

Strategic Intervention Material (SIM) for Grade 11 Science

Gica M. Tugbong

Senior High School Teacher, Don Andres Soriano National High School, Toledo, Philippines

ABSTRACT

This research assessed the effectiveness of Strategic Intervention Material for Grade 11 Science at Don Andres Soriano National High School, Toledo City Division. Twenty-one students from Grade 11-STEM (Academic Strand) were the respondents of the study. Quasi-experimental method of research particularly the one-group pre and post-test design with purposive sampling was used in the study. To determine the significant mean difference, a t-test was used. The study was designed to assess the status of strategic intervention material as an instructional tool for learning acquisition. The topics of the experiment were the layers of the earth and the continental drift theory. Findings revealed that SIM aided students to obtain higher academic performance in Earth Science. Post-data rejected the null hypothesis. Thus, there was a significant difference between the pre-test and post-test results. Strategic intervention materials were made which can be utilized as a medium of instruction for students' new way of learning acquisition.

KEYWORDS: *Teaching Science Strategic Intervention Material, STEM, quasi-experimental method, Toledo City, Cebu, Philippines*

1. THE PROBLEM AND ITS SCOPE INTRODUCTION

Rationale of the Study

The 21st century learners have changed with the advent on embarking the K to 12 curriculum. They are regarded as communicative, collaborative, critical thinkers and creative. The new concept of learners calls for the change of teaching strategies, classroom experiences and various meaningful activities. With this new concept, it is important to remember that in lesson delivery, a teacher is looking into an educative and interactive pool of making learners to become scientifically literate for them to develop the higher cognitive skills while using their innate mastered skills with fun. Also, making teaching-learning process easy and promoting hands-on, minds-on and life-long learning among the 21st century learners. Thus, strategies and intervention materials are deemed important in order to facilitate efficiency and effectiveness of instruction.

According to the Philippine's Department of Education's Order No. 9, s. 2005 highlights to address the deteriorating quality of education through instituting measures to increase engaged time-on-task and ensuring compliance therewith. Enrichment and

remediation classes and individual instruction shall be encouraged to support teaching and learning.

The strategic intervention materials, commonly known as SIM is an instructional material designed to reteach and relearn the lessons or concepts which are least mastered by students specially in Sciences subjects. It requires least teacher supervision. SIM must be easy to reproduce and for time allotment intended only for 1 period or 2 periods. The design should be original (Procarpio, 2015).

The basic parts of SIM are intricately designed to offer challenging and interesting activities for independent learning. It is a useful tool for the teachers and administrators in order to enhance study habit as well as facilitate the learning process.

The researcher used SIM as first hand material to deliver instruction and to be utilized by the students to acquire new learning. Lessons were delivered through SIM instruction. The manipulation and exploration and discovery of new acquired learning through the material were highly emphasized. It directed to teach and offer new way of acquiring

How to cite this paper: Gica M. Tugbong "Strategic Intervention Material (SIM) for Grade 11 Science" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-7 | Issue-2, April 2023, pp.276-292, URL: www.ijtsrd.com/papers/ijtsrd53996.pdf



Copyright © 2023 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



knowledge though individualized instruction and interactive learning. Thus, the material (SIM) was used by the researcher to prove its effectiveness and to assess its status in Grade 11 Science.

Theoretical Background of the Study

This study predicted that the utilization of the Strategic Intervention Material in the teaching of Grade 11 Science offers effective way of learning acquisition.

This study was anchored on the theory of **Constructivism** by Jean Piaget and Jerome Bruner. Learners construct knowledge for themselves. Each learner individually (and socially) constructs meaning as he or she learns. Constructing meaning is learning, there is no other kind. The dramatic consequences of this view are two folds: (1) we have to focus on the

learner in thinking about learning (not on the subject/lesson to be taught); and (2) there is no knowledge independent of the meaning attributed to experience (constructed) by the learner, or community of learners (Hein, 1991).

Triviño (2016) considered one of Piaget's significant contributions in education which is his influence on the conceptualization of educational theory called "constructivism." Piaget believed that learners must be actively involved in the learning process as this allows them to construct their own knowledge and understand how to use it. Proponents of constructivism likewise advocated that learners be allowed to explore, experiment and discover as they learn about concepts and their environment (qtd. Arendale, 1993).

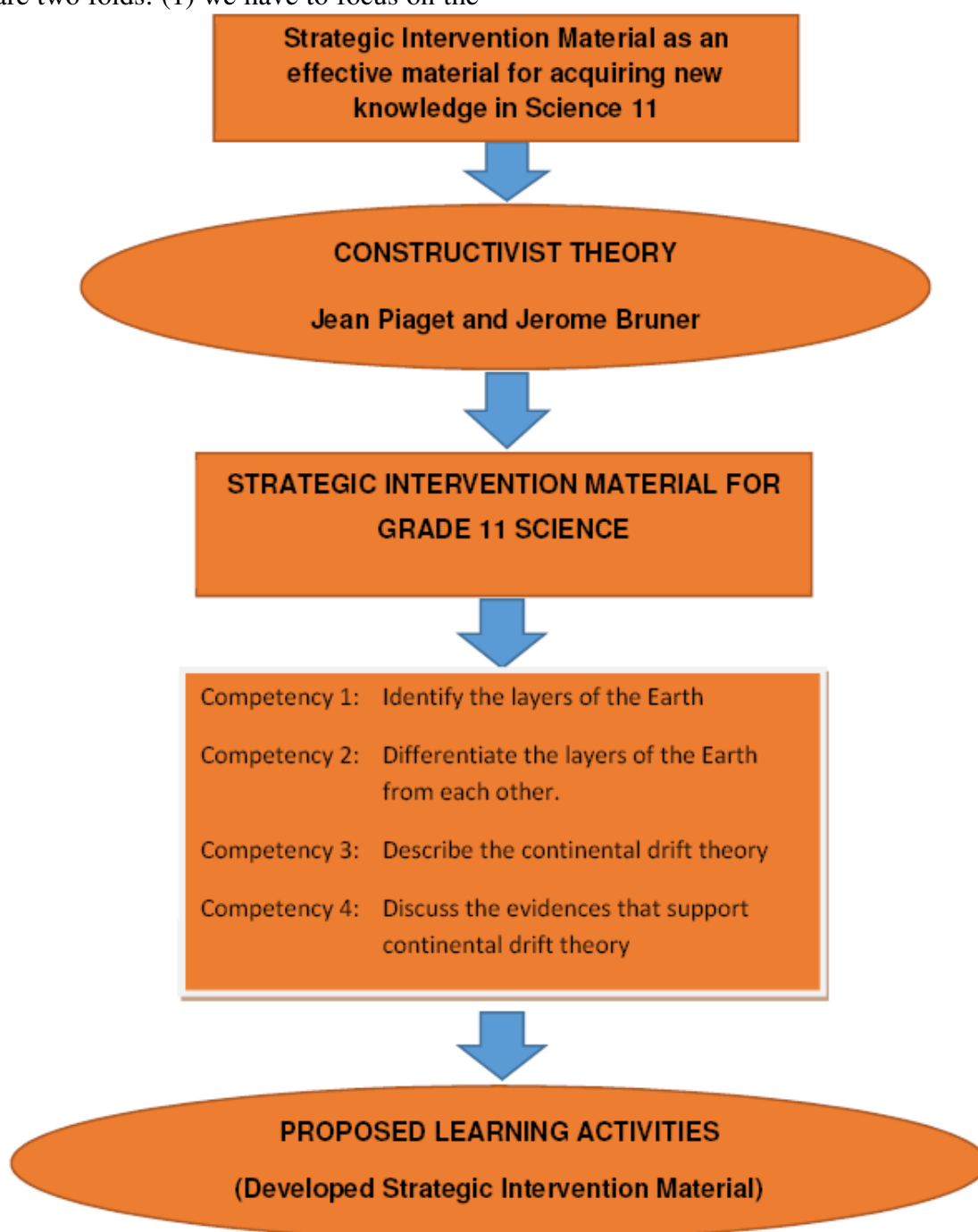


Figure 1: Schematic Presentation of the Theoretical Background of the Study

On the other hand, Bruner proposed that learners' construct their own knowledge and do this by organizing and categorizing information using a coding system. Bruner believed that the most effective way to develop a coding system is to discover it rather than being told it by the teacher. The concept of discovery learning implies that students construct their own knowledge for themselves (McLeod, 2012).

Constructivist theorists are emphasizing that students are not sponges-passive recipients of knowledge and that effective learning occurs when students are interacting with one another and the teacher to make their own meaning and construct their own knowledge (Cooper, 2011)

Arendale (1993) cited in the study of Triviño (2016), Dale concurred with Piaget's theory in his conceptualization of a model called- the Cone of Learning. Basically, this model shows some of Piaget's concepts of learning and the variety of instruction methods teachers may employ in order to stimulate learning. Dale's Cone of Experience is a model that incorporates several theories related to instructional design and learning processes. During the 1960s, Edgar Dale theorized that learners retain more information by what they "do" as opposed to what is "heard", "read" or "observed."

Furthermore, Dale's research, the least effective method at the top, involves learning from information presented through verbal symbols, i.e., listening to spoken words. The most effective methods at the bottom, involves direct, purposeful learning experiences, such as hands-on or field experience. Direct purposeful experiences represents reality or the closest things to real, everyday life. It also suggests that when choosing an instructional method it is important to remember that involving students in the process strengthens knowledge retention (Molenda, 2003).

Law of Exercise by Edward Lee Thorndike. The second law of learning is the "Law of Exercise," which means that drill or practice helps in increasing efficiency and durability of learning and according to Thorndike's S-R Bond Theory, the connections are strengthened with trial or practice and the connections are weakened when trial or practice is discontinued. the "law of exercise," therefore, is also understood as the law of use and disuse in which case connections or bonds made in the brain cortex are weakened or loosened. Many examples of this case are found in case of human learning. Learning to drive a motor-car, typewriting, singing or memorizing a poem or a mathematical table, and music etc. need exercise and

repetition of various movements and actions many times (Educational Psychology Journal, 2010).

Thus, philosophy of constructivism upholds lifelong learning. It occurs if learner acquires the knowledge himself and had created improvement to his life through lived experienced by the learners. Learners take charge of his learning based on his capabilities and level of understanding. It will be greatly appreciated if the learners do his best for the sake of improving and learning new things.

Discovery Learning and Discovery Teaching.

Discovery learning approaches are designed to engage students in inquiry through which, guided by the teacher and materials, they "discover" the intended content. All teaching, like all learning, involves discovery. What distinguishes these practices is a stance of inquiry wherein teacher discovery plays a central, essential role in shaping the substance and form of the course. Curriculum, in this sense, is not determined entirely in advance; it is largely discovered and emergent (Hammer, 1997).

In school, science subject has much weight in terms of units and emphasis. Science is considered as one of the indispensable learning areas in the restructured curriculum. It is one of the basic tool subjects in attaining functional literacy. To attain functional literacy, the students must master essential abilities such as scientific-numerical competence (Rivera, 2006).

Science and technology is viewed as the key to country's progress and global stability. Article XIV, Sec 10 of The Constitution of the Republic of the Philippines (1986) states that:

"Science and Technology are essential for national development and progress. The state shall give priority to research and development, inventions, innovations and their utilization; and to science and technology education, training and services. It shall support indigenous, appropriate and self-reliant scientific and technological capabilities and their application to the country's productive system and national life."

In line with the general aims of education, the Department of Education restructured its curriculum in 2002. The basic education curriculum is directed to provide greater understanding, mastery of skills life critical thinking and other scientific skills and appreciation of science and technology as applied to daily life as reported by the Presidential Commission on Education Reform (PCER, 2002) (Rivera, 2006).

Again, focusing on the general aims of education, the Department of Education (Dep.Ed.) enhanced the

curriculum and shifted to K to 12. The new curriculum was enacted in 2013 in the law known as RA 10533 An act enhancing the Philippine Basic Education system by strengthening its curriculum and increasing the number of years from basic education, appropriating funds therefor and for other purposes.

Based on the the K to 12 Program covers **Kindergarten and 12 years of basic education (six years of primary education, four years of Junior High School, and two years of Senior High School [SHS])** to provide sufficient time for mastery of concepts and skills, develop lifelong learners, and prepare graduates for tertiary education, middle-level skills development, employment, and entrepreneurship.

However, there are plenty of problems confronted by the Department of Education. These are weaknesses of science facilities and equipment, quality of science teacher, the learning process, instructional materials, curriculum, administrative support, teacher training, and funding manifest in the poor performance of Philippine high school students in several standardized tests, including the national achievement test (NAT). The Department of Education reports that the NAT mean percentage score (MPS) for high school in school year 2012-2013 was 51.41% or 23.59% points away from the target. The MPS in science was 41.35% (Dela Cruz, 2017).

Reported in PhilStar Global: The Philippines lags behind some of its regional counterparts in the latest Asian university rankings released by London-based Time Higher Education magazine. The University of the Philippines (UP) was the only higher education institution from the Philippines in the list of top 300 universities in Asia. Despite the inclusion of University of the Philippines (UP), Philippines was not included in the countries identified to have the potential to follow the footsteps of Asian higher education powerhouse such as China and South Korea. (Mateo, 2017).

In the Trends in International Mathematics and Science Study in 2003, the last time the Philippines participated in this assessment, the country scored 378 and ranked 34th of 38 countries (HS II Science). The Philippines ranked 67th of 140 countries in quality of math and science education in the 2015-2016 Global Competitiveness Report of the World Economic Forum, and 79th of 138 in the 2016-2017 data (Dela Cruz, 2017).

Compliance to this DepEd Order, Regional memorandum No. 0533, s. 2016 is the Conduct of Monitoring Evaluation and Adjustment (MEA) for Schools (SMEA), District (DsMEA) and Division

(DMEA) for the First Quarter of School Year 2016-2017 were nationwide implemented. This to ensure that learning-teaching process is not hampered and being monitored properly.

Cioco (2000), as cited by Rivera (2006), Science teaching is a worthwhile career. It is an art. It is both knowledge and practice. It will not only enrich the students with skills but is will also enrich the teachers. It brings satisfaction to oneself due to the reality that it opens doors and gives light to individuals who needs guidance and direction to see the relationship or interconnection of the things around them. It will enable everybody to come in contact with issues and concerns relevant to their lives.

To offer new avenue and new ways of acquiring knowledge. Lardizabal (1981) cited in the study of Manugas (1993), there is a need to upgrade and revise the teaching methodology to make it more productive in results particularly in achieving changes in attitudes and values which must be reflected in marked change in the conduct and behavior of the students.

it is important to remember that in lesson delivery, a teacher is looking into an educative and interactive pool of making learners to become scientifically literate for them to develop the higher cognitive skills while using their innate mastered skills with fun. Also, making teaching-learning process easy and promoting hands-on, minds-on and life- long learning among the 21st century learners. Thus, strategies and intervention materials are deemed important in order to facilitate efficiency and effectiveness of instruction.

Strategic Intervention Material reinforces the performance level of the students. It is an effective intervention material that helps students cover up the least mastered skills in science (Maringuran, 2017).

Somehow, it will allow students to give more time dealing with different strategies to increase their content literacy in a specific subject. Teachers should find way on how to conduct classes with variety of activities that will help the students as they develop skill competence and meet their classmates' abilities (Procarpio, 2015)

Proctan (2014) made a study on implementing SIM entitled "Strategic Intervention Materials (SIM): A Tool in Enhancing Students' Performance in AralingPanlipunan IV." The study concentrated on level of performance in the pre-test and post-test of the control (traditional) and experimental group (SIM). It was found out that before the students was exposed to the Strategic Intervention Materials

(SIMs) their competency level on the least mastered skills was average but after they were exposed to the Strategic Intervention Materials (SIMs) they achieved a very high performance.

The use of SIM as remedial strategy was used to determine student's improvement in their conceptual understanding in Radioactive Decay. The result of the test were higher compared to their scores before using the SIM. (Procario, 2015).

Unlike from above mentioned studies, this study used only one group experimentation method (quasi-experimentation) and students were exposed to SIM not for remedial purposes but as mode of instruction in acquisition of new knowledge. It assess if the known effective remedial tool for relearning the lesson can be used directly as learning instruction and effective learning acquisition as well.

Educators are considered as mind molders and facilitators, teachers should be creative in teaching their students, offering them with different strategies, approaches and techniques that aid them to understand the lesson easily and to be equipped with necessary knowledge for their academic growth.

Gentry (2013) cited in the study of Levy (2008), educators are mandated to see that all students meet the standards of their district and country. Through the use of differentiated instructional strategies, educators can meet the needs of all students and help them to meet and exceed the established standards.

Strategic intervention material is deemed as one of the differentiated instructional strategies that is potentially effective in delivering the lesson to students with different abilities, learning styles and personalities. This study makes use of the charisma and style of the strategic intervention material to be an effective material for new way of learning acquisition.

THE PROBLEM

Statement of the Problem

This research assessed the status of using the Strategic Intervention Materials (SIM) in the teaching of Earth Science for Grade 11 STEM (Academic Track) at Don Andres Soriano National High School during the School Year 2017-2018 as basis for a proposed learning activities.

Specifically, this answered the following questions:

1. What are the pre-post-test performances of the students in terms of the following competencies:
 - 1.1. identifying the layers of the Earth;
 - 1.2. differentiating the layers of the Earth from each other;

- 1.3. describing the continental drift theory; and
- 1.4. discussing evidences that support continental drift theory.
2. Is there a significant difference between the pre-post-test performances of the students on the aforementioned competencies?
3. Based on the findings of the study, what learning activities can be proposed?

Null Hypothesis

At 0.05 level of significance, null hypotheses was tested:

H_{01} : There is no significant difference between the pre-test and post-test scores of the students upon utilizing SIM in the abovementioned competencies.

Significance of the Study

This study poses beneficial to the following:

Students. Learners are able to experience another way of learning Science topics. This offers new way of supervising one's self and setting up their own pace in learning. With this strategy, students acquire maximum skills and knowledge with hands-on and minds-on experience. Thus, findings in this study give rise for better way of learning.

Teachers. Teachers able to come up with a more effective way of teaching topics in Science in particular. It is vital that teachers should be updated also in current trends and methods that suit the need of a student-centered teaching. Thus, findings in this study give rise for better instructions.

Administrators. This can be their basis in making their action plan so they can help Science teachers to improve their method of teaching.

Parents. Through this study, parents can have an idea on how teachers teach their children through different activities and they can see how the students learn and enjoy from these varied strategies.

Researchers. With this study, the researchers can develop better understanding to the strategies of teaching and as well as remediation for faster learning in getting to know today's learners.

Future Researchers. Strategic Intervention Material (SIM) is used as strategy in teaching. This may serve as reference in conducting new researches and may broaden and have a deeper understanding in Strategic Intervention Material (SIM) as tool for better learning with charisma and style.

RESEARCH METHODOLOGY

This part of the research study discusses the research design used by the researcher, the flow of the research study, the research environment and its location, the

research subjects, the different research instruments and how to treat the data statistically.

Research Designs

This study used Quasi-Experimental Method of research particularly the one-group pre and post-test with purposive sampling in assessing the status of using the Strategic Intervention Material to students for lesson delivery. This was conducted to the Grade 11-STEM (Academic Track) students at Don Andres Soriano National High School, DAS (Lutopan), Toledo City East District of Toledo City Division on the academic year 2017-2018.

The K to 12 Curriculum core subject Earth Science which was prepared by the Department of Education served as the reference in the selection of topics that were included in the test. This was the basis on the actual lesson that were taken up during the second

quarter in second semester. The topics include identifying layers of the Earth, differentiating the layers of the earth from each other, describe Continental Drift Theory and discussing the evidences that support continental drift theory.

Flow of the Study

The schema is shown in Figure 2; the input is the pre-test and post-test based on the competencies. Then, followed by the utilization of the researcher-made SIM. Lastly, the significance difference between the pre-test and post-test scores on the indicated competencies. Through the activities presented within the material, students can learn Science concepts in different way. Next, post-test was given and the scores were treated statistically. The data and findings were scrutinized and analyzed. Then, the proposed learning activities emerged.

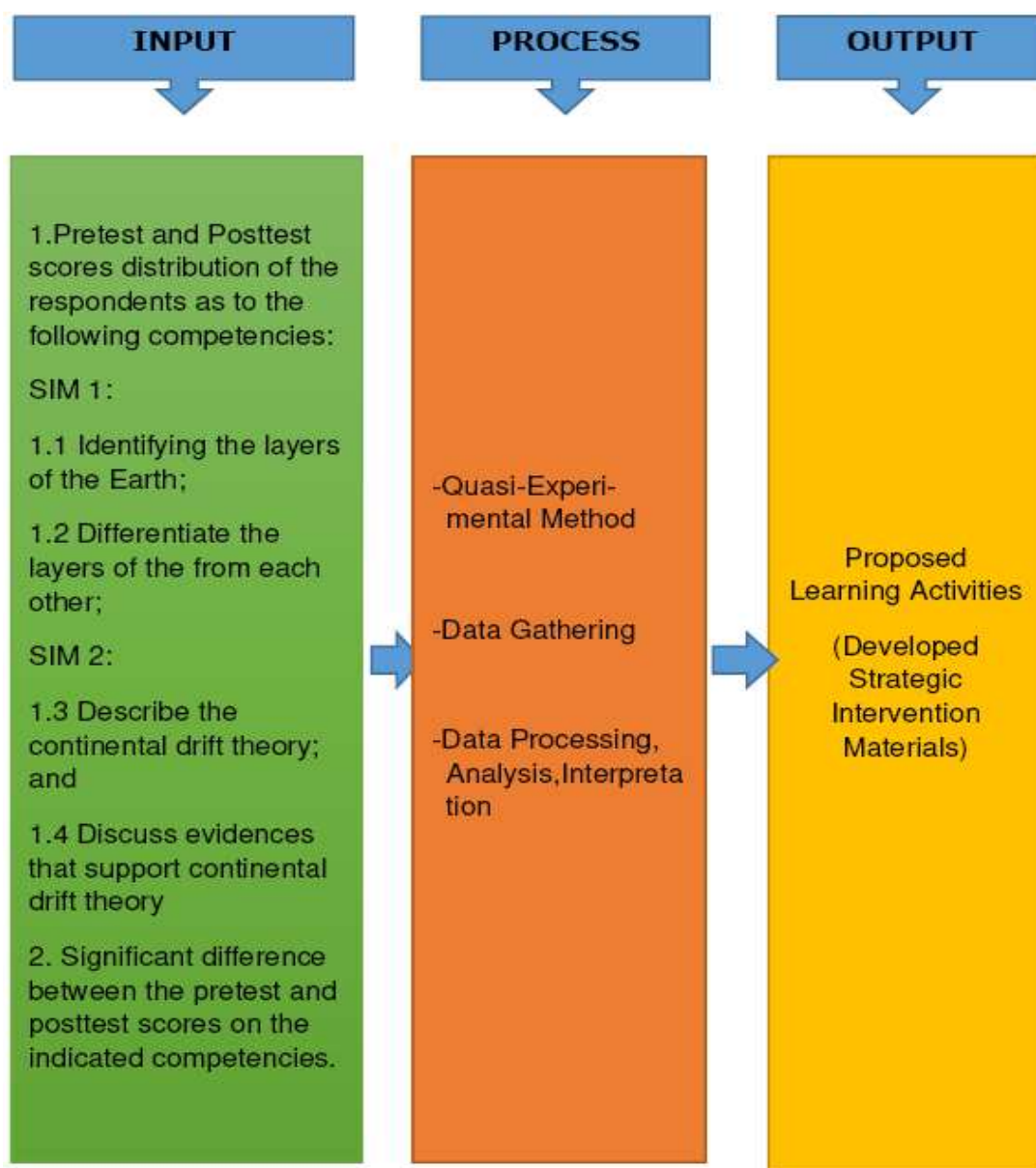


Figure 2: The Flow of the Study

Research Environment

The study experiment was conducted at Don Andres Soriano National High School in the City of Copper with a Heart of Gold- Toledo City, Cebu. It is located 14 kilo meters eastward away from Toledo City Proper. The

topography and land construction are somewhat hilly in some portion, partly rocky and areas are with lime soil with flat school ground along the Toledo-Naga National Road.

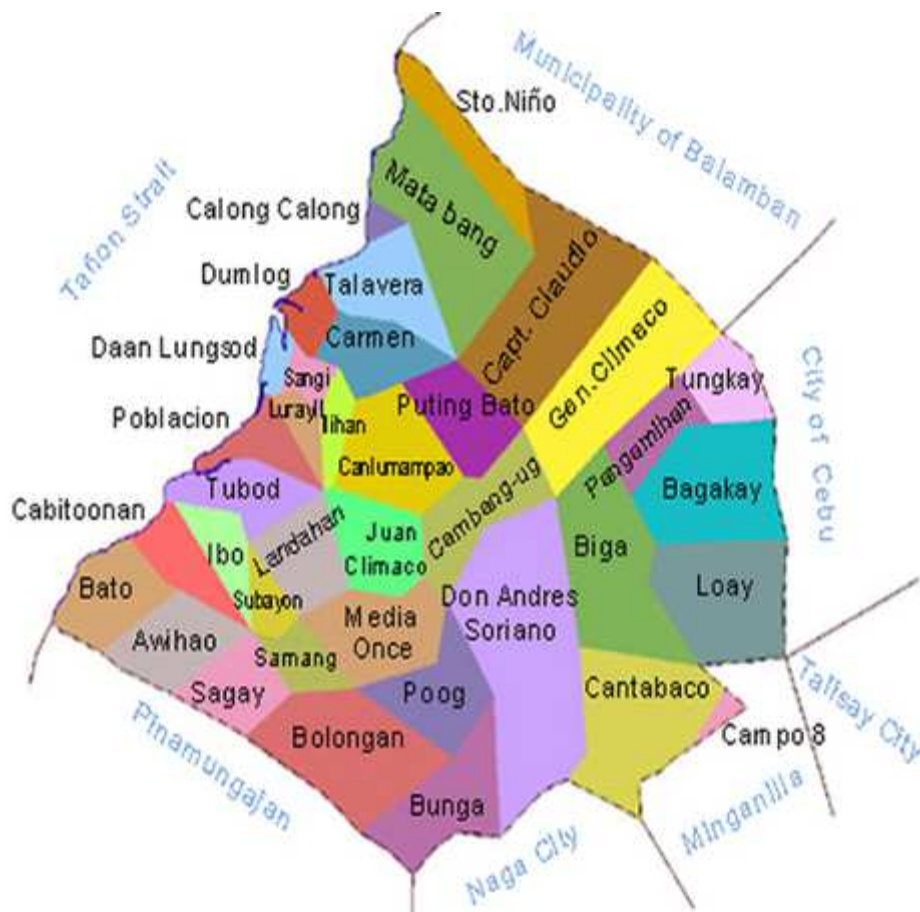
Don Andres Soriano National High School (DASNHS) is a car-line school and one of the biggest public schools in Toledo City. Consisting of more than 3, 500 students, 88 teaching and nonteaching staff and one administrator. It is serving the barangays of Lutopan, Uling, Media Once and Mayana.

The school currently has enough facilities to augment the needs of all graders. There are forty-nine (49) classrooms and six (6) of them needs major repair. All classrooms are well-lighted and well ventilated. It has a library, functional computer room with internet connectivity but no Science laboratory. It has a principal's office, guidance office, covered court, school canteen and shops for home economics (cookery and bread and pastries) and electrical students.



CEBU PROVINCE hk.images.search.yahoo.com

Location Map of the Research Environment (hk.images.search.yahoo.com)



Don Andres Soriano National
High School, Toledo City
Division

<https://toledocpdo.weebly.com/barangay.html>

Map of Toledo City

Respondents

The respondents of the study were the Senior High students specifically the Grade-11 STEM (Academic Track) of Don Andres Soriano High School, academic year 2017-2018.

Table 1 Population of the Grade 11 Students at Don Andres Soriano National High School S.Y. 2017-2018 (Second Semester)

NO.	MAJOR	MALE	FEMALE	TOTAL
ACADEMIC TRACK				
1	Science and Technology Engineering Mathematics (STEM)	11	10	21
2	Humanities and Social Sciences (HUMSS)	6	47	53
TECHNICAL VOCATIONAL AND LIVELIHOOD (TVL TRACK)				
3	TVL-Electrical Installation Management	50	0	50
4	TVL-Cookery	11	48	59
5	Plumbing	19	0	19
6	Computer Systems and Servicing (CSS)	13	17	30
TOTAL		110	122	232

Out of 232 Senior High School Students, only 21 were chosen as the respondents of the study. The other grade 11 sections: HUMSS A (53), TVL-Electrical (50), Cookery (59), ICT, Plumbing (49) were not included since they do not have the said core subject offered in the second semester and to some they do not have this subject, Earth Science in their track.

Research Instruments

In the process of the study, the researcher used three instruments: Strategic Intervention Material (SIM), Pre-test and Post-test. Some of the pre-test and post-test questions were adopted from the learners' material in Grade 10 Science and others were researcher-made.

The following were the instruments being utilized to get the necessary data needed to answer the problems set by this study.

Strategic Intervention Material (SIM). This served as experimental treatment of the investigation that being utilized by the students in learning science concepts and skills. The two (2) sets of Strategic Intervention Material were made. The first SIM encompassed two (2) competencies in Earth Science: 1] identify the layers of the earth; 2] differentiate the layers of the earth from each other. The second SIM encompassed another two (2) competencies which were 3] describe the continental drift theory and 4] discuss the evidences that support continental drift theory.

Steps in the Preparation of the Strategic Intervention Material (SIM).

The study starts with the development of the Strategic Intervention Material (SIM) in Grade 11 Science (Earth Science). The procedure was followed by gathering the material and information and in organizing these material included the following:

- A. Preliminary Phase
- B. Preparation Phase

Preliminary Phase. This first part in the preparation of the Strategic Intervention Material (SIM) is the preliminary phase. It consisted the collecting of references, reading, researching/surfing the internet, creating the themes of the SIM to suit the level of the learners. The review of topics found in the K to 12 Curriculum Guide in Grade 11 Earth Science. The topics in the second semester S.Y. 2017-2018 are the following:

- 1.1. identifying the layers of the Earth;
- 1.2. differentiating the layers of the Earth from each other;
- 1.3. describing the continental drift theory; and
- 1.4. discussing evidences that support continental drift theory.

Development or Preparation Phase

Strategic Intervention Materials. Strategic Intervention Materials instructional materials meant to re-teach the concept(s) and skill(s) to help learners master a competency-based skill which they were not able to develop during classroom teaching. Each intervention material has five parts such as the guide card, activity card, assessment card, enrichment card and reference card (Maringuran, 2017).

These are teaching materials which are designed to provide instruction to students. These are tools to make progress in teaching-learning process in individualized instruction.

Guide Card. The card sets the mode the first part in developing a strategic intervention material (SIM). This arouses students' desire and interest on the topic being discussed and gives students an overview of what they are going to learn as well as the learning competency that students need to master as stated in this part. It also includes the three sub-tasks or activities and the concept result or outcome expected to be achieved by the students.

Activity Card. This shows the different activities that challenge the learner to perform the given task which are competency-oriented and can be done through individual or group activity.

Assessment Card. The assessment card is used to assess students' level of understanding of what they learn through the given activities, exercise or drills. Students can correct errors and they can monitor their own progress. This card is designed base on the standardized test format to allow students to practice and measure their learning.

Enrichment Card. The enrichment can provide series that serves as reinforcement on the content of the lesson and give students opportunities to apply what they have learned. It motivates students to work independently or in a group to search answers of their own questions.

Reference Card. The reference card includes a carefully and well-researched list of resources that help students deepen the concepts and skills that they learn. Consequently, it includes additional useful content not found in the book.

The Strategic Intervention Material was designed by the researcher in accordance to the competencies and the type of learners. The alignment of the activities to the objectives of the material, varying exercises, easy to reproduce, can stand alone with less teacher supervision and the simplicity yet challenging tasks were ensured to meet the needs of diverse learning style of the learners.

Pre and Post-tests. This covered science concepts and ideas on the layers of the earth and the continental drift theory. These were 20-item multiple choice test. These instruments were a teacher-made test and some questions were adopted from the learners' material in Grade 10 Science based on the above mentioned competencies.

Data Gathering Procedures

The first phrase in gathering the data was sending letter (Appendix A) to the Principal and to the Schools Division Superintendent of Toledo City Division (Appendix B) to formally ask permission to do the experiment.

After securing the approval, the researcher conducted the study. The researcher administered the pre-test (Appendix C) to students on the two sets of competencies found on the K to 12 Curriculum on Earth Science for the second quarter in second semester. The researcher collected the test questionnaire. The papers were not checked in class. The researcher herself checked the papers and the result was not revealed in the class. The test lasted for thirty minutes and the test scores were recorded for comparison purposes.

The experimental phase was the utilization of the Strategic Intervention Material (Appendix D) as an instructional tool for lesson delivery of the topics. Each student was given a copy of the SIM and followed by the exploration, manipulation and utilization of the material. Students were given ample time to work independently to acquire new learning through the use of SIM.

The last part was the administration of the post-test to the students. Their scores was tallied, analyzed and interpreted by the researcher to determine whether there were significant difference on their mean scores in the pre-tests and post-tests.

Statistical Treatment

All data were analyzed and interpreted. These served as the bases in assessing the status of using the Strategic Intervention Material for Grade 11-STEM in teaching Earth Science.

The performance of the students was tested based on their scores of the pre-test and post-test. Frequency Count, Mean and Standard Deviation was utilized to summarize, analyze and describe the pre-test and post-test scores of the students. The statistical tools that were used in treating all the data as basis for analysis and interpretation are:

1. Homogeneity Test

The group of respondents were tested against homogeneity to ensure that they are similar at the start of the input.

2. T-test of Paired Observation

The scores were treated statistically in order to know the significant difference between the pre and post-test scores of the respondents. The t-test was used for small samples.

Scoring Procedure

Pre-test and Post-test Scores

The four competencies have 10 item multiple choice type each wherein some of the pre-test and post-test questions were adopted from the learners' material in Grade 10 Science and others were made by researcher. The progress and difference of test results of the respondents were determined based on the results of the pre-test and post-test scores.

The researcher established a range to determine the level of performance of the Grade 11 STEM in Earth Science.

Scoring Procedure

Range of Scores	Verbal Rating	Verbal Description
9-10	Outstanding	The respondent has gain mastery on the lesson.
7-8	Very Satisfactory	The respondent has above average performance on the lesson.
5-6	Satisfactory	The respondent has average performance on the lesson.
3-4	Fair	The respondents has below average performance on the lesson.
0-2	Poor	The respondent has poor performance on the lesson.

DEFINITION OF TERMS

The following are the operational definition of terms used in this study.

Competency. The learning objectives prescribe by the Department of Education found in the Grade 11-STEM Earth Science Curriculum Guide.

Developed Strategic Intervention Material. This is a researcher-made teaching material, a tool being utilized by the Grade 11-STEM to learn topics in Earth Science as a medium of instruction in teaching learning process

Proposed Learning Activities. This refers to a design used to improve the performance of the students.

Quasi-Experimental Group. This was composed of Grade 11 students who was exposed to Strategic Intervention Materials in learning new concepts in Science.

Remediation. This is an activity session that aims to re-teach the least mastered lesson.

Strategic Intervention Material. This is an intervention material commonly used as remedial tool. This material aims to address the least mastered topics in a certain subject. However, this material is being utilized in the study as new way of learning acquisition in lesson delivery. This material enhances mastery and alleviate the learning competency among learners in re-learning and re-creating new knowledge.

2. PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the data gathered with the corresponding analysis and interpretation of data from the Grade 11-STEM students of Don Andres Soriano National High School, DAS (Lutopan), Toledo City East District of Toledo City Division on the academic year 2017-2018.

The first part shows the distribution of the pre-test of the students in competency no. 1: identifying the layers of the Earth and competency no. 2: differentiating the layers of the Earth from each other. These competencies were tackled under SIM 1, entitled “Acquainting with the Layers of the Earth in an EGG-ccelelnt Way”. It includes also the distribution of the pre-test of the students in competency no. 3: describing the continental drift theory and competency no. 4: discussing the evidences that support continental drift theory. These were presented under SIM 2, entitled “The Gigantic Puzzle Pieces.” The second part shows the distribution of the post-test scores of the students after utilizing the SIMs with the abovementioned competencies. The last part presents the significant mean difference between the pre-test and post-test scores of the students.

Distribution of the students’ pre-post-test scores. This section presents the pre-post-test scores distribution of the respondents before utilizing the Strategic Intervention Material (SIM1) as to the competencies: 1] identifying the layers of the Earth and 2] differentiating the layers of the Earth from each other and Strategic Intervention Material (SIM2) with the competencies: 3] describing the continental drift theory; and 4] discussing evidences that support continental drift theory.

The Earth’s layers are made up of the three layers: the crust, mantle and core (inner and outer). The crust is the thinnest and the outermost layer of the Earth. The mantle is the thickest and in this layer found the special layer called asthenosphere, the soft weak layer capable of flowing and fluid like plastic. The core consists of iron and nickel. The outer core is liquid due to a very high temperature while the inner core is solid as a result of pressure freezing, which is common to liquids subjected under tremendous pressure.

Table 2 shows the distribution of students’ pre-post-test scores in the 10-item test in Competency No. 1: identifying the layers of the Earth.

Table 2 Distribution of Pre-Post-test Scores in Competency No.1

10-Item Test	Identifying the layers of the Earth					
	Pre-test (frequency) n=21	%	Verbal Rating	Post-test (frequency) n=21	%	Verbal Rating
9-10	0	0.00		5	52.94	Outstanding
7-8	2	9.50	Very Satisfactory	10	35.29	Very Satisfactory
5-6	8	38.10	Satisfactory	6	11.76	Satisfactory
3-4	9	42.86	Fair	0	0	
0-2	2	9.52	Poor	0	0	

The description of the scores are as follows:

9-10 Outstanding

7-8 Very Satisfactory

0-2 Poor

5-6 Satisfactory

3-4 Fair

Based on Table 2, out of 21 student-respondents, in the implementation of the study, in pre-test there were only two (2) or 9.52% of the respondents got very satisfactory grade. There were eight (8) or 38.10% of the student obtained satisfactory grade. There were nine (9) or 42.86% obtained a fair grade. Lastly, there were two (2) or 9.52% obtained a poor grade and none of them got an outstanding grade.

On the other hand, for the post-test scores shows there were five (5) or 23.81% of the students attained outstanding grade. There were ten (10) or 47.62% of the students attained very satisfactory grade and six (6) or 28.57% students attained satisfactory grade. None of the students got fair and poor grades.

The SIM 1 (Acquainting the Layers of the Earth in an EGGcellent Way) gave elaboration on the knowledge on competency 1: identifying the layers of the earth. The significant positive results gained by the students further emphasizes the effectiveness of the activities and drills embedded in the material which focused on the mastery of the lesson-identifying the layers of the earth.

This result supports the study of Estaban and Caballero (2015) which states that upon using strategic intervention material when used extensively, generate many advantages such as it develops higher thinking skills, improve scores and encourages students for responsible learning.

This result is also highlighted in the study of Maringuran (2017) stating that the use of strategic intervention material (SIM) reinforced the performance levels of the students and SIM is an effective intervention material that helps students cover up least mastered skills in Science. Furthermore, Rodrigo (2015) strengthened that strategic intervention materials increase and deepen the skills, knowledge and understanding of the child in various subject areas not only in science and math but also including various learning areas in the curriculum.

Table 3 shows the distribution of students' pre-post-test scores in the 10-item test in Competency No. 2: differentiating the layers of the Earth from each other.

Table 3 The Distribution of Students Pre-test Scores in Competency No. 2

10-Item Test	Differentiating the layers of the Earth from each other					
	Pre-test (frequency) n=21	%	Verbal Rating	Post-test (frequency) n=21	%	Verbal Rating
9-10	1	4.76	Outstanding	7	33.33	Outstanding
7-8	5	23.81	Very Satisfactory	8	38.1	Very Satisfactory
5-6	4	19.05	Satisfactory	6	28.57	Satisfactory
3-4	11	52.38	Fair	0	0	
0-2	0	0.00		0	0	

The description of the scores are as follows:

9-10 Outstanding

7-8 Very Satisfactory

0-2 Poor

5-6 Satisfactory

3-4 Fair

Based on Table 3, out of 21 student-respondents, in the implementation of the study, there was only one (1) or 4.76% of the respondents got an outstanding grade. There were five (5) or 23.81% of the student obtained very satisfactory grade. There were four (4) or 19.05% obtained a satisfactory grade. Lastly, there were 11 or 52.38% obtained a fair grade and none of them got poor grade.

For the post-test scores for Competency No 2, shows there were seven (7) or 33.33% of the students attained outstanding grade. There were eight (8) or 38.10% of the students got very satisfactory grade. There were six (6) or 28.57% got satisfactory grade and none of the students got fair and poor grades.

Furthermore, the pre and post-test results of the students present an enormous difference of the scores gained by the student-respondents. This was highlighted most in the outstanding percentage (4.76% pre-test and 33.33% post-test) with a difference of 28.76%. Then, none of the students got poor and fair ratings in post-test. Lastly, greatest number of respondents belong to very satisfactory rating.

Indeed, improvement of scores through visual materials, empirical strategy and self-paced learning that were absolutely offered by the materials utilized creates beautiful impact to the scores of the students.

The results support the study of Triviño (2016) states that students learn best through direct experience or visual orientation and when teaching styles and strategies are varied.

The Continental Drift Theory is proposed by Alfred Wegener stating that the continents were once part of a large landmass called Pangaea which drifted away from each other. The continents moved away from each other towards their current positions. This is supported by the evidences from jigsaw puzzle-tectonic fit, rocks and fossil remains, coal and glacier deposits.

Table 4 shows the distribution of students' pre-test scores in the 10-item test on describing the continental drift theory.

Table 4 Distribution of Pre-Post-test Scores in Competency No. 3

10-Item Test	Describe continental drift theory					
	Pre-test (frequency) n=21	%	Verbal Rating	Post-test (frequency) n=21	%	Verbal Rating
9-10	0	0.00	Outstanding	17	80.95	Outstanding
7-8	9	42.86	Very Satisfactory	4	19.05	Very Satisfactory
5-6	11	52.38	Satisfactory	0	0	
3-4	1	4.76	Fair	0	0	
0-2	0	0.00		0	0	

The description of the scores are as follows:

9-10 Outstanding 7-8 Very Satisfactory 0-2 Poor
 5-6 Satisfactory 3-4 Fair

Based on Table 4, out of 21 student-respondents, in the actual implementation of the study there were nine (9) or 42.86% of the respondents obtained very satisfactory grade. There were 11 or 52.38% of the students obtained satisfactory grade. Lastly, there was only one (1) or 4.76% of the students obtained a fair grade and none of the students got outstanding and poor grades. On the other hand, post-test scores for Competency No 3 shows there were seventeen (17) or 80.95% of the students attained outstanding grade. There were four (4) or 19.05% of the students got very satisfactory grade and there were none of the students got satisfactory, fair and poor grades.

In addition, the pre and post-test results of the students present a huge difference of the scores gained by the student-respondents especially in the outstanding rating with 0% pre-test and 80.95%. This major significance begets an impressive impact on the effectivity of the material. Lastly, none of the students got poor, fair and very satisfactory ratings in post-test. Undeniably, a well-crafted strategic intervention material generates positive strike on the test results.

This result corroborates the study conducted by Salviejo (2014) stating that SIM-Based Instruction is effective in terms of improving students' performance and learning approaches.

Table 5 shows the distribution of students' pre-test scores in the 10-item test on discussing the lines that support continental drift theory.

Table 5 Distribution of Students Pre-Post-test Scores in Competency No. 4

10-Item Test	Discuss the evidences that support continental drift theory					
	Pre-test (frequency) n=21	%	Verbal Rating	Post-test (frequency) n=21	%	Verbal Rating
9-10	2	9.52	Outstanding	16	76.19	Outstanding
7-8	11	52.38	Very Satisfactory	5	23.81	Very Satisfactory
5-6	7	33.33	Satisfactory	0	0	
3-4	1	4.76	Fair	0	0	
0-2	0	0.00		0	0	

The description of the scores are as follows:

9-10 Outstanding 7-8 Very Satisfactory 0-2 Poor
 5-6 Satisfactory 3-4 Fair

Based on Table 5, out of 21 student-respondents, in the actual implementation of the study there were two (2) or 9.52% of the respondents obtained an outstanding grade. There were 11 or 52.38% of the students obtained very satisfactory grade. There were seven (7) or 33.33% got a satisfactory grade. Lastly, there was only one (1) or 4.76% of the students obtained a fair grade and none of the students got poor grades. The students' post-test scores for Competency No 4 shows there were sixteen (16) or 76.19% of the students attained outstanding grade. There were five (5) or 23.81% of the students got very satisfactory grade and there were none of the students got satisfactory, fair and poor grades.

Unleashing the efficiency of the material was shown again by the result of the test scores on the last competency (discuss the evidences that support continental drift theory). With 66.67% difference between the post (76.19%) and pre-test (9.52%) percentage and an achievement of having none earner of poor, fair and satisfactory ratings. Definitely, SIM offers a well-articulated activity that surely enhances students' performance and engagement.

Indeed, teacher-made Science Strategic Intervention Material increased the performance level of the pupils and brought positive experiences of the pupils (Pleños, 2014).

SIGNIFICANT DIFFERENCE BETWEEN THE PRE-POST-TEST PERFORMANCES OF THE STUDENTS BASED ON THE COMPETENCIES

The difference of pre-post-test performances of the students. This part presents tables that showed the significant difference of the pre-post-test scores of the students in the four (4) competencies being measured with its mean gain (difference) and standard deviation. The p value is determined with the legend, if p value is <0.05 means significant and if p value is <0.01 means highly significant.

Table 6 The Significant Difference of the Pre-test and Post-test Score of the Students in Competency No. 1

Identifying the layers of the Earth		Pre-test	Post-test
	Mean	4.524	7.476
	N	21	21
	Std. dev	1.569	1.327
	T value	10.54	
	P value	0.0000	
	Interpretation	Highly Significant	
Legend: <i>p value</i> <0.05 -Significant <i>p value</i> <0.01 -Highly Significant			

Table 6 presents the significant difference of the pre-test and post-test performances of the students in Competency No. 1. The pre-test has a mean value of 4.524 with standard deviation value of 1.569 while the post-test has a mean value of 7.476 with standard deviation value of 1.327. It reveals that there was a difference of 2.952 for the mean value ($7.476 - 4.524$). Thus, there was a significant increase of the post-test scores of the students with p value ($p < 0.01$) of 0.0000 as interpreted as highly significant.

Furthermore, it shows that there is a difference in the pre-test and post-test performances of the students.

The result shows that the use of strategic intervention material in teaching science topics allow students' mastery. Students can easily identify the layers of the earth and can differentiate the layers of the earth from each other. The drills and challenges offered by the material enhances students' skills and alleviates students performance. It is vividly manifested also during the utilization of SIM, students were enjoying while exploring the instructional material.

Table 7 The Significant Difference of the Pre-test and Post-test Score of the Students in Competency No. 2

Differentiating the layers of the Earth from each other		Pre-test	Post-test
	Mean	5.095	7.571
	N	21	21
	Std. dev	1.813	1.535
	T value	6.96	
	P value	0.0000	
	Interpretation	Highly Significant	
Legend: p value <0.05 -Significant p value <0.01 -Highly Significant			

Table 7 presents the significant difference of the pre-test and post-test performances of the students in Competency No. 2. The pre-test has a mean value of 5.095 with standard deviation value of 1.813 while the post-test has a mean value of 7.571 with standard deviation value of 1.535. It reveals that there was a difference of 2.476 for the mean value ($7.571 - 5.095$). Thus, there was a significant increase of the post-test scores of the students with p value ($p < 0.01$) of 0.0000 that reveals a highly significant difference.

Moreover, it shows that there is a difference in the pre-test and post-test performances of the students and null hypothesis is rejected.

Strategic intervention materials offer variety of activities that gives wide range of learning styles. It also caters students' different pacing of learning. With the material, the learners own and manipulate the material in his own convenient and preferred style of learning.

Table 8 The Significant Difference of the Pre-test and Post-test Score of the Students in Competency No 3

Describe continental drift theory		Pre-test	Post-test
	Mean	6.238	9.19
	N	21	21
	Std. dev	1.044	0.073
	T value	12.11	
	P value	0.0000	
	Interpretation	Highly Significant	
Legend: <i>p value</i> <0.05 -Significant <i>p value</i> <0.01 -Highly Significant			

Table 8 presents the significant difference of the pre-test and post-test performances of the students in Competency No. 3. The pre-test has a mean value of 6.238 with standard deviation value of 1.044 while the post-test has a mean value of 9.190 with standard deviation value of 0.073. It reveals that there was a difference of 2.952 for the mean value (9.190 – 6.238). Thus, there was a significant increase of the post-test scores of the students with p value ($p < 0.01$) of 0.0000 that reveals a highly significant difference.

Again, it shows that there is a significant difference in the pre-test and post-test performances of the students and null hypothesis is rejected.

Based on the research of Atienza (2018), it was concluded that the use of SIM in teaching any concept results to higher MPS which only proved the effectiveness of the educational material in teaching science concepts.

Table 9 The Significant Difference of the Pre-test and Post-test Score of the Students in Competency No. 4

The Significant Difference of the Pre-test and Post-test Score of the Students in Competency			
Discuss the evidences that support continental drift theory		Pre-test	Post-test
	Mean	6.852	8.952
	N	21	21
	Std. dev	1.389	0.921
	T value	6.64	
	P value	0.0000	
	Interpretation	Highly Significant	
Legend: $p\text{ value} < 0.05$ -Significant $p\text{ value} < 0.01$ -Highly Significant			

Table 9 shows the significant difference of the pre-test and post-test performances of the students in Competency No. 3. The pre-test has a mean value of 6.852 with standard deviation value of 1.389 while the post-test has a mean value of 8.952 with standard deviation value of 0.921. It reveals that there was a difference of 2.1 for the mean value (8.952 - 6.852). Thus, there was a significant increase of the post-test scores of the students with p value ($p < 0.01$) of 0.0000 that interpreted as high significant difference.

Again, it shows that there is a significant difference in the pre-test and post-test performances of the students and null hypothesis is rejected.

Togonon (2011) cited in the study of Maringuran (2016) that SIM increases and deepens students' skills in manipulation, knowledge or thinking and understanding.

SUMMARY OF THE SIGNIFICANT DIFFERENCE OF STUDENTS PRE-TEST AND POST-TEST SCORES

Table 10 shows the comparison of the result of the mean difference between the pre-test and the post-test scores of the two researcher-made strategic intervention materials.

Table 10 Summary Table for the Significant Difference of the Pre-test and Post-test Scores of the Students

Sim No.	Competency	Pre-Test		Post-Test		N	T	P	Interpretation
		Mean	SD	Mean	SD				
1	1. Identify the layers of the Earth	4.524	1.569	7.467	1.327	21	10.54	0.0000	Highly Significant
	2. Differentiate the layers of the Earth from each other	5.095	1.813	7.571	1.535	21	6.96	0.0000	Highly Significant
2	3. Describe continental drift theory	6.238	1.044	9.19	0.073	21	12.11	0.0000	Highly Significant
	4. Discuss the evidences that support continental drift theory	6.857	1.389	8.952	0.921	21	6.64	0.0000	Highly Significant

For competencies: 1] identifying the layers of the Earth, the pre-test mean is 4.524 with standard deviation of 1.569 while in the post-test, the mean is

7.467 with standard deviation of 1.327. The test reveals a $p < 0.01$ which is highly significant. For competencies: 2] identifying the layers of the Earth,

the mean is 4.524 with standard deviation of 1.569 while in the post-test, the mean is 7.467 with standard deviation of 1.327. The test reveal a $p < 0.01$ which is highly significant.

For competency: 3] describing the continental drift theory, the pre-test mean is 6.238 with standard deviation of 1.044 and the post-test, the mean is 9.19 with standard deviation of 0.073. The test reveals a $p < 0.01$ which is highly significant. For competency 4] discussing the evidences that support continental drift theory, the pre-test mean is 6.857 with standard deviation of 1.389 and the post-test mean is 8.952 with standard deviation of 0.921. The test reveal a $p < 0.01$ which is highly significant. This further shows that there is significant difference in the results of the pre-test and post-test.

Based on the findings, there is significant difference to all the pre-test and post-test performances of the students. In this study reveals that strategic intervention materials aid much in acquiring new knowledge in Science topics. Thus, making learning fun and enjoyable through direct manipulation and exploration of the material. It also addresses the students' different learning styles and allow students to create his own unique way of learning in his convenience. Lastly, the materials proved its effectiveness through the manifestation of better performances of the students after the treatment.

Indeed, the performances of the students had significantly improved and had greatly enhanced when SIM was employed in teaching the lesson. Thus, the employment of SIM was efficient and effective (Villonez, 2018).

3. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary of findings, conclusions and recommendations based on the results and interpretation of the data from the previous chapter.

SUMMARY OF FINDINGS

The findings of the study as shown in the distribution of the pre-test and post-test scores revealed that most of the students obtained a rating of satisfactory grades in layers of the Earth while in the post-test it turned out that most of the students got outstanding grades. In continental drift theory, the distribution of the pre-test and post-test scores revealed that most of the students obtained a rating of satisfactory grades while in the post-test, most of the students obtained outstanding grades. This indicates that the developed strategic intervention material is effective new way of acquiring knowledge.

The study also revealed that there was a significant mean difference between the pre-test and post-test

scores of the students since the two sets of competencies have a p value of 0.0000. Thus, the null hypothesis was rejected.

CONCLUSION

Based on the findings of the study, it concluded that the utilization of strategic intervention material as instruction for learning acquisition in Don Andres Soriano National High School, East District, Toledo City Division aids greatly in the performance level of the Grade 11-STEM students in the two sets of competencies. SIM 1: 1] identify the layers of the earth and 2] differentiate the layers from each other and SIM 2: 1] describe continental drift theory and 2] discuss the evidences that support continental drift theory. Thus, Strategic Intervention Material (SIM) is an effective instructional tool that aids students for new learning acquisition.

RECOMMENDATIONS

Based on the findings of the study and its conclusions, it is recommended that the output will be utilized in teaching DASNHS-Senior High School students who did not master the competency level for the topics in the subject Earth and Life Science and Physical Science which are also offered in the other tracks. It is suggested that the output will be used as intervention for the remediation tool for re-teaching and re-learning science concepts.

Senior high school department is new curriculum. It still in the verge of building its foundation through our students. The lack and weaknesses of its facilities still being addressed. The major educational tool which are books are not readily available yet. It is highly recommended that Science teachers in senior high school will develop more strategic intervention materials to lessen the burden of our students in seeking material to use in their learning. Also, teachers will be provided supplemental materials/references for effective and stress-free teaching learning process.

4. OUTPUT OF THE STUDY STRATEGIC INTERVENTION MATERIAL FOR GRADE 11 SCIENCE

Rationale

This chapter presents the output of the study which is the developed Strategic Intervention Material (SIM) for Grade 11 Science at Don Andres Soriano National High School, DAS (Lutopan), Toledo City East District of Toledo City Division on the academic year 2017-2018.

It cannot be avoided that students can make absences and miss classes. A way to catch up and cope up with the class, students may be provided with an intervention through Strategic Intervention Material.

Furthermore, in a class especially in a heterogeneous type, the pacing of acquiring knowledge is varying. In strategic intervention material, the learner can work and learn independently with less or without teacher's supervision. This material provides activities, drills, bonus exercises and enrichment practices to learn new Science concepts at their own pace. In this material, learners are well motivated to learn through challenging activities, they can correct their own mistakes in every exercise and allows to assess their understanding of what they learned.

Lastly, the material offers a new way of acquiring new learning and making teaching-learning process easy and convenient.

Objective

The developed strategic intervention material aims to offer other way of acquiring knowledge and delivering lessons in new and creative way in learning Science concepts.

To utilize Strategic Intervention Material as intervention material as remedial tool.

Scheme of Implementation

The material has specific competency target, objectives, suggested activities, bonus task, enrichment practice and assessment task. The developed Strategic Intervention Material aids for convenient lesson delivery and independent learning.

The output of the study was presented to the Science teacher of Don Andres Soriano National High School-Senior High Department. The schedule of its implementation will be on the second quarter of the school year 2018-2019.

BIBLIOGRAPHY

- [1] Gentry, Ruben. et al. "Differentiated Instructional Strategies to Accommodate Students with Varying Needs and Learning Styles. Presentation The Urban Education Conference. Jackson State University. 2013.
- [2] Hammer, David. "Discovery Learning and Discovery Teaching." Department of Education Tufts University. Lawrence Erlbaum Associates, Inc. 1997.
- [3] Hein, George E. "Constructivist Learning Theory" The Museum and the Needs of People. CECA (International Committee of Museum Educators). Conference. Lesley College, Massachusetts USA. 1991.
- [4] Levy, Holli M. "Meeting the Needs of All Students through Differentiated Instruction: Helping Every Child Reach and Exceed Standards." Western Connecticut State University, Danbury.Wou.edu. 2008.
- [5] Mcleod, Saul. "Bruner."SimplyPsychology, Published 2008.Updated 2012. 18 Jan. 2018.

- [6] Molenda, Michael. "Cone of Experience".. A. Kovalchick and K. Dawson, Ed's Educational Technology: An Encyclopeida. 2003. Indiana University.
- [7] Triviño, Patricia C. "The Effects of Remedial Programs on the Study of Living Things in the Science Achievement of Grade 2 Students." De La Salle University Integrated School. Biñan, Laguna. Masteral Study. 2016.

Unpublished Materials

- [1] Esteban, Jovita P. and Caballero, Marietta S. Effect of Strategic Intervention Material: "Discover the Connection Between Photosynthesis and Respiration" In Selected Grade 9 Science Students of Camarin High High School (First Quarter of SY 2014-2015): An Action Research. 2015.
- [2] Garcia, Renzel Mae M. Cooperative Learning In Teaching Science Five at City of Naga, Cebu. Cebu Technological University, Cebu City, Philippines. 2016.
- [3] Manugas, Josefina M.Cooperative Learning Vs. Teacher-Centered Approach: Effects on Grade V Science Achievement", Unpublished Master Thesis, Cebu Normal University, Cebu City. 1993.
- [4] Maringuran, Angelina A. Strategic Intervention Material-Based Instruction (SIM-BI) for Science 10.Unpublished Master Thesis, Cebu Technologica University, Cebu City. 2017.
- [5] Policarpio, Jeffrey. The Effectiveness of SIM on Radioactive Decay: A Remedial Strategy: An Action Research. 2015.
- [6] Rivera, Maria Lourlyn A. Self-Activity Kits (SAK) for Elementary Science Instruction.Cebu Normal University, Cebu City.2006.

Department of Education Memorandum/Circulars

- [1] DepED Order No. 9, s. 2005. Instituting Measures to Increase Engaged Time-on-Task and Ensuring Compliance Therewith March 02,2005

Internet Sources/Website

- [1] Pleños, M. J. "Teacher-made Science Strategic Intervention Material: Tool to Enhance the Performance Level of Grade Six Pupils." Web. 11 Dec. 2017.
- [2] Dela Cruz, Mario James Simon. "Science ed and a thinking society." PressReader. 11 Mar. 2017. Web. 05 Dec. 2017.
- [3] Educational Psychology Online Journal. "Thorndike's laws of learning and its educational implications.dgwaymade.blogspot. Web. 19, Oct. 2010. 03. Oct. 2017.