Singapore Model and Mathematics Achievement of Students in Word Problem: A Quasi-Experimental Study

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ABSTRACT

This study was carried out to provide empirical data on the effect of teaching Junior High School students to solve Word Problems using the Singapore model method. This study employed a non-equivalent control group design, a quasi-experimental method. The participants were two heterogeneous sections of Grade 7 students from one of the private schools in Davao City. The instrument used in this study is a 26-item teacher-made test with 13 items for each of the following topics: Work Problems and Mixture Problems. This instrument was used in the pre-test and the post-test. The pre-test and post-test mean scores of the experimental and control groups were used to summarize, translate, and analyze the collected data. The t- test was used to determine the significant difference between the Singapore Model Method and Procedural strategy groups. The results show that the post-test mean score of experimental group and control groups is very high, which means that the students' academic achievement in word problem is very satisfactory. There is a significant difference between the experimental and control group's post-test mean gain scores. Their performance improved as anticipated, but the experimental group outperformed the control group due to significantly different mean gain scores. The study unequivocally established that the Singapore Model strategy has a favorable effect on participants' achievement in solving mathematical word problems.

KEYWORDS: Education, mathematics, procedural strategy, Singapore Model, quasi-experimental, Philippines

INTRODUCTION

Mathematics achievement is a requirement for academic success in the contemporary age. It is necessary for success in a wide range of fields (Pandey, 2017). Word problems contribute to students' overall math achievement (Hsiao, 2015). However, poor mathematics achievement, particularly in word problems, has been a worldwide concern for modern academic system (Daroczy et al., 2015). It has been remarked that over the years, secondary school students have frequently failed to acquire problem-solving skills and display mathematical thinking (Yeh et al., 2019). The learners' poor mathematics performance in word problems is evident in the Program for International Student Assessment (PISA), which reported that only 2.4 percent of participating countries acquired problem

solving abilities and more than 50 percent fall below the Organization of Economic Cooperation and Development math score when it comes to depicting situation mathematically (OECD, PISA 2018).

Furthermore, in South Africa, according to TIMMS, between 68 and 90 percent of African learners failed to meet the low international threshold in mathematics (Reddy et al., 2016). Consequently, in Indonesia, students' achievement scores in mathematics are extremely low, with only 2 percent achieving proficiency in solving math problems (Ajisuksmo & Saputri, 2017). Standardized test results and research by international organizations over the years have shown that high school students struggle with mathematics, especially word problems, which causes them to lag behind in their mathematics achievement (Nicolasa & Ematab, 2018).

Similarly, in the Philippines, the K-12 education system aims to instill in Filipino learners the rational reflection and worded problem-solving skills. This is obtained through the teaching of relevant skills and the provision of a rigorous curriculum and mathematical tools (Rodriguez & Abocejo, 2018). However, centralized assessments show that high school students need a long way to go before their critical thinking and problem-solving abilities have improved (Basri & Abdur, 2018). In the 2017 to 2018 Global Competitiveness Report, the Philippines' mathematics achievement in word problems needs to improve, ranking 76th out of 137 countries (World Economic Forum, 2018). In addition, Trends in International Mathematics 2019 reveals that the Philippines performed significantly beneath any other nation on worded math problems (Tadalan, 2021).

Moreover, according to Dinglasan and Patena (2013), Filipino students thrive in acquiring knowledge but underperform in subjects requiring higher order thinking skills. In the National Achievement Test (NAT, 2018), the Department of Education (DepEd) revealed that the average of high school students is 39.95 percent in problem solving (Gonzales, 2019). This further shows that learners performed way below the mean percentage score (MPS) of 75 percent. Inferentially, the patterns of student achievement in mathematics, notably in solving word problems, have been deteriorating for over two decades, with no improvement in the investigated nations (Guinocor et al., 2020).

A post-test in mathematics was administered by the Center for Learning and Assessment Development-Asia (CLAD) in one of the private schools in Davao City in May 2021. Clad Asia fostered timely and high-quality standards-based assessment tools anchored in the new K-12 curriculum to assist schools in evaluating students' performance in accordance with the DepEd-mandated standards and competencies. Results revealed that grade 7 students of S.Y 2020-2021 got an average of 6.26 which means they are in the beginner stage or the students demonstrate a low level of achievement in worded problems (CLAD, 2021).

Despite the extensive literature on word problem solving strategies; one notable work that addressed strategy is the use of cognitive tools in solving algebraic problems to improve math proficiency (Morin et al., 2017). There have been few studies on the effects of teaching word problem solving using Singapore model method. The research investigations indicated above revealed a dearth of literature on Singapore model method teaching methodology. Studies on teaching techniques' effects on senior high school and college students were also a focus of research, and there was limited literature on teaching strategies in junior high school that specifically used the Singapore model. It has also been observed that few studies on the Singapore model method have been conducted in the country, particularly in Davao City.

In this context, the researcher sees a need to fill the gap by conducting a study to evaluate the efficacy of Singapore model method in developing students' mathematics achievement in word problem. The finding of the study will enable students choose the best approach to solving word problems, which will help students' academic achievement and ability to become globally competitive graduates. It is further presumed that carrying out this research will benefit the institution, teachers, and, most importantly, the students who are the primary reason for studying word problem solving strategies, as the results may serve as the basis for training to reinforce the best method to solving word problems, as well as chances for mathematics teachers to assist themselves build their word problem skills in the classroom.

Theoretical Framework

This study is anchored on **Johann Heinrich Pestallozzi** (1825) and **Jerome Bruner's constructivist theory** (1966) and Jean Piaget's **Cognitivist Theory** (1972). Constructivism is a modern educational theory that is closely followed by the Department of Education. Constructivism is also explicitly stated in the Philippine Curriculum Guide for Mathematics Education. Johann Pestallozzi's Theory of Learning (1825) states that children should be taught in a non-restrictive environment and also be given the tools they need to solve problems and come up with solutions on their own (Hopkins, 2013). His theory also states that a child's first experiences influence their developing thoughts, so it is important for teachers to give their students activities that will let them use their senses. Pestallozzi stresses the significance of exposing learners to objects to which they can most easily relate before moving on to the presentation of abstract and remote concepts to the learner. In relation to the study, the Singapore model strategy is an action that create and promote the problem representation part of constructivist theory. This will entail the use of tangible materials that are relevant to the things that can be found in the learner's environment. As the students will participate in a series of worded problem devised by a professional adult, they will learn by hands- on approach. Students will thus be able to formulate their own solutions using a variety of senses and use concrete tools to solve worded problems. Thus, students' exposure to manipulatives, active exchange of ideas, and supportive environment accelerated their math enthusiasm and achievement.Furthermore, Piaget's cognitivist theory (1972) viewed mental abilities as a continuous conflict of a very complex organism to thrive and adapt in a very challenging environment. Furthermore, human intelligence develops through adaptation and organization. The framework shows that all cognitive structures are interrelated and must be integrated into the system. Thus, Piaget's analysis implies adapting education to the learner's development.

METHODS

Research Design

This study employed a quantitative research design, particularly the quasi-experimental design. The objective of quantitative research is to conduct in-depth analyses of observable events through the collection of measurable data and the use of statistical, mathematical, or computational methods. Consequently, a quasi-experimental design as introduced by Campbell and Stanley (1966), cited in Coryn and Hobson (2011), was utilized in this study. Prior to the application of the intervention, a quasi-experimental design identifies two groups with nearly identical characteristics. This method will entail manipulating variables to establish a cause-and-effect relationship (McLeod,2019). The primary

goal of this research design is to compare the effects of two experimental treatments. The researcher used a Pretest and Posttest Group design, which is an experiment with a control group that does not receive treatment and a separate group that does receive treatment. This design was utilized because the study will involve applying and assessing the effectiveness of the Procedural strategy and Singapore model Method in students' Mathematics Achievement, and because both the experimental and control groups will naturally be assembled as a section before the experiment. A posttest, which measures the outcome of the variable, is used to compare the groups. A pretest measures the dependent variable before any treatment has been applied. The experimental group and the control group comprised the participants in this study. This design utilized identical pre-test and post-test instruments for both the Procedural Strategy and Singapore Model Method groups, with the exception that treatment assignment is not random. The experimental group received the Singapore Model Method, while the control group received the Procedural Strategy. After the experiments, a comparison was performed between the experimental and control groups.

Place of the Study

This research was conducted at one of Davao City's private schools. To ensure anonymity, this school will be coded as School A. School A was founded in 1981 as a private, nonsectarian institution. It obtained government recognition and was authorized to issue diplomas to graduates of kindergarten, elementary, junior high, and high school. In addition, the institution received approval from TESDA to offer Technical-Vocational courses and permission from Commission on Higher Education (CHED) Region XI to operate four-year programs. Currently, the school offers various Senior High School tracks, including ABM, HUMMS, and STEM. The study's location was chosen because there have been few studies in the area on the effects of teaching word problem solving using two variables: procedural strategy and the Singapore model method, despite the fact that the area is classified as one of the most populated cities in the Philippines. Thus, the study was conducted to evaluate the efficacy of a procedural strategy and the Singapore model method in developing students' mathematics achievement in word problem.

Respondents

The respondents of the study consist of Grade 7 students in one of the private schools in Davao City. The respondents were split into two groups, with the control group implementing the procedural strategy and the experimental group implementing the Singapore model method, which was identified through draw lots. The respondents were assigned by their junior high school class advisers based on their academic performance and behavior in Grade 6. The sample used in the research is divided into two sections, with thirty-one students in each section identified as the participants in the study. The 2 sections were Grade 7 Section A, and Grade 7 section B. The Procedural strategy group was composed of Grade 7 Section A. Grade 7 Section A has 14 boys and 13 girls. The Singapore Model Method group are Grade 7 Section B. Grade 7 Section B has 15 boys and 15 girls.

Statistical tools

The statistical tools that were used in the analysis and interpretation of the data and in determining the efficacy of the variables of the study. M**ean,** this was used to describe the level of mathematics achievement of the respondents in the topics “Motion Problems”, “Age Problems”, “Work Problems”, “Mixture Problems” and “Geometric Problems”. **Standard Deviation**, this was

used to compute the spreading of the given data. A high standard deviation indicates that the data is dispersed across a wider range of values, whereas a low standard deviation indicates that the data is closer to the mean value. **T-test,** this was used to determine if there was a considerable rise in the same group of students' test scores at two different times. A paired t-test was used, in which two distinct groups that were linked were tested. This method will assist the researcher in determining whether the procedural strategy and Singapore model method have had a positive influence on the academic achievement of learners. **Effect size** assisted the researcher in determining the significance of the relationship between the procedural and Singapore model methods, as well as the difference between the two groups.

RESULTS AND DISCUSSION

Pretest Mean Scores of the Experimental and Control Groups

Table 1 exhibits the pretest mean scores for the experimental and control groups. The pretest mean score of the control group, which is the procedural strategy, is 11.00 or 42.31 percent of correct answers, described as moderate, implying that the academic achievement of learning of the students in mixture and work problem is satisfactory. This demonstrates that the student at this level has developed the fundamental knowledge, skills, and core understanding in word problem and can transfer this understanding through authentic performance tasks with little guidance from the teacher or with some assistance from peers.

Table 1

Pre-test Mean Scores of the Experimental and Control Groups

Groups	Mean	Percent of correct answer	SD	Description
Control (Procedural Strategy)	11.00	42.31	3.62	Moderate
Experimental (Singapore Model Method)	10.57	40.00	3.35	Low

Further, the pretest mean score of the experimental group, which is the Singapore Model Method, is 10.57 or 40.00 percent of correct answers, described as low, implying that the academic achievement of learning of students in mixture and work problem is fairly satisfactory. This demonstrates that the respondents at this level possess the minimum knowledge, skills, and core understanding in word problem but needs help throughout the performance of authentic task. This is acceptable because respondents were only exposed to these topics on the basis of basic computational mathematical skills and had insufficient knowledge of worded problems. Further, the standard deviation of the control and experimental group is 3.62 and 3.35, respectively, indicating that experimental group has more clustered responses than control group.

The outcomes coincide with the study of Bersano (2016) when she discovered that the Mathematics achievement of the students in word problem in terms of pretest before exposure to instructional strategies is low. He stated that the students at this level have the fundamental knowledge, abilities, and understanding of the subject but require assistance while carrying out real-world tasks. It also supports the study of Villaver (2014), when she showed that mathematics achievement of the students in mixture and work problems before exposure to Singapore model usually ranges from low to moderate level of learning, indicating that their learning achievement in word problems was at a minimal level and required assistance from peers and teachers to complete the task.

Significance of the Difference in the Pretest of Experimental and Control Groups

The difference between the Pre-test Mean Scores of the experimental (Singapore Model) and control group (Procedural) is tested under an alpha of 0.05 significance level. The p-value of 0.654 presented in Table 2 is greater than 0.05, implying that there is no significant difference between the experimental and control group's prior knowledge of Mathematics word problems, specifically in work and mixture problems, before the conduct of the study. Further, this demonstrates that the Procedural Strategy group and the Singapore Model Method group have comparable levels of knowledge and understanding and level of comfort in the topics of Work Problems and Mixture Problems before the conduct of the study.

Table 2

Significance of the Difference in the Pretest of Experimental and Control Groups

Groups	t	p-value	Remarks
Control (Procedural Strategy)			
Experimental (Singapore Model Method)	0.451	0.654	Not Significant

The findings are parallel with the result of the study of Osman et al. (2018), who investigated the mathematics achievement of the students in word problem using Singapore Model Method. They found out that the pretest achievement of the students in the procedural and Singapore model has no significant difference. In addition, the results of this study concur with what Bulac (2019) found out in his study that there was no significant difference in students' mathematics achievement in mixture and work problems between the pretest results of the two groups. He also stated that the experimental and control groups have roughly the same level of knowledge and comprehension in the word problem topics. Thus, prior to the implementation of the strategic instruction, both groups had low proficiency in mathematical problems.

Post-test Mean Scores of the Experimental and Control Groups

Table 3 illustrates the mean scores of the experimental and control groups after the Singapore Model Method and Procedural strategy were implemented. It reveals that the control group has a mean score of 17.78 or 68.39 percent correct answer, which is labeled as high, implying that the students' academic achievement in word problem is very satisfactory. It shows that the respondent at this level has mastered fundamental abilities and core concepts in word problem and can independently transfer them through a real-world performance task. In addition, the standard deviation is 3.62, showing quite disperse responses.

This outcome corroborates to the study of Bishara (2018), who claim that the Procedural strategy assists students in performing even the most difficult mathematical procedures through extrapolation, simulation equations, teamwork, and inquiry - based learning, which improves their academic achievement in solving worded problems. Further, Chua et al. (2019) support this finding by claiming that a procedural strategy is an effective method for completing a sequence of actions to solve a problem, which includes the ability to adapt a known procedure transfer to word problems.

Table 3

Post-test Mean Scores of the Experimental and Control Groups

Groups	Mean	Percent of correct answer	SD	Description
Control (Procedural strategy)	17.78	68.39	3.62	High
Experimental (Singapore Model Method)	20.37	78.33	3.35	High

Similarly, Table 3 reveals that the experimental group has a mean score of 20.37 or 78.33 percent of correct answer, described as high, indicating that the academic achievement of the students' learning is very satisfactory. This demonstrates that the respondent at this level has developed fundamental knowledge, skills, and core understanding in word problem and can independently transfer them through an authentic performance task. In addition, the standard deviation is 3.35, showing quite disperse responses.

The finding concurs with the statement of Yeap (2012), who revealed that using Singapore Model Method in the classroom aids and directs students as they solve word problems and elevates students' math achievement levels. Also, the findings are in accordance with the study of Matzin et al. (2020), who assert that students can better understand abstract mathematical relationships when they are presented with visual images and illustrations. They reported that when students can envision the question, and use illustrations to help them understand new concepts, their understanding of the question greatly enhances and perform better on work and mixture problems.

Significance of the Difference between the Post-test

Mean Scores of the Experimental and Control Groups

Table 4 shows the post-test mean scores for the experimental (Singapore Model) and control groups (Procedural). The difference in Post-test Mean Scores between the experimental and control groups is tested at the alpha 0.05 level of significance. The result yielded a t value of -3.075, indicating that the scores of the control group is lower than the experimental group. Further, it exemplifies that the p-value of 0.003 is less than the 0.05 level of significance. This would imply that the difference between the post-test mean scores of experimental and control group after the experiment is significant. Furthermore, this demonstrates that the experimental group performed significantly better than the control group on the posttest. The Singapore Model intervention or treatment appears to have had an effect on posttest scores, with higher scores in comparison to the control group.

Table 4

Significance of the Difference between the Post-test Mean

Scores of the Experimental and Control Groups

Groups	t	p-value	Remarks
Control (Procedural Strategy)			
Experimental (Singapore Model Method)	-3.075	0.003	Significant.

The results coincide with the study of Adhikari and Ishikawa (2021), who revealed a sizable difference between the mean achievement of the students in word problem using procedural and Singapore model method. They emphasized that the application of model drawing and visualization to student learning demonstrates that Singapore Model improves students' knowledge, comprehension, and application ability to solve equation word problems. They conclude that because the students were taught using a model drawing and visualization approach guided by interpretations, visualization, and mathematical equation and solution, their knowledge, comprehension, and application skills improved, and their academic performance enhanced.

Moreover, the result is in consonance with what Kho et. al (2014) revealed in their study that there was highly significant difference between the post-test score of those students exposed in Singapore model compared to procedural strategy. They state that after implementing the Singapore Model in the classroom for a short period of time, students' mathematics achievement in word problems, particularly mixture and work problems, has improved. It was found out in this study that after giving the treatment in three different sessions for a week, the students' academic achievement scored higher when using Singapore model method. They point out also in their study the importance

of using Singapore model method in order to help students gain confidence and competence in using this method, which is required for solving word problems in higher mathematics.

Significance of the Difference between the Pre- test and Post-test Mean Scores of the Control Group

Table 5 shows the difference in mean scores of students in the control group who were exposed to the procedural strategy. The results indicate that the t value is equivalent to -7.710, indicating that the scores of students in pre-test is lower compared to the post-test. It means that there is a significant change in the scores of the control group from the start to the end of the study. A significant difference between the control group pre-test and post-test mean scores exist ($p<.05$). The significant difference in mean scores suggests that the control group's intervention or treatment had a significant impact. Further, this demonstrates that the control group students differed in their pre-test and post-test achievement scores in word problems particularly in mixture and work problems. Thus, this implies that the mathematics achievement of the students in word problem increases after the intervention of procedural strategy.

Table 5

Significance of the Difference between the Pre- test and Post-test Mean Scores of the Control Group

Control Group	t	p-value	Remarks
Pre-Test Post-Test	-7.710	0.000	Significant

Moreover, the results concur with the study of Bottge (2012), which evaluated the effects of procedural strategy, anchoring instruction, and applied problems on the analysis and formulation of problems for students who scored averagely and poorly on the tests. He observed that the pretest and post-test of the students varies significantly after the intervention of procedural strategy. In addition, he reported that the outcome suggests that procedural strategy improves the academic achievement of the student. Furthermore, Ciubal and Tan (2018) stressed that a procedural strategy is a powerful technique that can carry out a series of operations to address a challenge, including the capacity to apply a trial-and-error technique to word problems. They added that procedural strategy consists of the abilities, tactics, production, and starting steps necessary to address a specific challenge. Their study led to the conclusion that using a procedural strategy improves the quality of mathematics instruction, resulting in higher student mathematics achievement.

Significance of the Difference between the Pre-test and Post-test Mean Scores of the Experimental Group

Table 6 shows the difference in mean scores of students in the experimental group who were exposed to the Singapore Model Method. Table 6 results indicate that the t value is equivalent to -16.190, indicating that the scores of the student in pre-test is lower than the post-test scores. It denotes a substantial improvement in the scores of experimental group from the beginning to the end of the study.

Table 6

Significance of the Difference between the Pre-test and Post-test Mean Scores of the Experimental Group

Experimental Group	t	p-value	Remarks
Pre-Test Post-Test	-16.19	0.000	Significant.

Further, there is a significant difference between the pre-test and post-test mean scores of experimental groups ($p<.05$). The significant difference in mean scores indicates that the intervention or treatment administered to the experimental group had an effect. Furthermore, this demonstrates that the experimental group students differed in their pre-test and post-test achievement scores in word problems particularly in mixture and work problems. Thus, it suggests that the Singapore Model Method had a significant impact and led to the improvement of the mathematics achievement of the students in word problems particularly in work and mixture problems.

The results jibe with the study of Adhikari and Ishikawa (2021), who discovered that the pre-test and post-test scores of the students differed significantly after implementing Singapore Model Method in the classroom. They added that the students' mathematics achievement in word problems in the topic's mixture and work problems after the intervention lesson using the Singapore Model Method is higher than before the intervention lesson in terms of knowledge, comprehension, and academic performance

Mean Gain scores of the Experimental and Control Groups

The mean gain scores for the control and experimental groups are shown in Table 7. The control group has a mean gain score of 6.78 with standard deviation of 4.22, while the experimental group has a mean gain score of 9.80 with standard deviation of 3.32, which implies that the students in the experimental group who were exposed to the Singapore model improved their learning achievement in word problems more than students in the control group. The mean gain score is the average difference between the pre-test and post-test scores, and it reflects the students' overall progress.

Table 7

Mean Gain Scores of the Experimental and Control Groups

Groups	Mean	Standard Deviation
Control (Procedural Strategy)	6.78	4.22
Experimental (Singapore Model Method)	9.80	3.32

Also, the responses of experimental group are more clustered compared to control group. The elevated mean gain score in the experimental group indicates the Singapore model was more effective in improving students' learning than the procedural approach utilized in the control group. This difference in mean gain scores indicates that the experimental group's instructional methods, techniques, or curriculum had a positive impact on the students' learning outcomes.

The findings are accordance with the study of Thirunavukkarasu & Senthilnathan (2014), who highlighted that Singapore model method is more effective than procedural method in enhancing the learning of mathematics word problem at the Secondary level. They had found in their research that because the Singapore model consistently uses one variant, students know what kind of picture to draw. This method is beneficial for students to use when solving complex word problems. Also, they added that the Singapore model has taught them not only to solve math problems but also to represent them symbolically- the mainstay of algebraic reasoning. Also, Spencer and Fielding (2015), clarified that the Singapore Model is an effective method for students to convey their ideas, show learners all of the components of a word problem, and gain a more fundamental understanding of word problems compared to the procedural strategy.

Significance of the Difference between the Mean Gain Scores of the Experimental and Control Groups

The data in Table 8 demonstrates the difference between the mean gain scores of control and experimental groups and uncovers that the mean gain scores of control and experimental groups have a computed t-value of -2.92, indicating that the score of procedural group is lower compared to the experimental group. Further, the difference between the mean gain scores of experimental and control groups is significant ($p<.05$). This demonstrates that the mean gain scores of experimental group differed significantly in the mean gain scores of control group before and after the experiment. Hence, the findings of the study imply the effectiveness of using Singapore model Method as an innovative approach in improving student's mathematics achievement in word problem particularly in work and mixture problem.

Table 8

Significance of the difference between the Mean Gain Scores of Experimental and Control Groups

Groups	t	p-value	Remarks
Control (Procedural Strategy) Experimental (Singapore Model Method)	-2.92	0.005	Significant
Effect Size (Cohen's d)	0.80		Large effect

The finding is congruent with the study of Abdullah et al. (2014) who found that the experimental group performed significantly differently from the control group on the post-test mean gain score. They asserted that the Singapore Model approach improved student achievement, reasoning skills, learning strategies, problem-solving strategy recognition, and mindsets toward resolving mathematical word problems. They emphasized that the Singapore model enables students to interpret problem through bar modelling and then apply it, changing their behavior and gaining valuable experience while also improving their ability to solve mathematical problems such as mixture and work problem.

CONCLUSIONS

Based on the foregoing findings, the researcher has made the following conclusions: The pretest mean score of the control group, which is the procedural strategy is described as moderate, implying that the academic achievement of learning of the students in mixture and work problem is satisfactory. While the pretest mean score of the experimental group is described as low, implying that the academic achievement of learning of students in mixture and work problem is fairly satisfactory. There is no significant difference between the pre-test mean scores of the experimental and control group. The post-test mean score of experimental group is high, which means that the students' academic achievement learning is very satisfactory. Also, the post-test mean score of control group is high which implies that the students' academic achievement in word problem in the control group are also very satisfactory. There is a significant difference between the post-test mean scores of control and experimental group after the experiment. There is a significant difference between the pre-test and post-test mean scores of students in the control group. The improvement in the mathematics achievement, as shown in the pre-test and post-test mean scores, were from satisfactory to very satisfactory for the topics work and mixture problems. There is a significant difference between the pre-test and post-test mean scores of students in the experimental group. The improvement in the mathematics achievement, as shown in the pre-test and post-test mean scores, were from low to very satisfactory for the topics work and mixture problems. The mean gain score of experimental group is higher than the control group. There is a significant difference between the mean gain scores of

experimental and control groups. Also, the significant difference between the Singapore Model Method and the Procedural Strategy is revealed in the effect size, labeled as large effect, indicating that the Singapore model method is a more effective intervention compared to procedural strategy.

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