International Journal of Education & Literacy Studies
ISSN: 2202-9478
www.ijels.aiac.org.au

Differentiated Scaffolding Strategies in Triangle Congruence: Their Effects on Learners' Academic Performance and Confidence in Mathematics

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ARTICLE INFO

Article history
Received: January 12, 2022
Accepted: April 22, 2022
Published: April 30, 2022
Volume: 10 Issue: 2

Conflicts of interest: None
Funding: None

ABSTRACT

The benefits of differentiated scaffolding strategies on boosting academic performance and confidence in Mathematics learners were studied in this paper. Quasi-experimental research was conducted at a state university's Secondary School Laboratory in the Philippines. It involved sixty Grade 8 learners, 30 from the control group and 30 from the experimental group. A panel of specialists assessed developed lessons on triangle congruence topics and the academic performance test and confidence scale. The developed lesson, test, and scale were improved after the panel of experts' comments and suggestions were considered. The instruments were pilot tested and came out reliable; the academic performance test had a Cronbach alpha of 0.807, while the confidence scale in Mathematics had a Cronbach alpha of 0.810. In addition, the mean, standard deviation, One-way Analysis of Covariance (ANCOVA), and Pearson Product Moment Correlation were used to analyze the data. The findings demonstrated that when learners were taught using differentiated scaffolding strategies, their academic performance significantly increased at the Fairly Satisfactory level. However, when they were taught using conventional teaching strategies, their academic performance remained at Did Not Meet Expectations. The performance outcomes of both groups were significantly different. Also, there was no significant difference in learners' confidence between the two groups when compared. Furthermore, there was a significant link between academic performance and confidence in Mathematics among students taught using differentiated scaffolding methodologies. Thus, concerns about increasing learners' mathematical literacy may be addressed with differentiated scaffolding strategies.

Key words: Differentiated Instruction, Mathematics Confidence, Mathematics Education, Teaching Strategies

INTRODUCTION

Teaching mathematics in the Philippines faced a considerable paradigm shift when the K to 12 Curriculum was introduced and implemented in the school year 2012-2013. The introduction of the curriculum had changed the way teachers have to teach mathematics. At the onset of the curriculum's implementation, mathematics teaching was strengthened by introducing the spiral progression approach. The said approach ensured learners acquire the necessary knowledge and skills appropriate to their developmental stage with high retention and mastery through continuous review and revisit of previous knowledge. The new curriculum envisioned learners to be critical thinkers and problem solvers.

However, regardless of the curriculum enhancement in mathematics and the strategies that go with it, the same recognizable outcome in mathematics education and literacy was observed among Filipino learners. Most of the learners had low Mathematics performance in the international, national, and local assessments. The recent 2018 Program for International Student Assessment (PISA) results revealed that the Philippines performed poorly in Mathematics among the participating Organization for Economic Cooperation and Development (OECD) countries. The country ranked 78th of the 79 countries participating in the international assessment. The National Achievement Test (NAT) results in Mathematics were parallel to the PISA results. The 2018 NAT results indicated that Filipino learners performed way below the acceptable mean percentage score in Mathematics, which is considered a low mastery level. Based on observation and performance records, a state university's Secondary School Laboratory learners were not exempted. Some high school students from this institution also demonstrated low academic performance in the said subject area.

The alarming results from international, national, and local assessments in Mathematics go back to how the K to 12 Basic Education Curriculum was implemented in schools. One of the factors considered is the teaching strategies used by the teachers. To understand more about this

Published by Australian International Academic Centre PTY.LTD.

http://dx.doi.org/10.7575/aiac.ijels.v.10n.2p.131

concern, unstructured interviews and observations were done. Based on observation and unstructured interviews, some teachers still teach the suggested learning competencies in the traditional way, which is a mismatch in teaching twenty-first-century learners. The traditional way of teaching, according to Dimitrios et al. (2013), is teacher-centered and is usually done through lectures and discussions. Also, the problem-solving activities that should be done by students are discussed or lectured by the teacher. Also, Naimiea et al. (2010) studied the teachers' teaching style and learners' learning style preference and their match or mismatch on learners' performance. The results suggest that matching teaching and learning styles improve student accomplishment up to a degree. With that, the teaching strategies of Mathematics teachers need to be updated to cater to their learning styles and diverse needs.

Many different strategies are used in the classroom setting to improve academic performance. Scaffolding and differentiated instruction are two of these strategies. In the Philippines, studies found that scaffolding and differentiated instruction enhance learners' performance (Tambaoan & Gaylo, 2019; Dagoc & Tan, 2018). These strategies provide instruction to learners based on their learning needs. Scaffolding demands intellectually assisting the learners as they improve toward a goal, slowly moving the responsibility from the teacher to the student as the student becomes self-reliant (Bakker et al., 2015). However, the learner might take a long time to engage in the scaffolding strategy used due to a lack of self-confidence to participate in the activity. If the learner is not prepared to engage in the lesson, it would be challenging to scaffold learning. The American Psychological Association (2021) pointed out that learners with low self-esteem or confidence doubt their potential to succeed, making them reluctant to engage in learning or take academic risks.

On the other hand, differentiated instruction as a strategy means delivering the same information to all students using a collection of different teaching schemes, or it may necessitate the teacher to teach at varying levels of challenges based on the ability of each student (Tomlinson, 2001). Yet, in differentiation alone, the teacher might be limiting the learners' ability to enjoy activities that other learners can also do on different learning styles. It can stereotype the kind of learners that they can't benefit from activities that could be a way to help them learn more. Those gaps can be figured out in a combination of these strategies called differentiated scaffolding strategies, which is the blending of scaffolding strategies and differentiated instruction.

Differentiated scaffolding is a relatively new strategy, and very few studies have been conducted regarding its use and effect on the academic performance of learners. Scaffolding and differentiated instruction, when treated separately, however, have been established to help aid learners learn various subject areas, including mathematics. Teaching strategies in Mathematics alone do not merit fruitful learning (Gaylo & Dales, 2017). One reason for this phenomenon is the learners' lack of confidence in mathematics and low self-esteem. Usually, when they are introduced to challenging mathematical concepts and problems, the learners typically say that these are difficult and could not do the computation. The age-old notion and belief that mathematics is a grueling subject persists.

The learners' confidence can influence the learners' behavior in the incorporation of the scaffolding strategies (Talebinejad & Akhgar, 2015). Thus, learners cannot perform better when they don't feel at ease with themselves to engage in the activities given by the teacher. The confidence then has a significant role in activating the learners' interest to participate and perform in the class. Gaffor and Kurukkan (2015) examined the difficulties perceived by high school students and teachers in learning and teaching mathematics. They found that learners who lack self-confidence tend to feel more difficulty in understanding mathematics. Therefore, the dilemma among Mathematics teachers includes how they could make their learners learn mathematics in a non-threatening manner. Most teachers also struggled to make their math lessons in a way that is exciting and interesting to the students who have believed that math is a complicated and unexciting subject. In short, math teachers are constantly challenged to teach math successfully and effectively.

Thus, this study is interested in investigating the effectiveness of differentiated scaffolding strategies on students' academic performance and confidence in Mathematics. This study determined if using this combined strategy will influence the Grade 8 students' confidence in learning math and their academic performance in this subject area. Also, the study focused on triangle congruence because the needs analysis result revealed that it is the topic that is least mastered by Grade 8 learners.

Framework of the Study

The study is anchored on the concept that teaching strategies may boost learners' confidence in Mathematics and increase their performance. This concept includes the notions of scaffolding that stems from the thought of "Zone of Proximal Development" (ZPD) by Lev Vygotsky (1978), the idea of differentiated instruction, and the Theory of Self-Efficacy, which in this study refers to confidence in mathematics. These theories are widely used as theoretical underpinnings in latest studies and still hold relevance today (Verenikina, 2010; Takaya, 2008).

One essential concept in this study is the Zone of Proximal Development (ZPD). Vygotsky (1978) defined ZPD as the distance between the actual development level and the level of potential development. Accordingly, to develop the ZPD, the learners must actively interact socially with a knowledgeable adult or a capable peer. A learner can only progress to the ZPD and independent learning if a teacher or an expert first guides him or her. Moreover, the concept explains that the learner's behavior can be affected by the social interaction of another learner who is more expert or knowledgeable other. The collaboration of the two kinds of learners promotes a healthy exchange of ideas from one person to another. Whether by pair or group, the partnership is realized using scaffolding strategies, which depend on their readiness levels. At the heart of the concept of ZPD is scaffolding, which was introduced by Bruner (1978). His description of

scaffolding is that when children start to learn new concepts, they need help from adults to help them. Scaffolding requires intellectually supporting learners as they move to achieve a goal, slowly diverting the responsibility, for example, from the teacher to the student as the student becomes more self-reliant (Bakker et al., 2015). In other words, scaffolding represents how children's learning can be supported.

An equally important concept of the study is differentiated instruction, an approach to instruction that incorporates a variety of strategies in providing entry points, learning tasks, and outcomes tailored to students' learning needs (Hall et al., 2003). The differentiated instruction is composed of planning and delivery of instruction, classroom management techniques, and expectations of the learners' performance that consider the diversity and varying levels of readiness, interests, and learning profiles of the learners (Tomlinson, 2001). Differentiation is responsive instruction designed to meet unique individual student needs.

Mathematics confidence in this study also refers to the Theory of Self-efficacy, which has been advanced by Bandura (1997). According to this theory, beliefs are constructed from the four primary sources of information, namely enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective states. Within the context of teaching, the enactive mastery experience is the act of education by an individual. Vicarious experience, on the other hand, is an individual observing another individual teach. Meanwhile, verbal persuasion is any teaching information conveyed to another individual. Finally, physiological and emotional states are experiences while engaging in events associated with the first three principal sources of information.

As used in this study, the Theory of Self-Efficacy or self-confidence postulates that when a person observes another similar individual successfully model a given event, individual efficacy beliefs or self-confidence are typically raised. On the opposite view, when a person follows another similar individual to fail at a given task, personal self-efficacy beliefs or self-confidence will naturally decline (Bandura, 1997). Therefore, it is presumed that effective differentiated scaffolding strategies employed in the delivery of lessons in mathematics will result in a higher level of confidence in mathematics, and higher academic performance in this subject will be observed.

Figure 1 illustrates the schematic diagram of the study. The box on the right side of Figure 1 indicates the teaching strategies used during the experiment. In contrast, the boxes on the left side indicate the dependent variables, namely academic performance and confidence in the mathematics. Since the study is quasi-experimental in design, the researcher has to use two groups: the control group, and the other is an experimental group wherein the intervention will be applied (Maciejewski, 2020). The control group of this study is taught using the conventional teaching strategies as suggested in the K to 12 learners' material which include knowing, processing, and transferring processes (Department of Education, 2014). The knowing strategy involve activities on understanding the mathematical concepts, while the processing strategy highlight the doing tasks. The transferring strategy involves reflection and transfer of knowledge and skills.

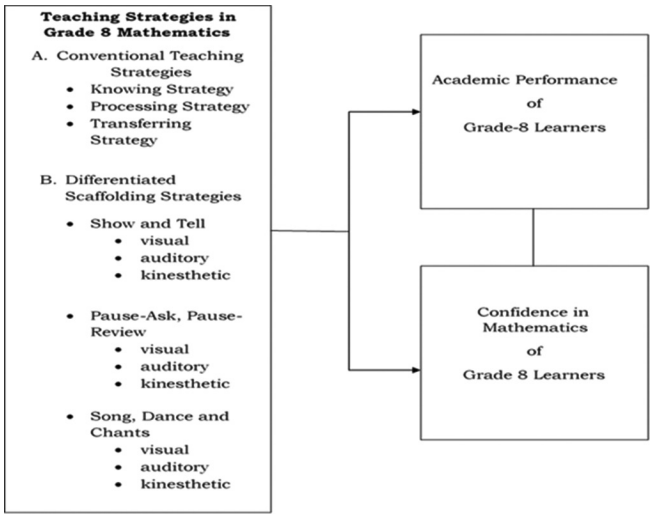

Figure 1. The schematic diagram showing the parameter of the study

On the other hand, the experimental group is taught with the same mathematical content as that of the control group but with a differentiated scaffolding strategy employing activities such as show and tell, pause-ask-pause-review and song, dance, or chants. These strategies are differentiated according to the learners' readiness, interests, and learning styles. The study uses multimedia, flexible grouping, and learner-centered activities. Such strategies are chosen as they resulted to learners' increase in performance and attributes based on studies (Tambaoan & Gaylo, 2019; Takahashi, 2008). The arrow to the right indicates the effects of differentiated scaffolding strategies on learners' academic performance and mathematics confidence. The possible relationship between confidence level and academic performance was also determined.

Statement of the Problem

This study investigated the effectiveness of differentiated scaffolding strategies in Grade 8 learners' academic performance and learners' mathematics confidence. The study was conducted at a state university's Secondary School Laboratory. Specifically, it answered the following questions:

1. What is the learners' academic performance when taught using conventional teaching strategies and when taught using differentiated scaffolding strategies?
2. Is there a significant difference in the learners' academic performance when taught using conventional teaching strategies and when taught using differentiated scaffolding strategies?
3. What is the learners' Mathematics confidence when taught using conventional teaching strategies and when taught using differentiated scaffolding strategies?
4. Is there a significant difference in learners' level of mathematics confidence when taught using conventional teaching strategies and when taught using differentiated scaffolding strategies?

5. Is there a significant relationship between academic performance and the level of Mathematics confidence among learners taught with differentiated scaffolding strategies?

METHODOLOGY

Research Design

A quasi-experimental pretest-posttest design was used in the study. A quasi-experimental research design examines whether there is a causal relationship between independent and dependent variables. The independent variable is the influencing variable, and the dependent variable is influenced (Loewen & Plonsky, 2015). In this study, the quasi-experimental design had two intact classes, one classified as the control group and the other as the experimental group. The experimental group was taught using differentiated scaffolding strategies, while the control group was taught using conventional methods. All groups were given a pretest and posttest before and after the conduct of the study.

Research Locale and Participants

The study was conducted at a Secondary School Laboratory located in Northern Mindanao, Philippines, in 2019. Sixty Grade 8 learners were considered participants of the study. Thirty learners were from the experimental group, while the other thirty came from the control group. There were fifteen males and females in a group. Each group belongs to a section where learners' ages vary between 12-14 years old. Moreover, these students have different learning styles like all students do. Each group consists of ten learners who learn best when exposed to visuals, another ten are auditory learners, and the last ten is kinesthetic ones.

Research Instruments

There were two research instruments used in this study. These are the performance test and the confidence in mathematics scale. Both tools were composed of 30 items. The performance test was guided by the table of specifications (TOS) consisting of essential domains from the Revised Bloom's Taxonomy. There were adjustments in the TOS, and these were made sure that the percentage on the competency thinking level is 20% lower, 40% average, and 30% higher. The test covered the four lessons of triangle congruence in a 30-item multiple choice format. Also, the confidence scale in mathematics was patterned after Sander and Sanders (2015) and was revised to suit the present study. The 30-item confidence scale is Likert-like and is subdivided into four categories: mastery expertise (7 items), vicarious experiences (7 items), verbal persuasion (7 items), and physiological and emotional state (9 items). The instruments cited were subjected to the experts' validation. Revisions were made based on the experts' comments and suggestions.

Further, the revised tools were pilot tested for reliability analysis. In the investigation, the performance test generated a Cronbach alpha of 0.807, while the confidence scale in Mathematics had 0.810. It reflects that the instruments were reliable, dependable, and consistent to assess the learners' academic performance and confidence in Mathematics.

Research Procedure

Before implementing the study, the researcher secured approval from concerned authorities. Protocols and ethical considerations were followed, including obtaining consent from the school head, parents, and students for voluntary participation in the study. Pretests on the concepts to be discussed and confidence in Mathematics was given to the learners before the intervention. In the implementation phase, one entire class was considered the control group whose learners will be exposed to the conventional teaching strategies stipulated in the teachers' guide. On the other hand, another entire class was taught using differentiated scaffolding strategies.

Both classes have the same teacher, topics, competencies, and assessment. They only differ in the teaching strategies. The control group had knowing, processing, and transferring processes. The knowing strategy involves activities on understanding the mathematical concepts behind triangle congruence, while the processing strategy highlights the doing tasks on the different theorems. The transferring strategy involves reflection and transfer of knowledge and skills on triangle congruence in real life. In contrast, the experimental group had differentiated ways, based on learning styles, in dealing with the show and tell activity, the pause-ask, pause-review strategy, and the songs, dance, and chants. These strategies are sequentially arranged before, during, and after the lessons. Before the lesson, all the groups had a show and tell activity tailor-fit to visual, kinesthetic, and auditory learners. During and after the lessons, all groups will have pause-ask, pause-review strategy, and songs, dance, and chants which were also based on the groups' learning styles. Afterward, posttests on the concepts discussed and confidence in Mathematics form were answered by the learners.

Scoring Procedure

The researcher anchored the scoring procedure of the researcher-made performance test to the DepEd Order No. 8, s. 2015, which contains the policy guidelines on classroom assessment for the K to 12 Basic Education Program (Department of Education, 2015). In the 30-item multiple-choice, every correct answer was given one (1) point, and the overall result was interpreted using the scoring matrix as shown in Table 1. For the learners' confidence in mathematics, the study also utilized the scoring matrix shown in Table 2.

Treatment of Data

To answer questions 1 and 3, which are on determining the learners' academic performance and confidence, descriptive statistics were used like frequency, percentage, mean, and standard deviation. For questions 2 and 4, analysis of covariance (ANCOVA) is used to compare the post-test results of learners' academic performance and confidence

Table 1. Scoring matrix for the performance test in triangle congruence

Score Range	Grading Scale	Description	Qualifying Statements
26-30	90-100	Outstanding	Exceeded the core requirements regarding knowledge, skills, and understanding of triangle congruence.
23-25	85-89	Very Satisfactory	Developed the fundamental knowledge, skills, and understanding of triangle congruence and transferred them automatically and flexibly through an authentic task.
21-22	80-84	Satisfactory	Developed the fundamental knowledge, skill, and understanding of triangle congruence from the teacher and transferred these understandings to the authentic task.
18-20	75-79	Fairly Satisfactory	Possessed the minimum knowledge, skills, and core understanding in triangle congruence.
0-17	Below 75	Did not meet expectations	Struggled with understanding the prerequisite and fundamental knowledge and skills in triangle congruence.

Table 2. Scoring matrix for learners' confidence in mathematics

Scale	Range	Qualitative Description	Qualifying Statements
5	4.21-5.00	Very Much Confident	Learners always have much higher trust in their mastery expertise, verbal persuasion, vicarious experiences, and physiological and emotional states in mathematics.
4	3.41-4.20	Very Confident	Learners usually have high trust in their mastery expertise, verbal persuasion, vicarious experiences, and physiological and emotional states in mathematics.
3	2.61-3.40	Moderately Confident	Learners sometimes have moderate trust in their mastery expertise, verbal persuasion, vicarious experiences, and physiological and emotional states in mathematics.
2	1.81-2.60	Not So Confident	Learners have low trust in their mastery expertise, verbal persuasion, vicarious experiences, and physiological and emotional states in mathematics.
1	1.00-1.80	Not Confident at all	Learners do not trust their mastery expertise, verbal persuasion, vicarious experiences, and physiological and emotional states in mathematics.

taking pretest results as the covariate. To answer question 5, Pearson product-moment correlation is used to determine if a significant relationship exists among the variables.

RESULTS AND DISCUSSION

Academic Performance of Learners

Before and after implementing the lessons in mathematics utilizing the differentiated scaffolding and conventional teaching strategies to the control and experimental groups of students, pretests and posttests were administered to determine the research participants' academic performance in mathematics. The results of the pretests and posttests are shown in Table 3.

It can be gleaned from the table that both pretest results of the control and experimental groups are low. The mean scores of both groups during the pretests can be qualitatively described as did not meet the expectations. From the control group, 94% of the students got scores that range from 0-17, while 86% of the students from the experimental group got the same score range in the pretest. This result means that most students from the two groups struggled in understanding the prerequisite and fundamental knowledge and skills in triangle congruence.

For instance, majority of students have difficulties understanding basic triangle congruence concepts, including stating and illustrating SAS, ASA, and SSS congruence postulates. They also failed to apply postulates and theorems on triangle congruence and apply triangle congruence to perpendicular bisector and angle bisector, which are the competencies tested in the researcher-made academic performance test. The Grade 8 learners are expected to have at least mastered these competencies, but the pretest results indicate otherwise.

The frequency and percentage of pretest scores denote that before the conduct of the study, the participants in both the experimental group and the control group have least mastered the concepts in triangle congruence. The results recommend strategies that will aid the improvement of learners' performance. This result is similar to the study's findings conducted by Bangis and Gaylo (2019), where the learners also got low scores in the pretest.

In the same table, the posttest results of both groups show an increase in the mean scores. It can be seen in the table that the experimental group obtained a greater posttest mean score as compared to the control group. The former got a slightly higher mean score that can be described as fairly satisfactory, but the control group remained at the same level

Table 3. Pretest and posttest performance of learners

Level of Proficiency	Range of Scores	Control Group				Experimental Group			
		Pretest		Posttest		Pretest		Posttest	
		f	%	*f*	%	*f*	%	*f*	%
Outstanding (O)	26-30	0	0%	0	0%	0	0%	1	3%
Very Satisfactory (VS)	23-25	1	3%	0	0%	0	0%	4	13%
Satisfactory (S)	21-22	0	0%	2	7%	2	7%	5	15%
Fairly Satisfactory (FS)	18-20	1	3%	6	20%	2	7%	8	26%
Did Not Meet Expectations (DNME)	0-17	28	94%	22	73%	26	86%	13	43%
$\bar{x}$		12.47		15.30		13.10		18.03	
SD		3.75		3.06		2.84		4.65	
QD		DNME		DNME		DNME		FS	

that did not meet the expectation. Furthermore, the results presented using frequencies and percentages show that in the posttest results of the two groups, a higher rate (57%) of learners in the experimental group was noted. This result implies that some students already possessed the minimum knowledge, skills, and core understanding in triangle congruence after the intervention, which is the use of differentiated scaffolding used to deliver the topic.

On the other hand, the posttest result of the control group remained at the same level, although there were at least a few learners (27%) that got a level higher than what they reached in the pretest. The 27% who reached a fairly satisfactory level in the posttest result did not contribute to the overall mean score of the group. Hence, collectively, the group remained at a level that did not meet the expectations. These findings revealed that after implementing the lessons in triangle congruence using the conventional strategies, the students still struggled to understand the prerequisite and fundamental knowledge in this topic. These results imply that differentiated scaffolding strategies in teaching triangle congruence increases learners' performance higher than the conventional teaching strategies. During differentiated scaffolding, the learners in the experimental group were engaged in different activities according to their learning styles. The findings corroborate with Tambaoan and Gaylo (2019) and Owenubiugie and Iyoha (2017) that scaffolding methods and differentiation produce better results than conventional methods.

To determine whether there is a significant difference in the academic performance of the learners taught with scaffolding strategies and those taught with conventional strategies, one-way ANCOVA was used at 0.05 level of significance. Based on Table 4, results revealed a significant difference in the learners' academic performance when taught using differentiated scaffolding strategies than when taught using conventional teaching strategies, as shown by the p-value. The p-value of 0.01, which is less than 0.05, signifies that the study's null hypothesis is rejected. There is enough evidence to support the claim that the two groups compared vary in performance.

The use of differentiated scaffolding strategies like a show and tell (before the lesson), pause ask, pause review (during the lesson), and song, dance, or chants (after the lesson) resulted in an improved performance outcome when compared

Table 4. One-way ANCOVA comparing the results of learners' academic performance in mathematics

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	320.088	2	296.237	12.648	0.00
Intercept	344.439	1	433.427	27.221	0.00
Pretest	208.021	1	344.407	16.440	0.00
Group	84.125	1	240.450	6.648	0.01
Error	721.245	57	14.812		
Total	17708.000	60			
Corrected Total	1041.333	59			

to the conventional teaching strategies employing knowing activities (before the lesson), processing activities (during the lesson), and transferring activities (after the lesson).

Using a differentiated scaffolding strategy in teaching triangle congruence allowed the students to learn the basic concepts and applications based on their learning styles. For example, before the lesson, the experimental group experienced the show and tell (Takahashi, 2008) activities where visual learners in pairs experienced describing and creating pictures of the different triangle congruence postulates in their minds. On the other hand, the auditory learners in pairs shared the triangle congruence concepts more. The kinesthetic learners in pairs used string and straws to visualize the different postulates. Meanwhile, the control group had the usual knowing activities, which are usually exploratory activities and lectures.

During the lesson proper, learners from the experimental group had a pause, talk, and pause, review activities in the five lessons of triangle congruence. These activities were again differentiated according to learners' learning styles. Visual learners represented triangle congruence by illustrations drawn and sharing ideas by group. At the same time, auditory learners brainstormed concepts on triangle congruence and illustrated their ideas by drawing the figures also by the group. Also, the kinesthetic group performed activities that showed and demonstrated the use of triangle congruence. The control group had processing activities through drills and lectures on the other side. They also had board work in which they solved problems and arrived at correct answers as a class. Sample activities are presented in Figure 2.

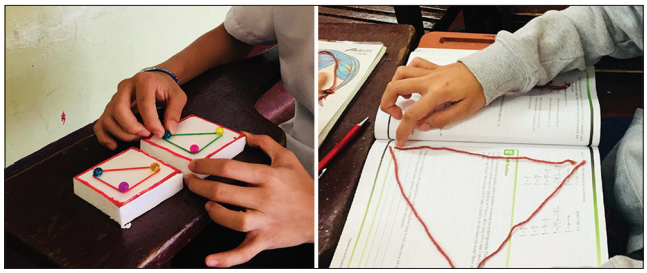

Figure 2. Sample activities done by the Grade 8 learners

After the lesson, the experimental group had a song, dance, or chants that differed according to the learners' learning styles, while the control group had transferring activities. The visual group created a short song and performed it. The auditory group created an advertisement related to triangle congruence. The kinesthetic group performed an action song related to the concepts they understood from the topic. As observed, the learners in the experimental group, at first, were shy to perform the differentiated tasks, but later on, they managed to do well and enjoyed the varied activities. The learners were assessed based on rubrics.

A student remarked that he liked making songs or mnemonics because it makes him think of terms associated with triangle congruence (SAS, SSS, ASA, and AAS). It allowed him to familiarize the different concepts and applications. This result is similar to the findings of the study conducted by Balbuena and Buayan (2015) on mnemonics and games that had an effective influence on the improvement of the academic performance of Grade 7 learners. The study of An et al. (2013) shared the positive effects on the ability of the students to use songs in modeling and strategies while solving a mathematical problem. Different scaffolding strategies may be given in many ways. However, the objective of the design is to help the learners make use of their maximum ability to reach the specific competency.

Likewise, the cited observation is supported by the findings of Civil (2007). The researcher examined whether learners learn mathematics better through music by comparing a traditional method of teaching mathematics versus mixing content and strategy involving mathematics and music. Results in the posttest showed a more significant difference in the mean scores, which means that the learners who were engaged with music in mathematics showed more improvement in the scores compared with no music. A student from the auditory group who had peer-discussion on topics, a series of debates, and the like reported that she enjoyed the lesson's delivery because she likes to learn about the topic with a partner. This way, she expressed her understanding of the different topics in triangle congruence with depth and interest. Andan et al. (2013) declared that different learning styles affect academic performance.

Learners' Confidence in Mathematics

To determine the confidence in the mathematics of both experimental and control groups, means and standard deviations of the student's scores in the confidence scale were obtained, analyzed, and compared. The level of mathematics confidence of the Grade 8 learners is shown in Table 5.

Table 5 presents the overall confidence in the mathematics of Grade 8 learners. Results indicate that before the conduct of the study, the participants in the experimental group were confident based on the mean pretest scale. In contrast, the participants from the control group were very confident in mathematics. When the students are confident, the learners usually have moderate trust in their mastery expertise, verbal persuasion, vicarious experiences, and physiological and emotional states in mathematics. Meanwhile, those who are very confident are learners who usually have high trust in the four areas of the math confidence scale.

During the posttest, the results showed a more positive response in favor of the control group, where the participants showed a higher level of confidence in mathematics. Only the physiological and emotional state had improved in the experimental group compared to the other factors and not the overall result. The confidence level of the students in this group remained at the same level, which is very confident. The study of Hasan et al. (2014) used self-efficacy factors, namely, mastery experience, vicarious experience, verbal persuasion, and physiological arousal, which the researcher adopted to use as factors. The learners' confidence is correlated to the teachers' lesson goals (Pleis et al., 2012). There could be a concern in the emotional state of the learners' previous experiences from the teacher that could affect the mathematics confidence. Hence, the learners were pleased with the emotional condition and physiological that helped them be more confident (Fogarty et al., 2001).

With the intervention, particularly differentiated scaffolding, the learners from the experimental group experienced working on activities that suit their learning styles. Consequently, the intervention encouraged active participation as the activities made the students engaged with the lessons. Mathematics confidence relates to understanding and perception towards mathematics (Nurmi et al., 2003). Higher mathematics confidence indicates higher mathematics performance (Liu & Koirala, 2009). The indicator shows that cooperative learning activities can improve mathematics confidence and performance (Khun-Inkeeree et al., 2017). Compared to the experimental group, the learners from the control group showed confidence in two areas of the confidence scale and two areas where they manifested a very confident level. Unlike the experimental group, the control group experienced activities that they were familiar with during the implementation of the lessons. The students need not adjust to their seatmates and group mates anymore.

To determine whether there is a significant difference in the level of confidence between learners taught with differentiated scaffolding strategies and those with conventional teaching strategies, one-way ANCOVA was used at a 0.05 level of significance. The result of the ANCOVA is shown in Table 6.

The results show no significant difference in the mathematics confidence between the experimental and control groups. The data show a higher p-value than 0.05; hence, the study's null hypothesis, which states that there is no significant difference in the mathematics confidence between

Table 5. Learners' confidence in mathematics and its dimensions

Confidence in Mathematics	Experimental Group						Control Group					
	Pretest			Posttest			Pretest			Posttest		
	$\bar{x}$	SD	QD	$\bar{x}$	SD	QD	$\bar{x}$	SD	QD	$\bar{x}$	SD	QD
Mastery Expertise	3.31	0.27	MC	3.39	0.16	MC	3.30	0.11	MC	3.54	0.13	VC
Vicarious Experience	3.53	0.12	VC	3.80	1.00	VC	3.47	0.13	VC	3.89	0.13	VC
Verbal Persuasion	3.05	0.14	MC	3.33	0.16	MC	3.22	0.06	MC	3.41	1.12	VC
Physiological and Emotional State	3.31	0.17	MC	3.54	0.11	VC	3.43	0.10	VC	3.67	0.13	VC
Over-all Confidence	3.03	0.34	MC	3.52	0.40	VC	3.36	0.38	VC	3.63	0.38	VC

Grade 8 learners taught using differentiated scaffolding strategies and those with conventional teaching strategies, is not rejected. There is no sufficient evidence to support the claim that two strategies make a difference in learners' Mathematics confidence.

Both the differentiated scaffolding strategies and conventional teaching strategies have similar results towards learners' confidence in Mathematics in terms of their mastery expertise, vicarious experience, verbal persuasion, and physiological and emotional state. Results suggest that either of the two strategies may boost learners' confidence. The results support the findings of Sander and Sanders (2001) on the confidence level of the different groups of learners that there was no significant difference in learners' confidence while taking various degree programs. Additionally, Hu's (2006) findings also showed no significant difference in students' performance after two scaffolding methods were used, such as computer-based concept and linking and retention of comprehension.

Table 6. One-way ANCOVA comparing the results of learners' confidence in mathematics

Source	Type III Sum of Squares	df	Mean Square	F	p
Corrected Model	2.519[a]	2	1.260	5.416	0.007
Intercept	9.944	1	9.944	42.758	0.000
Pretest	2.330	1	2.330	10.018	0.002
Group	0.124	1	0.124	0.533	0.468
Error	13.256	57	0.233		
Total	781.969	60			
Corrected Total	15.775	59			

Table 7. Correlation between mathematics confidence and academic performance of learners

Confidence	Academic Performance of Learners		
	r	r^2	p
Mastery Expertise	0.642	0.412	0.000
Vicarious Experience	0.484	0.234	0.007
Verbal Persuasion	0.577	0.332	0.001
Physiological and Emotional State	0.496	0.246	0.005
Overall Confidence	0.662	0.438	0.000

Relationship of Learners' Academic Performance and Confidence in Mathematics

Table 7 shows the results of correlation analysis involving the variables involved. As shown in the table, the findings reveal that there is a significant relationship between learners' academic performance and mathematics confidence in the experimental group. It is supported by the p-value (sig), which is less than the set of significance levels, which led the researcher to reject the null hypothesis. The learners' performance was tested at each level of confidence to have a more comprehensive relationship test. In mathematics confidence and factors such as mastery expertise, vicarious experiences, verbal persuasion, and physiological and emotional state, the null hypothesis had to be rejected in the experimental group since the p-values are less than the set level of significance.

Looking at the correlation coefficient r, the learners' overall confidence in mathematics positively correlates with their academic performance. Considering the dimensions of confidence, there is still a positive correlation for all. The coefficient of determination (r-squared) reveals that the learners' confidence in Mathematics explains 43.80% of the variation in academic performance. The more confident are the learners, the better they will perform in a Mathematics class. As observed in the students' performance in the differentiated scaffolding strategy, they were eager to do the task given to them. The kinesthetic group was confident in performing the song and dance to the class which made the class fun. The visual group's outputs made them active and participative. From the previous studies, for example, by Telbis et al. (2014), there was evidence that a correlation exists between self-efficacy and academic success. It adds that the learners who completed their program with a high score also had a high score in their confidence and vice versa.

It can be inferred from the results that the more differentiated scaffolding strategies are utilized and mathematics confidence, the greater the academic performance scores they would obtain. For these reasons, the differentiated scaffolding strategies are a venue to increase academic performance and confidence level. Effective strategies have to be incorporated in the teaching and learning process so that the learners will be highly confident in the class and, in the long run, will improve learners' academic performance.

The present study is supported by Mutodi and Ngirande (2014). Their study on learners' perception of mathematics performance resulted in a significant difference in perception

and beliefs about mathematics. In perception, self-confidence is a contributing factor. The correlation analysis results showed a strong positive relationship between performance and perception constructs such as self-confidence, interests in mathematics, teacher and learning support material, and myths and beliefs. The characteristics of learners show increasing independence when the scaffolding is given (Anghileri, 2006), while Hasan et al. (2014) stated that mastery experience, vicarious experience, verbal persuasion, and psychology arousal influenced self-efficacy in which confidence is a part of it. Their study found a significant relationship between self-efficacy and academic performance. Also, the study of Ayotola and Adedeji (2009) showed the same result of a positive relationship between mathematics self-efficacy and performance in mathematics.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results and findings of the study, it can be concluded that differentiated scaffolding strategies can help improve students' academic performance in Mathematics. When incorporated in the lesson, differentiated scaffolding strategies like the show and tell, pause-ask-pause-review, and songs, dance, and chants can aid the students in learning better in Mathematics. Therefore, differentiated scaffolding strategies like the show and tell, pause-ask-pause-review, and songs, dance, and chants can increase students' confidence in mathematics in terms of mastery expertise, vicarious experience, and verbal persuasion and physiological and emotional state. The more confident the learners are in class, the better the academic performance scores. As a result, increase in performance be achieved through the use of instructional strategies like differentiated scaffolding as it boosts learners' academic performance and increases their confidence.

As teachers take a great deal of time and effort in planning for their lessons, some may not find the idea of constantly incorporating differentiated scaffolding strategies as a practical course of action. For instance, since triangle congruence concepts are visual in nature, then show and tell would be an appropriate teaching strategy. Other concepts in Mathematics that can be presented in various ways and learned with appropriate scaffolding could make use of the cited strategies. Problem-solving on linear and quadratic equations, right triangle trigonometry, and algebra problems are some of the areas where differentiated scaffolding strategies can be utilized.

The differentiated scaffolding strategies are potential in developing learners' mathematical literacy. With the features of the strategies, learners' ability to think mathematically in a range of situations. It involves utilizing mathematical reasoning to understand and predict phenomena. It is recommended that another study may be conducted on differentiated scaffolding strategies utilizing other research methodologies. Mathematics teachers may utilize differentiated scaffolding strategies in their classrooms, while school leaders may train teachers on using the cited teaching strategy. Other researchers may explore more on mathematics confidence, in terms of its construct and influence on learning Mathematics.

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