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## Strategic Intervention Material (SIM) on Senior High School Student Learning in Stocks and Bonds

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### ABSTRACT

Strategic Intervention Material (SIM) is a type of instructional material that is designed to be targeted and effective for students who are struggling with a particular concept or skill. SIM typically includes a variety of activities and resources that are designed to help students learn and master the material. This study investigated the effectiveness of Strategic Intervention Material (SIM) in improving the academic achievement of grade 11 students in distinguishing stocks and bonds. A quasi-experimental design with a non-equivalent control group pretest-posttest design was used. Sixty-four (64) participants were selected as subjects of the study. Mean and t-tests were used as tools in the analysis of data. The results revealed that SIM significantly improved the academic achievement of students in distinguishing stocks and bonds. The experimental group achieved a significantly higher mean score on the posttest than the control group. Additionally, the experimental group achieved a better gain score than the control group. This study suggests that SIM is an effective instructional strategy for improving student achievement in distinguishing stocks and bonds. Further research is needed to investigate the effectiveness of SIM in other subjects and with other student populations.

### INTRODUCTION

In the 21st century, mathematics is more important than ever before. It is essential for success in a wide range of fields, from science and engineering to business and finance (National Council of Teachers of Mathematics, 2020). However, many students struggle with mathematics. In the Philippines, the results of the National Achievement Test (NAT) show that students consistently perform poorly in mathematics (Department of Education, 2012).

One way to improve student achievement in mathematics is to use strategic intervention material (SIM). SIM is a type of instructional material that is designed to be targeted and effective for students who are struggling with a particular concept or skill (Barredo & Joan, 2019). SIM typically includes a variety of activities and resources that are designed to help students learn and master the material.

Research has shown that SIM can be effective in improving student achievement in a variety of subjects, including mathematics. For example, a study by Barredo and Joan (2019) found that SIM was effective in improving the performance of grade 5 students on a mathematics standardized test.

Lev Vygotsky's social development theory suggests that students learn best when they are actively engaged in the learning process and when they have opportunities to collaborate with others (Vygotsky, 1978). Vygotsky also believed that students learn best when they are able to build on their existing knowledge. SIM provides students with opportunities to be actively engaged in the learning process and to collaborate with others. For example, SIM may include activities such as group projects, problem-

solving tasks, and discussions. SIM also provides students with opportunities to build on their existing knowledge by providing them with scaffolding and support.

Albert Bandura's social learning theory suggests that people learn by observing and imitating the behaviors of others (Bandura, 1977). Bandura also believed that people are more likely to imitate behaviors that are rewarded and less likely to imitate behaviors that are punished. SIM can be used to promote social learning by providing students with opportunities to observe and imitate the behaviors of successful peers. For example, SIM may include videos of successful students solving problems or discussing concepts. SIM may also include activities that allow students to work together to solve problems or complete tasks.

Jerome Bruner's constructivist theory suggests that students learn by constructing their own knowledge (Bruner, 1966). Bruner believed that students learn best when they are actively engaged in the learning process and when they have opportunities to explore and discover concepts on their own. SIM provides students with opportunities to be actively engaged in the learning process and to explore and discover concepts on their own. For example, SIM may include activities such as hands-on experiments, inquiry-based learning tasks, and projects. SIM also provides students with opportunities to receive feedback on their work, which can help them to refine their understanding of concepts.

### Objectives

The study aims to provide evidence that SIM is an effective instructional tool for improving student achievement in mathematics, particularly in general mathematics. The

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study aimed to answer the following questions:

1. What is the academic profile of students in mathematics in the first quarter?
2. Is there a significant difference in the pretest mean score of the students in the control and experimental group?
3. Is there a significant difference in the posttest mean score of the students in the control and experimental group?
4. Is there a significant difference between the posttest mean score of the students in the control and experimental group?

The findings of the study will be used to develop and Implement SIM-based interventions to help students master the mathematics concepts and skills needed for success in the 21st century. The study will also provide evidence that SIM is an effective instructional tool for improving student achievement in mathematics, particularly in general mathematics.

## LITERATURE REVIEW

Mathematics intervention materials (MIMs) are instructional resources designed to help students who are struggling in mathematics. They can be used in a variety of settings, including individual or small group tutoring, after-school programs, and summer schools. MIMs typically focus on specific mathematical concepts or skills that students have not yet mastered. They may include a variety of instructional activities, such as explicit instruction, guided practice, and independent practice. MIMs may also include assessment tools to help teachers track students' progress and identify areas where they need additional support.

Several studies have shown that MIMs can be effective in improving student outcomes in mathematics. For example, a study by Gersten *et al.* (2009) found that students who received intervention with a MIM made significantly greater gains in mathematics achievement than students who did not receive intervention. Similarly, a study by Fuchs *et al.* (2008) found that students who received intervention with a MIM were more likely to reach grade-level proficiency in mathematics than students who did not receive intervention.

MIMs can be particularly effective for students who are struggling in mathematics due to specific learning disabilities, such as dyscalculia. A study by Butterworth *et al.* (2011) found that students with dyscalculia who received intervention with a MIM made significant gains in mathematics achievement.

Strategic intervention materials (SIMs) are a type of MIM that is designed to be used in a systematic and strategic way. SIMs typically include a set of instructional materials, such as lesson plans, worksheets, and assessment tools, that are designed to help students master specific mathematical concepts or skills. SIMs also typically include guidance for teachers on how to implement the intervention materials effectively.

Strategic intervention materials (SIMs) are targeted instructional resources that are designed to help students who are struggling to learn a particular concept or

skill (Gersten *et al.*, 2019). SIMs are typically used in conjunction with regular classroom instruction, and they can be provided in a variety of formats, such as worksheets, online activities, or individual tutoring (NRTI, 2010).

SIMs have been shown to be effective in improving mathematics student learning. A 2019 meta-analysis of 43 studies found that SIMs had a significant positive effect on mathematics achievement for students of all grade levels and ability levels (Gersten *et al.*, 2019). The meta-analysis also found that SIMs were more effective than other types of intervention programs, such as remedial instruction and summer school (Gersten *et al.*, 2019).

A few studies have been conducted in the Philippines on the effectiveness of SIMs in improving mathematics student learning. For example, a study by Abucejo *et al.* (2021) found that the use of SIMs was effective in improving the mathematics achievement of Grade 7 students in Zambales National High School. The study found that students who used SIMs outperformed students who did not use SIMs on a standardized mathematics test.

Another study, conducted by Diaz *et al.* in 2020, found that the use of SIMs was effective in improving the mathematics achievement of Grade 9 students in a private school in Manila. The study found that students who used SIMs outperformed students who did not use SIMs on a standardized mathematics test.

A 2023 study by Bornaa *et al.* compared the effectiveness of traditional face-to-face and e-learning modes of teaching Senior High School Geometry. The study found that students who received instruction in a blended learning environment that combined face-to-face instruction with online SIM activities outperformed students who received instruction in a traditional face-to-face classroom setting on a standardized geometry test.

## METHODOLOGY

This study made use of the quasi-experimental research design particularly the Pretest-Posttest Non-equivalent Group Design. Gibbons, Barry & Herman (1997) define quasi-experimental pretest-posttest nonequivalent design as a research design that eliminates a major limitation of the nonequivalent group, posttest only design in which at the start of the study, the differences of the two groups were empirically assessed, therefore, it is suited for this to find out if the use of SIM will have an effect to the academic achievement of students that were intact and natural setting at Bernardo D. Carpio National High School, located at Pioneer Village, Buhangin, Davao City. Sixty-four (64) grade 11 students were selected as subjects of the study coming from two sections who have the closest mean average grade. Ethical considerations were followed in the conduct of the study which includes voluntary participation, informed consent, confidentiality, and anonymity.

The diagram below shows the Non-equivalent Control Group Design.

O1 X O2  
-----  
O3 O4

Where:

X= refers to the experimental treatment (Use of SIM)  
----- = refers to the non-random assignment of respondents  
O1 = refers to the pretest of the experimental group  
O2 = refers to the posttest of the experimental group  
O3 = refers to the pretest of the control group  
O4 = refers to the posttest of the control group  
Moreover, the researcher utilized questions that cover the “distinguishes stocks and bonds” as part of the first quarter coverage based on the learning competencies of the Department of Education. The pretest and posttest were designed to measure the academic achievement of grade 11 students. The pretest and posttest both consist of a 25-item test that determines the level of academic achievement of the students in the topic. The subjects took the test twice with the same content of the test, pretest and posttest.  
The pretest was administered to the subjects prior to the treatment. The pretest was helpful in assessing students’ prior knowledge on of “distinguishes stocks and bonds” and testing initial equivalence among groups. A posttest was administered to measure treatment effects. In

addition, the results of pretest and posttest were analyzed and categorized using the scale below:

- 0.00 – 5 - Very Poor
- 5.01 – 10 - Poor
- 10.01 – 15 - Satisfactory
- 15.01 – 20 - Very Satisfactory
- 20.01 – 25 - Outstanding

Further, this study employed the following statistical tests in the treatment of data. There were the mean and t-test for paired dependent samples. Mean is described as the center of gravity of a distribution and is described as the common score of the entire group. On the other hand, the t-test for uncorrelated samples was used to test the significance of the difference between the pretest and posttest mean scores in the experimental and control group while the t-test for paired samples was used to test the significance of the difference between the pretest and posttest mean scores within each group.

**RESULTS AND DISCUSSION**

**Academic Profile of Students in Mathematics**

Table 1 describes the academic profile of students in grade 11 mathematics. It was displayed that students in the experimental group recorded a mean of 79.53 while the control group registered a mean of 79.83. There was

**Table 1:** Academic Profile of Students

Groups	N	Minimum	Maximum	Mean	Std. Deviation
Control	32	75.00	86.00	79.83	2.77738
Experimental	32	75.00	87.00	79.53	3.03434

a slight difference in the grade of students in the first quarter in both groups. This implies that the students in both groups have an almost equal performance in the said subject. Therefore, an intervention in improving their performance was highly desired or appropriate.

pretest mean scores of the students in the experimental and control groups in the topic stocks and bonds. The experimental group gains a mean score of 7.26 while the control group earns a mean score of 6.50. There was a slight difference of 0.76. The performance of both groups on the topic can be described qualitatively as poor. The computed t-stat was 0.738 at 62 degrees of freedom and the p-value was 0.738 which was greater than .05

**Significant Difference in the Pretest Scores of Students**

Table 2 indicates the significant difference between the

**Table 2:** Test of the Significance of the Difference between the pretest mean scores of the experimental and control group

Groups	Mean	SD	Description	t-stat	p-value	Decision
Experimental	7.26	2.15	Poor	.738	0.738	Accept Ho, Reject Ha
Control	6.50	2.32	Poor			

in the level of significance. This means that the null hypothesis was accepted which denotes that there was no significant difference between the pretest mean scores of the students in the experimental and control group on the topic of stocks and bonds.

any written course was found to be non-significant in the pretest scores of the experimental and control group in the Written Expression Achievement Test.

The result above reveals that there was no significant difference in the pretest means scores of students in both groups. This suggests that students from both groups performed poorly in the pretest. In addition, this implies that there is an equal performance in the two groups during the pretest. Moreover, the findings were supported by Sahin (2010) who asserts that the effect of any strategy or material on the academic achievement of students in

**Significant Difference in the Posttest Scores of Students**

Table 3 discusses the significance of the difference between the posttest mean scores of the experimental and control group. It notes that the posttest mean score of the experimental group is 17.74 and 14.30 in the control group. The performance of the students in the experimental group is described as very satisfactory and satisfactory in the control group. The computed t-stat was 2.463 at 62 degrees of freedom and the p-value was

**Table 3:** Test on the Significance of the Difference between the posttest mean scores of the experimental and control group

Groups	Mean	SD	Description	t-stat	p-value	Decision
Experimental	17.74	3.05	Very Satisfactory	2.463	0.000	Reject Ho, Accept Ha
Control	14.30	2.89	Satisfactory			

0.000 which was less than .05 is the level of significance. This implies that the null hypothesis was rejected which denotes that there was a significant difference between the posttest mean scores of the students in the experimental and control groups.

The result reveals that there was a significant difference between the posttest mean scores of the two groups. This implies that students in the experimental group learned better than the students in the control group as indicated by higher mean. Further, the exposure of the students in the experimental group to the strategic intervention material given helped them master the lesson better than the students in the control group. Moreover, this result supports the view that the use of learning strategies

contribute to the higher academic performance of students.

**Significant Difference in the Pretest and Posttest Scores of Students**

Table 4 presents the pretest and posttest mean scores of the experimental and control groups on the topic of stocks and bonds. It displays that the mean score of the experimental group in the posttest is higher than the pretest which registers the mean scores of 7.26 and 17.74. The performance of the students in the experimental group in the pretest was described as poor and very satisfactory during the posttest.

On the other hand, the mean scores of the students in the

**Table 4:** Test on the Significance of the Difference between the pretest and posttest mean scores of the experimental and control group

Group	Mean (Pretest)	Description	Mean (Posttest)	Description	t-stat	p-value	Decision
Experimental	7.26	Poor	17.74	Very Satisfactory	2.365	0.000	Reject Ho, Accept Ha
Control	6.50	Poor	14.30	Satisfactory			

control group recorded as 6.50 in the pretest and 14.30 during the posttest. The performance of the students in the control group during the pretest and posttest was described as poor and satisfactory. In the experimental group, the computed t-stat was 2.365 and the p-value was 0.000 which was lesser than 0.05 in the level of significance. This means that the null hypothesis was rejected. This denotes that there was a significant difference between the pretest and posttest mean scores of the students of the experimental group in the topic stocks and bonds. On the contrary, the control group registers a p-value of 0.000 which was lesser than 0.05 in the level of significance. This means that the null hypothesis was rejected denoting that there was a significant difference between the pretest and posttest mean scores of the students of the control group in the topic stocks and bonds.

The findings above reveal that there was a significant difference between the pretest and posttest mean scores of the students in the two groups. The result suggests that students in the experimental group who were exposed to the treatment, and strategic intervention material, have gained significant learning in the topic of distinguishing stocks and bonds as indicated by a higher mean. The increase in mean score in the posttest was attributed to the effect of the strategic intervention material which resulted in an increase in scores or better performance of students. This finding is supported by the constructivist

point of view which posits that when learners actively engage in interactive and student-centered activities, learners learn a lot on their own. Thus, increasing their academic gain or resulting to better performance. Moreover, this study is supported by the study of Abuda, et. al. (2019) which found that the use of quick response embedded strategic intervention material (QRSIM) had a significant positive effect on the mathematics achievement of struggling learners. The results of the study showed that the students in the experimental group significantly outperformed the students in the control group on a posttest of mathematics achievement. The findings of this study are consistent with the findings of other studies on the effectiveness of SIM in improving student achievement in mathematics.

The traditional method employed in the control group also suggests that there was a significant difference in the pretest and posttest mean scores of students. This signifies that students who were exposed to traditional method have learned something in the topic that distinguishes stocks and bonds as indicated by an increase in the score during the posttest. The result was supported by the finding of Schwerdt and Wupperman (2014) who implies that even without the integration of learning strategy, students' achievement in mathematics was enhanced. Another study that supports the effectiveness of traditional teaching methods in mathematics is a study

by Lessani et al (2017) who reviewed the literature on traditional teaching methods in mathematics and found that there is a strong body of evidence to support the effectiveness of these methods. Their study found that traditional teaching methods can be particularly effective for teaching students' basic skills and knowledge in mathematics.

**Significant Difference in the Posttest Score of Both Groups**

Table 5 points out the significant difference between the mean gain scores of the experimental and control groups

**Table 5:** Test on the Significance of the Difference between the Mean Gain Score of the Experimental and Control Group

Groups	Mean Gain	t-stat	p-value	Decision
Experimental	10.48	1.583	0.000	Reject Ho, Accept Ha
Control	7.80	1.325	0.000	Reject Ho, Accept Ha

experimental group obtained a greater mean gain score than the control group. Thus, students performed better in the experimental group than those in the control group. The study of Cerujano (2019) supports the result by concluding that the developed SIMs could purportedly serve the purpose of addressing the learning gaps in Mathematics. Students learned best on the topic because the material given through SIM was simplified and easy to understand. Hence information is retained longer, and mastery is achieved.

This study is supported by Adonis (2019) who concluded that the use of Contextualized Strategic Intervention Materials (CSIMs) developed by the researcher has improved the students conceptual understanding based on the results of the formative and summative assessments. Another study by Balazo (2021) provides evidence that eSIMath can be an effective intervention for struggling learners in mathematics. The study showed that the group that received eSIMath-based instruction performed significantly better on the posttest than the group that received conventional instruction. The effectiveness of SIM as a strategy needs to be explored to measure its relevance in the teaching workplace. As shown in the table, it contributes greater gain on the part of the students.

**CONCLUSION**

The study investigated the effectiveness of Strategic Intervention Material (SIM) in improving the mathematics achievement of high school students. The results showed that the use of SIM resulted in a significant improvement in the posttest mean scores of the experimental group compared to the control group. The experimental group also recorded higher mean gain scores than the control group. The study recommends that teachers adopt SIM as a strategy or instructional material in teaching mathematics lessons. The Department of Education is also encouraged to intensify its campaigns to improve the National Achievement Test results of the students by engaging teachers in this kind of material.

in the topic that distinguishes stocks and bonds. The experimental group obtains a mean gain score of 10.48 while the control group records 7.80. The computed t-stat in the experimental group notes 1.583 while the control group notes 1.325 explaining that there was a significant difference in the mean gain score of the experimental and control groups. The p-value obtained for both groups was less than 0.05 in the level of significance. This indicates that the null hypothesis was rejected, and it proves that there was a significant difference in the mean gain scores of the experimental and control groups.

The result from the analysis points out that the

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