation by experts in content quality, format, presentation, and organization. The study utilized pre-tests and post-tests. The findings revealed a significant increase in student learning outcomes after using the "Transformation City" SIM, demonstrating its potential to bridge the gap in science education.

Manlapig et al. (2024), in their study Exploring Student Academic Performance and Motivation in Physics Through Electronic-Strategic Intervention Material (e-SIM), developed a competency-based e-SIM in Newton's Laws of Motion, developed to enhance the academic performance of low-performing students. The findings revealed a significant difference between the students' academic performance and learning motivation using eSIM. The use of eSIM in enhancing academic proficiency and learning motivation in Newton's second law of motion is recommended.

The development and validation of the Strategic Intervention material was supported by Luzano (2020) in his study Development and Validation of Strategic Intervention Materials (SIMs) of the Selected Topics in Trigonometry of Precalculus Discipline in Senior High School. This study implies that the content validators considered the SIMs as teacher support materials that can be used to master the competencies in Pre-Calculus and learner enhancers to improve their competence as evaluated by the student validators. The validation results of the two SIMs paved the way for the construction of the new learning material to confirm the findings, and the undergone validation was rated "excellent" and "more than adequate" by content and student validators, respectively. It is recommended that teachers develop more SIMs for other disciplines to address students' difficulties in learning trigonometry.

II. Research Methodology

This study employed a descriptive-comparative and Research and Development method to determine the status, level of mathematics proficiency, and effectiveness of the Power-of-2 Strategic Intervention Material. The descriptive method was used in determining the status and the mathematics proficiency level of the control and experimental groups in proving statements on triangle congruency based on the pre-test and post-test results, and the curricular validity of Power-of-2 strategic intervention material as evaluated by the experts.

A comparative approach was employed to identify the significant difference in the mathematics proficiency level of the control and experimental groups based on the pre-test and post-test results, and the effectiveness of the Power-of-2 Strategic Intervention Material in improving the students' mathematics proficiency. The research and development (R&D) method was applied in crafting and producing a strategic intervention material entitled Power-of-2, focusing on proving statements on triangle congruency and to describe the design of Power-of-2 strategic intervention material along its standard parts, namely, guide card, activity card, evaluation card, enrichment card, answer key card, and reference card.

III. Results and Discussion

The status of Grade 8 students' mathematics proficiency in proving statements on Triangle Congruency was determined through a pretest. Table 1 presents the status of the mathematics proficiency across the different competencies in proving statements on Triangle Congruency. The 40-item researcher-made test determined the status of the control and experimental groups' mathematics proficiency.

In proving statements on triangle congruence by SSS, SAS, ASA congruence postulates, and AAS congruence theorem, with a 16-item question for this competency, the students from the control group got a mean score of 5.62, with a proficiency level of 35.13 and a standard deviation of 2.50. The students from the experimental group got a mean score of 5.24, with a proficiency level of 32.75 and a standard deviation of 2.35. In proving statements on triangle congruence by congruent right triangles, with a 16-item pre-test questions, the control group recorded a mean of 5.62 with a proficiency level of 35.13 and a standard deviation of 2.48. The students from the experimental group got a mean score of 5.04, with a proficiency level of 31.50 and a standard deviation of 2.36. In proving statements on triangle congruence by applying theorems on Isosceles triangle, with an 8-item pre-test questions, the control group obtained a mean score of 2.87, with a performance level of 35.88 and a standard deviation of 1.27. The students from the experimental group got a mean score of 2.33, with a proficiency level of 29.13 and a standard deviation of 1.48.

Table 1

Status of the Mathematics Proficiency of the Control and Experimental Groups on Triangle Congruency

Competencies	Control					Experimental				
	N	Mean	SD	PL	Int	N	Mean	SD	PL	Int
Proving statements on triangle congruence by SSS, ASA, SAS congruence postulate, and AAS congruence theorem	16	5.62	2.50	35.13	DME	16	5.24	2.35	32.75	DME
Proving statements on triangle congruence by congruent right triangles	16	5.62	2.48	35.13	DME	16	5.04	2.36	31.50	DME
Proving statements on triangle congruence by applying theorems on isosceles triangle	8	2.87	1.27	35.88	DME	8	2.33	1.48	29.13	DME
Average		4.70		35.38	DME		4.20		31.13	DME

The results in Table 1 show that the respondents from the control group got an overall average mean of 4.70 and an overall proficiency level of 35.38. The respondents from the experimental group got an average mean of 4.20 and a proficiency level of 31.13.

The results showed that the proficiency level of both groups implied that students did not meet the passing threshold mandated by DepEd, which is 75%. The results of the standard deviation revealed that both groups were homogeneous in terms of mathematics proficiency. This means that the students demonstrated a failing rate before discussing the concept and using the Power-of-2 strategic intervention material. Students demonstrated low understanding of the competency and needed more intervention to enhance and improve their mathematics proficiency.

Design of Power-of-2 Strategic Intervention Material

The Power-of-2 Strategic Intervention Material is a learning intervention for Grade 8 students of Rodriguez National High School. It aims to improve students' mathematics performance in proving statements on triangle congruency.

Guide Cards. This part of the SIM grabs students' attention, previews the lesson, and introduces the topic by outlining learning competencies, goals, and tasks for students. Power-of-2 strategic intervention material has 10 guide cards guiding students throughout their SIM journey. Guide Card 1 introduced the topic that led the students to the succeeding guide cards. Guide Cards 2, 3, 4, and 5 were about proving statements on triangle congruence by SSS, SAS, ASA congruence theorem, and AAS congruence postulate. Guide Cards 6, 6.1, and 6.2 were about proving statements on triangle congruence by congruent right triangles. Guide Card 7 and 7.1 were about proving statements on triangle congruence by applying theorems on isosceles triangle.

The guide card provides information about the process and steps involved in using the strategic intervention material. Images like the main characters, such as triangle heroes and different images of congruent triangles, were present in the SIM. The "Remember" part at the bottom of every page of the guide card was also evident as it enlightened the student in the new concept being introduced in the SIM. The results showed that the guide card guided students in the completion of the task and activities present in the SIM. It can be inferred that the guide cards can be utilize as one of the standards parts of the SIM as mandated by DepEd.

Activity Cards. This standard part of the SIM allows students to check their understanding of the concepts. These help clarify any misunderstandings students might have experienced in the guide cards. In teaching Mathematics, the repetition of the studied material is given an important place. Properly organized repetition is one of the factors contributing to the intellectual development of each student and their achievement of

deep and lasting knowledge (Akerke, 2020). Repetition of tasks and activities were also evident in the activity cards, from activity 1 to 10, which leads students to mastery of a skill. Activity cards allow students to be involved in the learning process through answering the tasks and checking their learning progress by reviewing their notes at the bottom of each page of the SIM. Evident in the activity card is the story of two triangle heroes to be proven congruent by the user of the SIM. Once the two triangles have been proven, the enemy will be defeated. SIM, adding a specific image and illustration serves this purpose. The tasks in the activity cards are quite challenging for students. The learning styles of students were given emphasis. Each activity has different tasks; each task has different ways for students to absorb, process, and retain information.

The results showed that activity cards helped students deepen their understanding of the material and involved them in the learning process. It can be inferred that the activity cards can be utilized as one of the standard parts of the SIM as mandated by DepEd.

Assessment Cards. This standard part of the SIM features exercises, drills, and other tasks that allow students to evaluate their comprehension of the learned material, identify and correct any mistakes, monitor their learning progress, utilize feedback to gauge their understanding, assess learning, and measure their competency in proving statements on triangle congruency. Four assessments were present in the SIM, but of different content levels. Assessment Card 1 is aligned with the three focused skills, such as assessing students' understanding of the different markings found on the congruent triangles along SSS, ASA, SAS, AAS congruence, and HyL, HyA, LL, LA congruence. Assessment Card 2 aligned with the skill in proving statements on triangle congruency by SSS, ASA, SAS congruence postulates, and AAS congruence theorem. Assessment Card 3 aligned with the skill in proving statements on triangle congruency by congruent triangles such as HyL, HyA, LL, and LA congruence theorem. Assessment Card 4 aligned with the skill in proving statements on triangle congruency by applying different theorems on isosceles triangle. The assessment result identified the knowledge and skills that students need to develop. This can also be a basis for the teacher in assessing students' progress with the topic. There was also space for the student to evaluate their learning by checking the appropriate box corresponding to their scores. Through this, students can reread and revisit previous cards for clarification if they got low scores in the assessment.

The results showed that assessment cards helped students deepen their understanding of the SIM content and involved them in the learning process. It can be inferred that the assessment cards are one of the standards parts of the SIM as mandated by DepEd, as they include problems that develop higher-order thinking skills.

Enrichment Cards. This standard part of the SIM extends learning by providing additional drills and exercises to master the topic and further application of knowledge. It also reinforces the students' understanding of the SIM. The SIM has four enrichment cards that explore the world of congruent triangles. Enrichment Card 1 was aligned with the three focused skills, such as enriching students' understanding of the different markings found on the congruent triangles along SSS, ASA, SAS, AAS congruence, and HyL, HyA, LL, LA congruence. Enrichment Card 2 was aligned with the skill in proving statements on triangle congruency by SSS, ASA, SAS congruence postulates, and AAS congruence theorem. Enrichment Card 3 was aligned with the skill in proving statements on triangle congruency by congruent triangles, such as HyL, HyA, LL, and LA congruence theorem. Enrichment Card 4 is aligned with the skill topic in proving statements on triangle congruency by applying different theorems on the isosceles triangle. There was also space for the student to share their learning experience in the SIM by checking appropriate boxes corresponding to their feelings about their work. Through this, students can reflect on their understanding of the topic and find ways to cope whenever they get low scores.

Answer Key cards. This standard part of the SIM contains all the answers to the different tasks found in the activity cards, as well as in the assessment cards and enrichment cards. This part allows student to check their understanding and progress. Answers were intended for self-evaluation to facilitate independent learning. It helps students identify the questions where they made mistakes and where they need improvement. It gives students insight into planning their studies accordingly to achieve their goals. Moreover, answer key

cards allow students' independent learning since all the answers in the activity cards and in the assessment cards are present, allowing learners to check and recheck their responses to the questions evident in the SIM. The results showed that answer key cards helped check understanding of the SIM's content and involved students in learning. It can be inferred that answer key cards are one of the standard parts of the SIM as mandated by DepEd, as they include answers and solutions to the problems presented in the SIM.

Reference Card. This part of the SIM provides students access to materials that support continued learning and reinforce previously acquired topics and skills. Power-of-2 SIM is carefully developed to provide a researched list of resources, such as books, modules, links, and other resources that reinforce the concept and skill learned and provide additional content not found in the SIM for the student to refer to for further reading. It also includes a list of resources the researcher has used to write and make Power-of-2 strategic intervention material. It gives supporting evidence for the content and ideas present in the SIM. Reference card is an important part of Power-of-2 as it allows learners to deepen their own understanding of the competencies covered in the SIM. The results showed that the reference card helped students deepen and expand their understanding of the SIM content and involved them in the learning process. It can be inferred that the reference card is one of the standard parts of the SIM as mandated by DepEd, as it includes references and sources that allow learners to access other materials for more input and information regarding the topic.

Curricular Validity of Power-of-2 Strategic Intervention Material

The evaluation of curricular validity performed on the Power-of-2 Strategic Intervention Material includes face, content, and construct validity. Validation by experts is essential; the developed instructional material, such as Power-of-2, undergoes proper validation to produce quality-assured material. The Power-of-2 strategic intervention material was reviewed and analyzed by the ten experts in the field of Mathematics, who validated the SIM through an evaluation checklist. Each aspect has ten indicators to evaluate the face, content, and construct validity.

Table 2 summarizes the curricular validity of the Power-of-2 strategic intervention material. All aspects were very highly valid in terms of construct, with an average weighted mean of 4.98; content validity, with an average weighted mean of 4.91; and face validity, with an average weighted mean of 4.85. Overall, the Power-of-2 strategic intervention material was very highly valid, with an average weighted mean response of 4.91.

Table 2
Summary of the Curricular Validity of the Power-of-2 Strategic Intervention Material

Aspects	AWM	Int	R
Construct	4.98	VHV	1
Content	4.91	VHV	2
Face	4.85	VHV	3
Overall AWM	4.91	VHV	

The result implied that the developed Power-of-2 Strategic Intervention Material met construct, content, and face validity criteria. This implies that the organization of the content of Power-of-2 Strategic Intervention Material measures the construct being measured. The content of the SIM provided competency-based activities under the different standard parts, such as the Guide Card, Activity Card, Assessment Card, Enrichment Card, Answer Key Card, and Reference Card. The face indicated that the SIM used in this study has its unique feature, and font size and style, spacing, overall layout, graphics and illustrations, and color of the texts and images were appropriate and applicable for the learners. It can be inferred that the validators agreed to the validity of the developed strategic intervention material. The result justified the use of Power-of-2 SIM in providing additional learning information.

Level of the Mathematics Proficiency of the Control and Experimental Groups on Triangle Congruency after the Use of SIM

Table 3 presents the post-test results conducted with the Grade 8 students to determine the mathematics proficiency level of the Control and Experimental groups on Triangle Congruency. All acquired scores are based on the weighted raw score of the students' assessment and are interpreted according to the transmutation standard of DepEd. These include the competencies along with proving statements on triangle congruency. Data were presented in terms of the number of items, mean, standard deviation, and performance level.

Table 3
Level of Mathematics Proficiency of the Control and Experimental Groups on Triangle Congruency

Competencies	Control					Experimental				
	N	Mean	SD	PL	Int	N	Mean	SD	PL	Int
Proving statements on triangle congruence by SSS, ASA, SAS congruence postulate, and AAS congruence theorem	16	8.22	2.61	51.38	DME	16	10.29	2.46	64.31	DME
Proving statements on triangle congruence by congruent right triangles	16	9.04	2.81	56.50	DME	16	11.31	2.28	70.69	DME
Proving statements on triangle congruence by applying theorems on isosceles triangle	8	3.64	1.60	45.50	DME	8	4.98	1.45	62.25	DME
Average		6.97		51.13	DME		8.86		65.75	DME

In proving statements on triangle congruence by SSS, SAS, ASA congruence postulates, and AAS congruence theorem, the post-test result of the control group obtained a mean score of 8.22 with a proficiency level of 51.38 and a standard deviation of 2.61. The post-test results of the experimental group obtained a mean score of 10.29, with a proficiency level of 64.31 and a standard deviation of 2.46. In proving statements on triangle congruence by congruent right triangles, the control group obtained a mean score of 9.04 with a proficiency level of 56.50 and a standard deviation of 2.81. In contrast, the experimental group obtained a mean score of 11.31, a performance level of 70.69, and a standard deviation of 2.28 and in proving statements on triangle congruence by applying theorems on Isosceles triangle, the control group obtained a mean score of 3.64, with a proficiency level of 45.50 and a standard deviation of 1.60. In contrast, the experimental group obtained a mean score of 4.98, with a proficiency level of 62.25 and a standard deviation of 1.45 and in proving statements on triangle congruence by applying theorems on Isosceles triangle, the control group obtained a mean score of 3.64, with a proficiency level of 45.50 and a standard deviation of 1.60. In contrast, the experimental group obtained a mean score of 4.98, with a proficiency level of 62.25 and a standard deviation of 1.45.

The respondents from the control group got an overall average mean of 6.97, an overall proficiency level of 51.13. The respondents from the experimental group got an overall average mean of 8.86 and an overall proficiency level of 65.75.

This means that the overall proficiency level of both groups was interpreted as not meeting expectations but statistically improved based on the data presented. With the implementation of the SIM, the proficiency level of the respondents exposed to it significantly improved, while those who were not had a slight increase in their proficiency level. This means that students taught with SIM performed better and scored higher than those taught without SIM.

Difference in the Proficiency Level of the Control and Experimental Group in Proving Statements on Triangle Congruency.

The pre-test and post-test were conducted to determine whether the mathematics proficiency level of Grade 8 students improved when the Power-of-2 strategic Intervention material was utilized. A T-test for independent samples was used to determine whether there was a significant difference in the proficiency level of the control and experimental group in proving statements on triangle congruency. The succeeding tables indicate the comparative mathematics proficiency level of the control and experimental groups of Grade 8 students. Tables 4A to 4D present the t-values and critical values, which are the basis of the interpretations and decisions.

Difference between the Pre-tests of the Control and Experimental Groups.

Table 4A revealed no significant difference between the pre-test mean scores of the students in the experimental and control groups in proving statements on triangle congruency.

In proving statements on triangle congruence by SSS, SAS, ASA congruence postulate, and AAS congruence theorem, the computed t-value was 0.739 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences. In proving statements on triangle congruence by congruent right triangles, the computed t-value was 1.131 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences. In proving statements on triangle congruence by applying theorems on isosceles triangles, the computed t-value was 1.835 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences.

Table 4A
Difference Between the Pre-Tests of the Control and Experimental Groups

Pretest – Pretest	t-value	Df	Critical Value	Int
Proving statements on triangle congruence by SSS, ASA, SAS congruence postulate, and AAS congruence theorem	0.739	88	1.987	NS
Proving statements on triangle congruence by congruent right triangles	1.131	88	1.987	NS
Proving statements on triangle congruence by applying theorems on isosceles triangle	1.835	88	1.987	NS

The computed t-value in all competencies is less than its corresponding t-critical value, which means that no difference existed in the pre-test performance level of the control and experimental groups. This means that the null hypothesis was accepted, which denotes that there was no significant difference in the proficiency level of the experimental and control groups in proving statements on triangle congruency. Students from both groups showed a poor understanding of concepts and performed poorly in the pre-test. It can be inferred that the students from both groups have more or less the same level of understanding of the concepts.

Difference Between the Pre-Test and Post-Test of the Control Group

Table 4B presents a significant difference in the pre-test and post-test mathematics proficiency of the control group in proving statements on triangle congruency.

In proving statements on triangle congruence by SSS, SAS, ASA congruence postulate, and AAS congruence theorem, the computed t-value was the absolute value of -4.827 at 88 degrees of freedom with a critical value of 1.987 at alpha 5% level for significant differences; in proving statements on triangle congruence by a congruent right triangle, the computed t-value was the absolute value of -6.123 at 88 degrees of freedom with a critical value of 1.987 at alpha 5% level for significant differences; and in proving statements on triangle congruence by applying different theorems on an Isosceles triangle, the computed t-

value was the absolute value of -2.555 at 88 degrees of freedom with a critical value of 1.987 at alpha 5% level for significant differences.

Table 4B
Difference Between the Pre-Test and Post-Test of the Control Group

Pretest – Posttest	t-value	Df	Critical Value	Int
Proving statements on triangle congruence by SSS, ASA, SAS congruence postulate, and AAS congruence theorem	-4.827	88	1.987	S
Proving statements on triangle congruence by congruent right triangles	-6.123	88	1.987	S
Proving statements on triangle congruence by applying theorems on isosceles triangle	-2.555	88	1.987	S

The computed t-value is greater than its corresponding t-critical value in all competencies, which means that a difference existed in the pre-test and post-test performance of the control group. This means that the null hypothesis was rejected, which denotes a significant difference in the pre-test and post-test proficiency of the control group in proving statements on triangle congruency. The traditional teaching method signifies that students exposed to the traditional method have learned something about proving statements on triangle congruency, indicated by an increase in the score during the post-test.

Difference Between the Pre-Test and Post-Test of the Experimental Group

Table 4C presents the experimental group's pre-test and post-test performance in proving statements on triangle congruency.

Table 4C
Difference Between the Pre-Test and Post-Test of the Experimental Group

Pretest – Posttest	t-value	Df	Critical Value	Int
Proving statements on triangle congruence by SSS, ASA, SAS congruence postulate, and AAS congruence theorem	-9.963	88	1.987	S
Proving statements on triangle congruence by congruent right triangles	-12.787	88	1.987	S
Proving statements on triangle congruence by applying theorems on isosceles triangle	-8.560	88	1.987	S

In proving statements on triangle congruence by SSS, SAS, ASA congruence postulate, and AAS congruence theorem, the computed t-value was the absolute value of -9.963 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences. In proving statements on triangle congruence by congruent right triangles, the computed t-value was the absolute value of -12.787 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences. In proving statements on triangle congruence by applying different theorems on the isosceles triangle, the computed t-value was the absolute value of -8.560 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences.

The computed t-value is greater than its corresponding t-critical, which means that a difference existed in the pre-test and post-test proficiency of the experimental group. This means that the null hypothesis was rejected, which denotes a significant difference in the pre-test and post-test proficiency of the experimental

group in proving statements on triangle congruency. It can be inferred that the students' mathematics proficiency under the experimental group increased after exposure to the intervention material. The activities provided in the Power-of-2 strategic intervention material helped students understand and master the concepts.

Difference Between the Post-Tests of the Control and Experimental Groups

Table 4D presents the post-test proficiency results of the Control and Experimental groups in proving statements on triangle congruency.

In proving statements on triangle congruence by SSS, SAS, ASA congruence postulate, and AAS congruence theorem, the computed t-value was the absolute value of -3.869 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences. In proving statements on triangle congruence by congruent right triangles, the computed t-value was the absolute value of -4.197 at 88 degrees of freedom with a critical value of 1.987 at an alpha 5% level for significant differences. In proving statements on triangle congruence by applying different theorems on the isosceles triangle, the computed t-value was the absolute value of -4.141 at 88 degrees of freedom with a critical value of 1.987 at alpha 5% level for significant differences.

Table 4D
Difference Between the Post-Tests of the Control and Experimental Groups

Posttest – Posttest	t-value	Df	Critical Value	Int
Proving statements on triangle congruence by SSS, SAS, ASA congruence postulate, and AAS congruence theorem	-3.869	88	1.987	S
Proving statements on triangle congruence by congruent right triangles	-4.197	88	1.987	S
Proving statements on triangle congruence by applying theorems on isosceles triangle	-4.141	88	1.987	S

The computed t-value is greater than its corresponding t-critical value in all competencies, which means that a difference existed in the post-test performance of the control and experimental group. Statistical findings revealed that the null hypothesis was rejected, which denotes that there was a significant difference in the post-test performance of the control and experimental group in proving statements on triangle congruence by applying different theorems on an isosceles triangle. It could be concluded that the mathematics performance of the students in proving statements on triangle congruency on the three competencies between the control and experimental group poses a big difference. It is presented that the learning is higher on the part of the experimental group than the control group.

Effectiveness of Power-of-2 Strategic Intervention Material on the Academic Performance of the Grade 8 Learners

The developed Power-of-2 strategic intervention material is composed of content and topics that improve the students' mathematical proficiency, as this study aims to do. Table 5 presents the experimental group's comparative pre-test and post-test proficiency in proving statements on triangle congruency.

Table 5
Effectiveness of the SIM on the Academic Performance of the Grade 8 Learners

Competencies	$M_1 - M_2$	Cohen's D	Int
Proving statements on triangle congruence by SSS, ASA, SAS congruence postulate, and AAS congruence theorem	5.05	2.10	Large Effect
Proving statements on triangle congruence by congruent right triangles	6.27	2.70	Large Effect
Proving statements on triangle congruence by applying theorems on isosceles triangle	2.65	1.80	Large Effect

In proving statements on triangle congruence by SSS, SAS, ASA congruence postulate, and AAS congruence theorem, the experimental group records a pre-test and post-test mean difference of 5.05 with a Cohen's D result of 2.10, more significant than 0.8. In proving statements on triangle congruence by congruent right triangles, the experimental group records a pre-test and post-test mean difference of 6.27 with a Cohen's D result of 2.70, more significant than 0.8. In proving statements on triangle congruence by applying different theorems on isosceles triangle, the experimental group records a pre-test and post-test mean difference of 2.65 with a Cohen's D result of 1.80, more significant than 0.8.

The result showed that the experimental group achieved a higher proficiency level required in the learning competencies. With this finding, it can be inferred that the strategic intervention material has a large effect and is effective in improving the students' mathematics proficiency, which led to a high performance in proving statements on triangle congruency. It is presented that the learning is higher on the part of the experimental group in the post-test results. This implies that using SIM as a remediation and supplementary material affects students' proficiency in mathematics.

Conclusion

Based on the findings, the students' mathematics proficiency status did not meet the criterion prescribed by DepEd and denotes a low understanding of concepts in proving statements on triangle congruency. The Power-of-2 strategic intervention material followed an appropriate design with an appropriate self-paced learning element. The activities were composed of content that aligned with the curriculum guide under the K to 12 curriculum and were appropriate to the respondents' levels. The curricular validity of Power-of-2 Strategic Intervention Material was very highly valid in terms of face, content, and construct. The mathematics proficiency level of the experimental and control groups did not meet expectations based on the criteria set by the Department of Education. However, both groups gained a comprehensive understanding of the competency covered in the SIM, as reflected in the scores gained in the post-test. The experimental group showed higher mathematics proficiency than the control group. The study showed that the difference between the control and experimental group in the pre-test was not significant, the difference between the control and experimental group in the post-test was significant, the difference between the pre-test and post-test of the control group was significant, and the difference between the pre-test and post-test of the experimental group was significant. Power-of-2 Strategic Intervention Material has a large effect and was effective in improving the mathematics proficiency of Grade 8 students in proving statements on triangle congruency.

Recommendations

The study suggests that teachers must continue to conduct interventions to address the learning gaps, using intervention materials such as strategic intervention materials, by determining and considering the learners' needs and interests to encourage them to perform well in Mathematics. When developing strategic intervention material, teachers should consider the students' levels, interests, and needs to capture their interest in learning. The material's content should be aligned with the curriculum guide under the K to 12 Curriculum.

Additionally, Mathematics teachers are encouraged to develop intervention materials that undergo validation. The Power-of-2 strategic intervention material can be utilized as a supplementary and remediation material for students to improve their mathematics proficiency and for teachers to address the least learned competency in Mathematics. Teachers can use Strategic Intervention Material (SIM) to re-teach concepts and skills and improve students' mathematical proficiency. Intervention materials that address learning competency in the least-mastered skills in the subject. The teacher should continuously develop strategic intervention materials that improve the students' mathematical proficiency to facilitate their learning and increase their interest in mathematics. Grade 8 students should use the Power-of-2 Strategic Intervention Material as one of the supplementary materials to enhance learning and to understand the concept of proving statements on triangle congruency.

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