

Strategic intervention material: A tool in enhancing grade nine students' mathematical performance

Arpilleda, Alcher J. ✉

St. Paul University Surigao, Philippines (ajarpilleda@gmail.com)

Received: 4 September 2020

Available Online: 27 January 2021

Revised: 15 January 2021

DOI: 10.5861/ijrse.2021.5051

Accepted: 23 January 2021

ISSN: 2243-7703

Online ISSN: 2243-7711

OPEN ACCESS



Abstract

The goal of every teacher is to make every learner understand and apply the lessons learned from the class, but, this goal may not be met if students themselves find it hard to understand the lessons in Mathematics. One of the ways to help the learners achieve success in learning is through the use of a strategic intervention material. Thus, this study aimed to determine the effectiveness of the Strategic Intervention Material (SIM) in Integrated Mathematics 9 on Positive, Zero, and Negative Integral Exponents. It described further the significant difference on the level of performance of the seventy-seven (77) Grade 9 students under the two groups (control and experimental) in the pre and post-test. T-test was employed to test significant difference in the test results and the groups where they belong. It was concluded in the study that the strategic intervention materials gave a positive impact in mastering the least-learned competency identified as reflected in the post-test results of the two groups. Thus, the school may conduct training, programs and activities that will enhance more the skills of the teachers in crafting strategic intervention materials to aid the students' needs most especially on mastering the least learned competencies.

Keywords: exponents; least-learned competency; mathematical performance; strategic intervention materials

Strategic intervention material: A tool in enhancing grade nine students' mathematical performance

1. Introduction

Every teacher aims to make every learner understand and apply the lessons learned from the class to their daily lives, but, this may not be met if students themselves find it hard to understand the lessons in Mathematics. According to Kautzman (2012), many students these days seem to struggle more and more with math, it could be the standards are growing in difficulty, and there are more requirements for the students. Math intervention strategies are needed and used to help students who are struggling or having difficulty succeed for whatever reason. Van-de Walle (2007) found out that students perceive exponents as challenging, unnecessary and complicated concepts and also, they think that exponents have no connection with everyday life. With the different rules or laws of exponents, students tend to experience problems in remembering these rules.

Students have many conceptions in learning Mathematics which hinders them to progress and study the subject (de Gracia, 2016). Kautzman (2012) added that when students are struggling, teachers should use various assessments to identify areas of need, and they should use the data that they obtain to choose interventions. These interventions can help the students achieve and master the competencies in targeted and structured ways. To help them achieve success in learning, one of the ways found to be effective is through the use of a strategic intervention material (SIM).

Strategic intervention materials aid learning and are used for the mastery of the least-learned competencies. These materials consist of activities and simple interactive discussions where students can study and explore on their own. With these features and uses of the strategic intervention material, the researcher is prompted to conduct this study to determine its effectiveness in enhancing the mathematical performance of the students, specifically on positive, zero and negative integral exponents in Mathematics 9. The findings of the study will serve as the basis or reference of the school for further improvement and enhancement of the instructional delivery if there is a need, especially in the use of intervention materials to increase and boost the performance and mastery of the students on the concepts discussed.

1.1 Statement of the problem

The study aimed to determine the effectiveness of the Strategic Intervention Material (SIM) in Mathematics 9 on Positive, Zero, and Negative Integral Exponents. Specifically, this sought to answer the following:

- What is the level of performance of the pupils in the control and experimental group in terms of pre-test and post-test?
- Is there a significant difference between the pre-test and post-test results of the control and experimental groups?
- Is there a significant difference between the control and experimental groups in the pre-test and post-test?

1.2 Hypothesis

At .05 level of significance, it is hypothesized that:

- H_{01} . There is no significant difference between the pre-test and post-test results of the control and experimental groups.

- H_{02} . There is no significant difference between the control and experimental groups in the pre-test and post-test.

1.3 Significance of the study

The study aimed to determine the level of effectiveness of using Strategic Intervention Material in teaching positive, zero, and negative integral exponents. The result of the study would be more significant to the students, Mathematics teachers, parents, school administration, and future researchers.

Students - This study would give them an idea on how students learn using an intervention material and by just using the traditional delivery of instruction. This would also be a great help to students because this could give them motivation on how to cope with their struggles in learning Mathematics concepts.

Mathematics Teachers - The findings of this study would help and motivate them to think of another intervention material that could address the learning needs and difficulties of the students.

Parents - The findings of the study might encourage the parents to work hand-in-hand with the teachers in achieving the success of their child or children.

School Administrators - The findings of the study would lead them to plan for effective strategies and interventions that would cater to the academic problems of the students. This would also motivate them to organize seminars/training on the making of strategic intervention materials.

Future Researchers - This study might serve as their reference in the conduct of future relevant researches.

1.4 Scope and limitations of the study

This study aims to determine the effectiveness of the Strategic Intervention Material (SIM) in Mathematics 9 on Positive, Zero, and Negative Integral Exponents. This study was conducted during the SY 2017-2018 to the Grade 9 students of St. Paul University Surigao-Basic Education Department.

2. Review of related literature

This section presents related articles, literature, studies for the purpose of introducing ideas and concepts that provide linkage to the present study.

2.1 Learning mathematics

Exponents as illustrated by King (2017) are a fundamental math tool that one should learn, but a lot of people continue to struggle with them all the way which is totally understandable, because exponents, not to mention related operations like fractions and radicals, can be really tricky. Sherman et al. (2014) pointed out that the major component of the child-centered, systematic teaching approach is content. To dissimilar learners, learning the discipline of mathematics presents many challenges. Students often consider and term Mathematics as the “gatekeeper” of success. This hinders them to graduate from high school and eventually succeed in their careers. Learning mathematical skills will help one to make decisions thus, a lack of this sufficient mathematical skill and understanding affects one’s ability to make critically important educational, life, and career decisions.

There are many reasons of why students fall or fail in mathematics. When asked, many people would respond that they “never understood math,” or “never liked it because it was too abstract and did not relate to them,” thus, they were not as successful in learning mathematics. Sherman et al. (2014) as cited by Tañedo (n. d.) in her presentation on etiology of mathematics learning pointed out those opportunities for concept building, relevant challenging questions, problem solving, reasoning, and connections within the curriculum and real-world situations should be provided for an effective Mathematics instruction. Using rote memorization will

lead the students to experiencing difficulty recognizing and retaining math concepts and generalizations.

In the K to 12 Framework, contents are arranged in a spiral progression. Doing such, the learners have the opportunity to deal with content developmentally over time, as learners learn at different pace. Concepts can be built upon and related to previous learning in their previous years throughout the curriculum. Students, as they progress, become more proficient and experienced in learning mathematics and its concepts. Moreover, Sherman et al. (2014) added that underachieving students are frequently assigned repetitious and uninteresting skill-and-drill work each year in order to teach them “the basics.” This type of work often represents a limited view of mathematical foundations and a low level of expectation of students’ abilities. It limits opportunities to reason and problem solve.

The gap between learner and subject matter - When the mathematics content being taught is unconnected to students’ ability level and/or experiences, serious achievement gaps result. If students are absent frequently or transfer to another school during the academic year, this situation will likely occur. A student may find the mathematics curriculum to be more advanced or paced differently compared to what was being taught in the previous school. Without intervention strategies, students could remain “lost” for the duration of their education (Sherman et al., 2014). Furthermore, here are some tips in learning mathematics especially algebra where exponents also belong and he suggested the following activities or tips: Video Clips and Webinars, Let your natural curiosity allow you to explore, Avoid Relying on Memorization, Learn Basic Algebraic Notation, Focus on Conceptual Understanding, and Learn to Evaluate Expressions (Borenson, 2011).

2.2 *Intervention materials*

Kautzman (2012) as presented in the NCTM standards stated that early and appropriate identification is important for students at all levels of achievement. Any student may require intervention as he or she works with mathematics. Even those students who are excellent in one topic may require the support of intervention in other topics. When students are struggling, teachers should use various assessments to spot areas of need, and that they should use the information that they obtain to decide on interventions that may help the learners move in targeted and structured ways to greater and brighter success with important concepts and mathematical ideas.

Kautzman (2012) added that interventions have many models and are flexible in nature. They can be carried out in the classroom setting as well as in tutoring or tiered support sessions conducted by tutors or mentors. Regardless of the model, intervention should put premium on supporting students’ understanding through explicit instruction anchored on diagnostic assessments. Intervention should strengthen conceptual and procedural knowledge to close an existing gap so students can move smoothly to and make connections with other mathematics. The long-term goal of intervention should be to assist students gain independent strategies and take responsibility for his or her own learning. This approach to intervention ends up with an emphasis on bigger ideas in mathematics and their applications so important skills do not become trivial, isolated, or fragmented.

Moreover, every intervention model relies on teachers’ knowledge of mathematics content and evidence-based teaching strategies, ensuring that people who deliver interventions can take advantage of students’ prior mathematics knowledge. An educator who uses multiple models and ways of sequencing or structuring topics can present rich adaptations of the mathematics content to support students’ needs effectively (nctm.org, 2011).

2.3 *Strategic intervention materials*

Strategic Intervention Material, according to (Bunagan, 2012) tries to increase and deepen skills, knowledge and understanding from concrete to what is more abstract. It gave students the chance to explore their understanding and add up of those new ideas. Furthermore, an intervention material meant to recall the concepts and skills to assist and help the learners master a competency-based skill which they were not able to develop during classroom discussion. Dy (2011) also defined Strategic Intervention Material (SIM) as a teaching aid

introduced into the teaching methods to stimulate the activity of the students and thereby increase their level of understanding.

The Department of Education prescribed the use of Strategic Intervention Material (SIM) to boost students' achievements and reduce least mastered skills in Mathematics subjects. Different studies have shown that the utilization of SIM successfully decreased the least mastered skills in Mathematics subject; thus, poor performance is addressed. Furthermore, SIM is an instructional material prescribed by the Department of Education (DepEd) to boost students' performance in Mathematics subjects. To promote successful learning within the field of Science and Technology subjects in both elementary and secondary among public schools, DepEd provided the teachers with training and workshop on how to prepare this intervention material.

To promote and encourage teachers to use and develop intervention materials, SIM making for Math teachers was included by the Department of Education in the annual Mathematics Fair as one of the contests in in the school, division, region, and national level competitions. DepEd Memo No. 225, s. 2009 enclosure No. 2 There are criteria and areas to be considered in making Strategic Intervention Materials in Mathematics. The parts of the SIM are title card, guide card, activity card, enrichment card, assessment card, and reference card. In a Strategic Intervention Material (SIM), alignment of activities with the tasks/objectives is ensured and guaranteed. Activities are kept short and simple for the learners to easily work independently; variety of activities are provided as well to cater to the diverse learners of different intelligences and leaning styles; and a number of activities are also provided so that the learner can have enough practice and time in developing the skill and focus on the least mastered skills. Each intervention material has five parts such as the guide card, activity card, assessment card, enrichment card and reference card. The overview of the lesson, learning competency and subtasks about the entire SIM are found in the guide card; activities to concretize learning competencies and to develop the mastery of the least-mastered skill are provided in the activity card; the *assessment card* provides exercises that will assess and check the level of mastery of the skill upon the completion of the activities and tasks given; the *enrichment card* provides activities that reinforce the content of the lesson to make learning meaningful; and the *reference card* lists resources found in the whole material or card that the learner may refer for further reading and learning.

Furthermore, the topics used in a Strategic Intervention Materials (SIM) should be competency-based specifically least mastered competencies as identified during assessments and it should follow the Bloom's taxonomy guidelines especially in checking for the level of comprehension – may it be remembering, understanding, applying, analyzing, evaluating or creating. Activities, content and skills must be aligned at all time to get the desired result. It should be validated before using it in the class and it should be easy to copy. Materials used must improve mastery level as it is its main purpose in order to increase students' academic achievement in learning Mathematics and in other subject areas as well.

2.4 Effectiveness of strategic intervention materials

There are numerous studies conducted on the effectiveness of strategic intervention materials in mastering the competencies set by the Department of Education. Alboruto (2017) in her study on *Beating the Numbers through Strategic Intervention Materials (SIMs): Innovative Science Teaching for Large Classes*, found out that the use of SIMs significantly contributed to the mastery of science concepts and also to the development of science process skills. She used experimental research design where students were grouped into two – the control and experimental group. Similar to the method being used in this research, the experimental group was given the Strategic Intervention Materials as an aid for learning. She also concluded that the project [strategic intervention material] is effective in improving student performance. Villonez (2018) also concluded that the employment of SIM was better and effective than the use of traditional method in teaching some topic in science.

In addition, Salviejo et al. (2014) in their study on *Strategic Intervention Material-Based Instruction, Learning Approach and Students' Performance in Chemistry* also found out that the use of SIM-BI is effective to

improve students' performance and learning approach. A descriptive-experimental design was used in their study where the students were grouped into deep and surface learners using the Chemistry Learning Approach Inventory. Dumigsi and Cabrella (2019) in their study on *Effectiveness of Strategic Intervention Material in Mathematics as Remediation for Grade 9 Students in Solving Problems Involving Quadratic Functions* also found out that the Strategic Intervention Material was effective as a remediation tool for Grade 9 students in solving problems involving quadratic functions. Quasi-experimental design was used where the two groups took pre-test and post-test.

SIM can also be very acceptable, applicable, and useful to the potential users. Regarding the use of SIM in Mathematics IV for the fourth year students, Herrera & Soriano (2016) revealed that the students easily mastered the least learned topics. Furthermore, Blalock (2010) described SIM as a competency-based academic support approach which will help students in upper elementary, middle high school, and higher education become independent and successful learner.

3. Materials and methods

3.1 Research design

The researcher employed descriptive and experimental methods of research. Descriptive research was deemed appropriate because this is probably the best method that is available to use in collecting data for the purpose of determining the curricular validity of the Strategic Intervention Materials (SIM). In addition, the experimental method of research was also used by the researcher in this study because there were two groups used, the control and experimental group, respectively. The two groups were exposed to different classroom settings to test significant differences between the groups.

3.2 Participants

The students in two classes in Mathematics 9 handled by the researcher were the respondents in this study. They were the Grade 9 students of St. Paul University Surigao-Basic Education Department who were enrolled for the school year 2017-2018. There were 77 student-participants where 38 of them are in the control group while 39 are in the experimental group. The average grade in the first quarter in Integrated Mathematics 9 served as the basis in selecting and grouping students as to who should belong to the control or experimental class.

3.3 Instrument

The Pre-Test/Post-Test and the Strategic Intervention Material were used by the researcher in conducting the study.

Pre-Test/Post-Test - A 15-item test was made by the researcher in which the questions were taken from the books used as references of the material. This was designed to measure the level of understanding on the lesson chosen by the researcher which is exponents. The test items for the two tests (both pre- and post-test) were the same. Both the control and experimental groups took a pre- and post-test. The tests were the same; however, the experimental group was exposed to the use of the Strategic Intervention Material developed by the researcher while the control group used the traditional way of teaching. The traditional way of teaching uses lecture method for the whole class duration while that of the experimental group, different activities were employed along with the strategic intervention material.

Strategic Intervention Materials - These are the materials used by the researcher to aid the learning of the students. This would help increase the performance or the mastery level of the students on the topics identified as least-learned or least-mastered. If the passing rate below 75% in the assessment conducted, then, the competency is considered as least-learned. The intervention material consists of five parts. These are guide card, activity card,

assessment card, enrichment card, and reference card. The overview of the lesson, learning competency, and subtasks about the entire SIM are found in the guide card; the activity card contains varied activities to concretize learning competencies and to enhance the mastery of the skill.; the assessment card contains exercises that will assess the level of mastery of the skill upon the completion of the task(s).; the enrichment card contains activities that reinforce the content of the lesson; and the reference card lists resources found in this card that the learner may refer to for further reading.

3.4 Data gathering procedure

The researcher presented the idea to the Subject Team Leader in Mathematics and discussed with her the conduct of the research. A proposal was made and was to the Assistant Principal for Junior High School. With the consent of the Assistant Principal, the researcher then sought approval from the principal about the same matter. After the approval, the researcher met the Mathematics Teachers with the Subject Team Leader to identify the least mastered skills in Mathematics IX and found out that mastery level was not achieved by the students in the previous years (2016-2017) and this school year. The orientation of the student-participants followed. Then the conduct of the tests started. The same set of tests was given to the two groups - control and experimental group, however, experimental group was given the intervention material. And their scores in every treatment were tallied and interpreted to determine whether there were significant differences in their mean scores in the pretests and posttests.

Experimental Phase - There were two classes used as participants by the researcher, a total of 77 students were involved in the study. The control class consists of 38 students while the experimental group has 39 students. On one hand, a traditional approach using a lecture method was used in the control class. On the other hand, the strategies and activities included in the Strategic Intervention Materials (SIM) were used in the experimental class.

The researcher developed first the Strategic Intervention Materials (SIM) in Mathematics 9. This is on Positive, Zero, and Negative Integral Exponents. In gathering materials and information, the researcher considered the following phases:

- **Preliminary Phase** - The first part included the identification of the least mastered competency, those below 75% passing in the assessment conducted. Then, the researcher gathered the learning resources to be used in the Strategic Intervention Material.
- **Preparation Phase** - Preparation phase is the second phase where activities and tasks were prepared. The topic that will be used for the material was identified and then, the researcher prepared the Strategic Intervention Material (SIM). It contains the five namely: the guide card, activity card, assessment card, enrichment card, reference card and the answer key card.
- **Evaluation Phase** - The last phase was the evaluation phase which was conducted to determine the effectiveness and acceptability of the material. To evaluate the Strategic Intervention Materials prepared by the researcher, the three (3) Mathematics teachers as respondents were given a questionnaire using a 5-point scale. The result of the validation done by the teachers was 4.91 which is qualitatively described as *Very Evident*. The qualitative interpretations uses the 5-point scale which is presented as follows:

4.20-5.00	Very Evident (VE)
3.41-4.19	Evident (E)
2.61-3.40	Moderately Evident (ME)
1.81-2.60	Less Evident (LE)
1.00-1.80	Least Evident (LE)

These interpretations were based on the standardized criteria prepared and issued by the Bureau of Secondary Education (BSE) and the Department of Education (DepED).

3.5 Data analysis

To determine the effectiveness of the strategic intervention material in enhancing the performance of the students in positive, zero, and negative integral exponents, the following statistical tools were utilized:

Mean and Standard Deviation - These tools were used to answer Problem 1 to determine the average of the scores and the extent of deviation for a group as a whole in the pre-test and post-test taken by the students in both the control and the experimental groups. The following guide was used for interpretation:

Parameter	Qualitative Description
12.20 – 15.00	Very High Performance
9.40 – 12.19	High Performance
6.60 – 9.39	Average Performance
3.80 – 6.59	Low Performance
1.00 – 3.79	Very Low Performance

T-test - This was used to determine whether there is a significant difference between the means of two groups, the control and the experimental group.

4. Results and discussion

4.1 Level of performance of students under the control and experimental group in the pre-test and post-test

Table 1 present the level of performance of the students under the control and experimental group in their pre-test and post-test. To interpret the results, mean and standard deviation were used.

Table 1

Level of performance students under the control and experimental group in the pre-test and post-test

	<i>M</i>	<i>SD</i>	Qualitative description
Control Group			
Pre-Test	3.11	1.90	Very Low Performance
Post-Test	3.00	1.77	Very Low Performance
Experimental Group			
Pre-Test	2.90	2.33	Very Low Performance
Post-Test	11.26	2.29	High Performance

Legend. 12.20 – 15.00: very high performance, 9.40 – 12.19: high performance, 6.60 – 9.39: average performance, 3.80 – 6.59: low performance, and 1.00 – 3.79: very low performance.

As presented in Table 1, the performances in the pre-test and post-test results of the control group (\bar{M} =3.11, 3.00, SD =1.90, 1.77, respectively) are described as Very Low Performance. This implies that the students did not understand clearly the concept on exponents even after the short discussion was given by the teacher. It can be attributed to the method being used where the students were exposed to a traditional learning engagement, involving pure lecture method. In fact, the mean decreased in which it can be inferred that after the discussion, there were some concepts that confused them which led to a very low performance.

Meanwhile, the pre-test (\bar{M} =2.90, SD =2.33) and the post-test (\bar{M} =11.26, SD =2.29) of the experimental group is described as Very Low Performance and High Performance, respectively. It can be ascertained that there is a big difference in the test results before and after the discussion after using an intervention material. From getting low performance in the test, the students understood the concepts by using the activities and exercises provided in the intervention material even with less guidance of the teacher, which led to a high performance. The significant increase in the mean score of the students manifests the effectiveness of the material.

Based from these results, it can be inferred that students learned best when different activities are employed and an intervention material is being used. Thus, the Strategic Intervention Material (SIM) is an effective intervention in boosting the mastery level of the students on certain topics. This will help the students who are

struggling to master concepts as they have time to do the activities and learn at their own pace.

4.2 Significant difference between the pre-test and post-test results

Table 2 presents the significant difference between the pre-test and post-test results of the two groups. This was computed using *t*-test.

Table 2

Significant difference between the pre-test and post-test results

	<i>M</i>	<i>SD</i>	SE Mean	t-value	df	<i>p</i> -value	Decision
Control Group							
Pre-Test vs Post Test	0.11	1.64	0.27	0.40	37	.695	Do not reject H ₀
Experimental Group							
Pre-Test vs Post Test	-8.36	2.50	0.40	-21	38	.000	Reject H ₀

It can be gleaned from Table 2 that the hypothesis which states that there is no significant difference in the pre-test and post-test of the control group is retained which means that pre-test have no bearing with the post-test (t-value = 0.40, *p*-value=.695). This entails that there is no significant difference between the results of the pre-test and post-test in the control group. This further means that the performance of the students before and after the discussion does not differ when there is no strategic material used. Students have more or less the same level of understanding before and after the discussion, as the results show.

Meanwhile, findings revealed that under the experimental group, pre-test and post-test pose a significant difference (t-value = -21, *p*-value=.000). There is a significant difference between the results of the pre-test and post-test in the experimental group. This means that after being exposed to an intervention material, the performance of the students increased from very low to high. This also means that the activities provided in the material helped them in understanding and mastering the concepts and laws of exponent.

4.3 Significant difference between the control and experimental groups

Table 3 shows the significant difference between the control and experimental groups in the pre-test and post-test. This was also computed using *t*-test.

Table 3

Significant difference between the control and experimental groups

	<i>M</i>	<i>SD</i>	SE Mean	t-value	df	<i>p</i> -value	Decision
Control Group							
Control Group vs Experimental Group	-0.26	2.42	0.39	-0.67	37	.508	Do not reject H ₀
Experimental Group							
Control Group vs Experimental Group	8.26	2.88	0.47	18	37	.000	Reject H ₀

Statistical findings revealed that the null hypothesis of no significant difference between the performance of the control and the experimental group in the pre-test is retained (t-value = -0.67, *p*-value=.508). This entails that in the pre-test, there is no difference in the performance of the students under the control and experimental group. It can be inferred that the students from both groups have more or less the same level of understanding of the concepts on exponents, which is very low as presented in Table 1.

On the other hand, it was revealed that the null hypothesis of no significant difference between the control and experimental group in their performance in post-test is rejected (t-value = 18, *p*-value=.000), which means that there is a significant difference. It could be concluded that the performance of the students between the two groups really poses a big difference. It is clearly presented that the learning is higher on the part of the

experimental group than the control group. With this finding, it can further be inferred that the strategic intervention material has a positive effect on the learning of the students which led to a high performance. Hence, the experimental group achieved the 75 percent proficiency/performance level required in the subject area.

5. Conclusion

Based on the findings in this study, the following conclusions were given:

- The students under the control group did not understand clearly the concept even after the short discussion given by the teacher because they got very low performance in the pre-test and post-test. Meanwhile, the students under the experimental group understood the concepts. They were given activities and exercises in the intervention material and there was less guidance of the teacher. Thus, the students learned best when varied activities are given and an intervention material is being used.
- The level of performance of the students under the control group in the pre-test and post-test does not differ. However, the performance of the students in the experimental group increased from low to high after using the strategic intervention material, which indicates that they understood the concepts and laws of exponents involving positive, zero, and negative integral exponents.
- The performance of the experimental and control groups are almost at the same level before the experiment as the result shows there is no significant difference. On the other hand, there is a big difference in the performance of the students between the two groups, the control and experimental groups, in the post-test which means that the intervention material developed the mastery of the skill on exponents.
- Innovative materials used by the teacher, as included in the material, enhanced the performance of the students. This helped the teacher address the least-learned competency.
- The concepts of exponents can be learned best when an intervention material is given, especially for those learners who are struggling. The intervention material is effective in enhancing the mastery of the concept.

5.1 Recommendations

In the light of the conclusions given, the following are hereby recommended:

- The students, especially those who are struggling, may be given ample time to master the necessary skills expected of them to perform at their level with the aid of an intervention material. On their own, they may cope with the competencies they miss or least-mastered.
- The Secondary Mathematics teachers may craft more strategic intervention materials to help the students master the competency-based skills for them to have clearer understanding of the concepts through the aid of the activities/tasks included in the material.
- The parents, through their association, may help the teachers and administrators by supporting them in the conduct of intervention for the success of the learners.
- The school may conduct seminars and trainings on the development and implementation of the strategic intervention materials in the classroom or send teachers to attend relevant trainings. Other subject areas may be encouraged to design strategic intervention materials to aid the least-learned competencies.
- A similar study may be conducted covering a module or a quarter to ensure the mastery of the skills across the school year.

Acknowledgment - The researcher wishes to express his profound gratitude to the following who helped him make this study possible. To the Almighty Father, who gave him strength, wisdom, and courage to persevere in the completion of this endeavor. To his Mr. and Mrs. Arpilleda, his parents, who showed him their unfailing support. To the Subject Team Leader in Mathematics, Mrs. Milagrosa P. Resullar, who gave him inputs on how to prepare the material and the action research. To the Assistant Principal, Mr. Ricky Boy E. Limlingan, who allowed him to conduct the study in the Junior High School unit. To the Principal, Sr. Aileen U. Bonifacio, SPC, who gave the approval in the conduct of the study. To his co-Math teachers and friends, who gave him assistance and supported him during the process. Thank you!

6. References

- Alboruto, V. (2017). Beating the numbers through strategic intervention materials (SIMs): Innovative science teaching for large classes [Conference proceedings]. *AIP Conference Proceedings*.
<https://doi.org/10.1063/1.4983982>
- Blalock, G. C. (2010). *Strategic intervention material model 6*. Transition project: Education Transition Consulting UC. <https://www.ku.crl.org.pdf>
- Borenson, H. (2011). *Best Algebra help tips part I*. <https://www.howtolearn.com/2011/06/best-algebra-help-tips/>
- Bunagan, F. (2012). *Science intervention material*. Retrieved from
<http://www.slideshare.net/felixbunagan/strategic-intervention-aterial>
- De Gracia, R. (2016). *High school seniors with alternative conceptions on exponents and logarithms*. 13th National Convention on Statistics (NCS) EDSA Shangri-La Hotel, Mandaluyong City.
- Department of Education. (2005). *Department of Education Memorandum No. 117, s. 2005, entitled, Training Workshop on Strategic Interventions for Successful Learning*. <https://bit.ly/2YVA6DW>
- Department of Education. (2009). *Department of Education Memorandum No. 225, s. 2009. 7th National Science Quest for Elementary and Secondary Levels*. <https://bit.ly/2OP7Fnq>
- Dumigsi, M., & Cabrella, J. B. (2019). Effectiveness of strategic intervention material in Mathematics as remediation for grade 9 students in solving problems involving quadratic functions. *Asian Journal of Education and Social Studies*, 1-10. <https://doi.org/10.9734/ajess/2019/v5i130137>
- Dy, L. (2011). *Teaching mathematics through Strategic Intervention Materials (SIM)*.
http://www.mathlanding.org/collections/pd_collection/strategies-teaching-students-struggling-mathematics
- Herrera, F. T., & Soriano, A. T. (2016). The efficacy of strategic intervention materials with physics and mathematics remediation to the achievement of selected fourth year students of Las Nieves, Agusan del Norte. *Annals of studies in science and humanities*, 2(2), 22-33.
- Kautzman, K. (2012). *Math intervention strategies: Suggestions for struggling learners*.
<http://www.brighthubeducation.com/teaching-elementary-school/89697-math-intervention-strategies-for-struggling-learners/>
- King, K. (2017). *Exponents-What are they?* <https://www.kristakingmath.com/blog/exponents-what-are-they>
- National Council of Teachers of Mathematics. (2011). *A position of the national council of teachers of mathematics*. Retrieved from
<https://www.nctm.org/Standards-and-Positions/Position-Statements/Intervention/>
- Salviejo, E. I., Aranes, F., & Espinosa, A. (2014). Strategic intervention material-based instruction, learning approach and students' performance in chemistry. *International Journal of Learning, Teaching and Educational Research*, 2(1), 91-123.
- Sherman, H. J., Richardson, L. I., & Yard, G. J. (2014). *Why do students struggle with mathematics*.
<http://www.education.com/reference/article/why-students-struggle-mathematics/>
- Tañedo, L. (n.d.). *Etiology of mathematics learning*. Retrieved from
<https://www.scribd.com/presentation/449534676/ETIOLOGY-OF-MATHEMATICS-LEARNING>
- Van-de Walle, J. A. (2007). *Elementary and middle school mathematics teaching developmentally* (6th ed.).

Commonwealth University.

Villonez, G. (2018). Use of SIM (Strategic Intervention Material) as strategy and the academic achievement of grade 7 students on selected topic in earth science. *Pupil: International Journal of Teaching, Education and Learning*, 2, 78-88. <https://doi.org/10.20319/pijtel.2018.23.7888>

Yeniterzi, B., & Ulusoy, F. (2013, September). *Investigation on pre-service mathematics teachers' knowledge about eight grade students' possible errors in exponents* [Conference presentation abstract]. The European Conference on Educational Research (ECER), Bahçeşehir University, İstanbul. <http://www.eera-ecer.de/ecer-programmes/conference/8/contribution/21092/>