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CoSIM (Comics cum SIM): An Innovative Material in Teaching Biology

RESTY C. SAMOSA

Graceville National High School, Department of Education, Schools Division of San Jose del Monte City, Bulacan, Philippines

resty.samosa002@deped.gov.ph

ABSTRACT

The study assessed the effectiveness of developed comics as strategic intervention material on teaching biology, particularly Photosynthesis. The study also determined the attitudes of the students on the use of developed CoSIM. Moreover, the study provided results on the mean difference between the students' pre-test anad post-test performance and a significant relationship between academic performance and the attitudes when aided by advanced strategic intervention materials. The researchers also used validated pretest-posttest and attitude survey-questionnaire as the primary tools of the study. The findings showed that the developed comic was useful as strategic intervention material in teaching biology concepts on Photosynthesis. The students have high positive attitude toward the developed CoSIM. There was a significant difference between the pre-test and post-test mean scores of the students. More so, students' academic performance significantly high positive relationship to the students' attitude toward the utilization of CoSIM in teaching biology, particularly Photosynthesis. Future utilization of this CoSIM as a strategic instructional material would raise students' academic performance and attitude in teaching specific science concepts.

Keywords- Students' Academic Performance, Students Attitude, Comics, Strategic Intervention Material (SIM), CoSIM,

I. Introduction

"Rich countries are science-rich and poor countries are science-poor." This statement was made by Dr. Frank Yui, Senator Emmanuel Pelaez's companion, the "Father" of Science Act of 1958 (Barredoz, 2014). This is a challenge to all educators to improve the teaching-learning process, especially in Science. It is said that Science is the backbone of the development of a country and a country with a majority of science illiterates is a developing country. The Philippines' development challenges can be overcome by committing to science and technology education to help breed innovative ideas, technology transfer and scientific breakthrough for progress. On the other hands, the Philippines was joined the Programme for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development (OECD), as part of the Quality Basic Education reform plan and a step towards globalizing the quality of Philippine Basic Education. PISA results revealed that the Philippines scored 357 in Science which is below the average of participating OECD countries. With these, it also reflecting the learners'

performance in the National Achievement Test, DepEd recognizes the urgency of addressing issues and gaps in attaining quality of basic education in the Philippines (DepEd, 2018).

As a result, it is normal to find that studying biology as a subject generates unfavorable reviews from the majority of secondary school students. One of the most despised subjects of science is biology. Students are more than likely to fail to meet the standards and receive poor grades in both academics and conceptual thinking (Samosa, 2021). Science is never enjoyable for many pupils. Since the process is tedious and time-consuming, student success in this area is limited (Samosa, 2019). In biology classes, Photosynthesis is a popular subject. It remains one of the most difficult, owing to a) its conceptual difficulty, which leads to a lack of interest and misconceptions among students; b) the difficulties students have visualizing or relating the process to things they can see, particularly when the topic is presented purely as a molecular process; and c) limitations to the practical demonstration of Photosynthesis due to the fact that the process is a molecular process (Russell, Netherwood & Robinson, 2015).

In the framework of addressing science-related contexts and activities, some new tools have been proposed to directly provide intuitive knowledge for students and making it more motivating and comprehensible for them. Visual aids are seen as particularly critical for conveying knowledge and embedding it in understandable learning scenarios. Using cartoons or comics is one way to do this in a unique way (Kennepohl & Roesky, 2018). Comics, whether streaming or written on paper, are commonly associated with the younger generation's social world. The influence of comic books has been blamed for both higher visual literacy and declining reading ability among today's students (Tatalovic, 2019).

More importantly, comics imagine stories, are seen as understandable by students, and enable teachers to relate science activities to real-life scenarios (Meinhart, & Eilks, 2018). Teachers should use a variety of teaching methodologies and instructional tools to help students overcome educational obstacles. As a result, the researcher agreed to assess the efficacy of the CoSIM (Comics cum SIM) in improving students' academic success in teaching Photosynthesis.

The researcher wants to introduce CoSIM (Comics plus SIM) as a new teaching tool for Photosynthesis. CoSIM (Comics cum SIM) is a form of instructional content used to teach concepts and skills. The primary goal of CoSIM (Comics cum SIM) is to help students learn the principles of Photosynthesis in a simple manner. CoSIM is offered to students to assist them in mastering a competency-based ability that they were unable to acquire through normal classroom instruction. Furthermore, once they have learned the principles of Photosynthesis in simple questions and have correctly answered them, they can progress academically. Casumpang & Enteria (2019) claimed that comics as educational material will promote students' learning of overarching principles such as cognitive growth, motivation, knowledge processing, and process skills, based on Gary (2012) and zdemir (2016) theories. With the current situation and emerging

hypotheses on comics as instructional materials, the researcher attempted to measure the efficacy of CoSIM (Comics cum Strategic Intervention Material) as a constructive tool in improving students' performances in a teaching biology, especially in Photosynthesis, as well as learners' attitudes toward CoSIM use. The report also looked at whether there was a substantial gap between the pre-test and post-test in teaching the principles of Photosynthesis to students exposed to CoSIM and whether there was a significant association between academic success and attitudes toward CoSIM exposure.

II. Literature Review

Strategic Intervention Material (SIM) in Science Education

Instructional materials are school resource inputs (SRI). They include print and non – print items that are designed to impart information to students in the educational process. Instructional materials also include kits, textbooks, magazines, newspapers, pictures, recordings, slides, transparencies, videos, video discs, workbooks and electronic media including music, movie, radio, software, CD – ROMs, and online services (Dahar, 2015). Instructional material plays a vital role in the teaching learning process. It enhances the students' memory level and makes the teaching – learning process interesting (Raw, 2015).

At present, in the Philippine education system, intervention materials are highly regarded as tools for remediating the learners' poor achievements. SIM or Strategic Intervention Material refers to a teaching aid introduced into the teaching methods to stimulate the students' activity and increase their understanding level (Dy, 2011). It is strategically prepared and designed for teaching remediation for low achievers in the subject. It is given after the regular classroom instruction to students who were not able to grasp the concepts of the subject matter.

Salviejo et al (2014), defined Strategic Intervention Material as meant to re-teach the concepts and skills (least mastered). It is a material given to students to help them master competency–based skills that they could not develop during regular classroom teaching. It consists of both learning strategies (for students) and content enhancement (for teachers). It is a multifaceted approach to help students to become independent and successful learners. He further differentiated SIM and modules. This intervention material focuses on the skill not mastered by the students during regular class. It does not involve pretest and posttest and includes fun activities. On the other hand, module contained different topics included in a given chapter and intended for regular classroom teaching and distance learning. The module requires pretest and posttest and also includes fun activities.

Strategic Intervention Material is an instructional material prescribed by the Department of Education to improve students‘ performance in science subjects. To promote successful learning in the field of science and technology subjects in both elementary and secondary among public schools, DepEd Memorandum No. 117, series of 2005, provided the teachers the training and workshop on how to prepare this intervention material. As part of promoting the wide use of the material, the Department of Education included SIM making that is open to all science teachers as

one of the contests in yearly science fair in the school, division, region and national level competitions.

The Strategic Intervention Material (SIM) is divided into six parts taken from the researcher's seminars and trainings.

The first part of the SIM is the title card, this part of the SIM includes the specific chapter, or the subject matter covered by the material. The SIM used in this study is entitled Photosynthesis that covers the stage of Photosynthesis and its processes, which are considered least mastered skills in second quarter of Earth and life science.

The second part is the guide card. This section gives a preview of what students will learn. This card should stimulate the interest of the students with respect to the topic covered by the strategic intervention material. It presents the focus skills mentioned in the learning competencies and must state at least two sub-tasks (activities). This part must also cite prerequisite skills built on prior learning and concrete outcome or product that students are expected to demonstrate or produce.

The third part of the SIM is the activity card. This section is considered the heart of the Strategic Intervention Material. It consists of activities that will develop understanding of the students related to the given objective of a specific lesson stated in the guide card. It contains also guide questions for the students to answer and relate the activity conceptually, that will be developed after completing the main activity. This part also provides the objectives, students‘ exercises, activities, and drills with clear directions to develop necessary skills in the three domains and concrete concepts, particularly those drawn from real – life situations. It also allows the students to organize based on the focus skills sequence and make discoveries and formulate ideas on their own. This section also consists of questions that establish relationship between the topic and what students already know or familiar to them.

The fourth part is the assessment card that is made up of activities and tests concerning what the students learned from the previous activities of the SIM. This test measures how much students learned from the given activities in the activity card. It is made up of questions in different forms (multiple choice, interpreting graph, identification, and matching type). This section determines the effect of this material as a tool for teaching remediation.

The fifth part of the SIM is the enrichment card. This section provides practical activities to be done by students related to the topic. This involves applications of the topic in their daily life, in industry, or in other technologies. The last part of the SIM is the reference card which includes the title of the books, websites, or any other electronic or printed materials. Students may use this part as reference for additional information concerning the topic covered.

Strategic Intervention Materials (SIMs) are aimed to help teachers provide students the needed reinforcement to make progress in their respective subjects. Various studies and literature have particularly pointed out the effectiveness in the utilization of SIMs in their respective science lessons.

Gultiano (2012) studied the effect of strategic intervention material on the students’ academic achievement in Chemistry. The study employed the experimental design and found out

that the experimental group, where SIM was integrated, performed significantly better in the post test. Gultiano (2012) concluded that the use of strategic intervention materials is effective in mastering the competency based skill in chemistry based on the mean gain scores in the posttests of the experimental and control group. Similarly, Salviejo, Aranes, and Espinosa (2014) explored students' learning approach and investigated the effect of strategic intervention material-based instruction (SIM-BI) on their Chemistry performance. Using the pretest-posttest pre-experimental design, result showed that the use of SIM-BI has significantly enhanced the performance of the students in Chemistry and that surface and deep learners equally performed in Chemistry when SIMBI was integrated in their Chemistry Classes.

Paras (2012), The study focused on the usefulness of Modified Strategic Intervention Materials (MSIM) in enhancing the Science learning skills of the Grade V Pupils in Mangin-Tebeng Elementary. The researcher developed a teacher-made test for the pretest and posttest research design. The test administered was validated by five teachers and the result is effective in its utilization. The respondents were classified under control group (23 pupils) and experimental group (23 pupils). The study applied one-shot experimental design. All data gathered were used for the enhancement of instructional materials in teaching Science. The statistical tool utilized is t-test for independent sample comparing means the two independent groups. The findings indicated a tremendous increase from the result of pretest to the posttest. Therefore, the modified Strategic Intervention Materials (MSIM) were effective in mastering the competency-based skills in Science based on the mean scores in the posttest of the experimental and control groups. Seminars and in-service training should be conducted in the division to develop and implement MSIM in the classroom. This should be made to address the least mastered skills.

Moreover, the study of Anderson et al. (2012) revealed that using intervention material helped the learners of biology improve their performance in understanding the concepts of Photosynthesis, respiration, mendelian, and non-mendelian genetics. His use of computer-based materials and exercises on concept mapping allowed these students to improve their performance significantly in answering and understanding genetic problems and concepts.

Escoreal (2012) found that the use of SIM reduced the number of least mastered skills after the implementation of the intervention material in grade 4 science. She particularly emphasized that SIM must be implemented to avoid pupils' marginalization. Proving that students can cope with science lessons with the teacher utilization and integration of intervention materials.

Villareal (2013), conducted an action research on the effectiveness of the intervention material that used scaffold in teaching Biology. The statistical treatments employed was weighted mean and t test. Based on the data gathered, the mean gained by the experimental group is higher than the control group's mean. The computed t value showed that there is significant difference between the mean of two groups. Therefore, the intervention materials is an effective way of improving students' competence.

Salviejo et al (2014), study the use of Strategic Intervention Material-Based Instruction (SIM-BI) based on the results showed that it is effective in improving students' performance and learning approach. The surface learners performed equally well as the deep learners when SIM-BI

was used. The positive result of the survey suggested that the SIM was appreciated and appealed to both types of learners.

Barredo (2014) developed a strategic intervention material in Science to enhance learning and remedy the students' least mastered skills, thus attain growth in their academic performance. The study reveals that the experimental and control groups performed at the same level before the experiment. Consequently, experimental group performed better in the posttest than the control group. Moreover, strategic Intervention materials were effective in teaching competency-based skills. There was significant difference between the mean scores in the posttests of the experimental and control groups.

Marimla & Dimalanta (2015), conducted study on the usefulness of the Strategic Intervention Material in Science V to the pupils. Specifically, the study dealt to identify the least learned topics in Science V in the third quarter; to describe pupils in the pretest; to know the scores of the pupils in the posttest; to prove the highly pupils in the pretest and posttest; to know how the Strategic Intervention Material in Science V developed by the researcher evaluated by the experts on SIM in terms of Content/Objectives, Subject Matter quasi-experimental method was used in the study, standardized test, strategic intervention material and an evaluation form were the primary instruments used in gathering data. Pretest was first administer develop a strategic intervention in Science V which consisted of two least learned topics. Electricity and Simple Machines we least learned topics; teacher respondents strongly agreed usefulness of the Strategic Intervention Material; the pupils' performance on the Strategic Intervention Material based scores was described satisfactory and very there was a highly significant difference between the pretest and posttest scores of the pupils. It was concluded that Strategi Material is useful in order to reduce the least learned topics and at the same time to improve the performance of the pupils.

Villonez (2018), find out that the use of SIM (Strategic Intervention Material) would improve the academic achievement of grade seven students on selected topic in earth science. The study made use of quasi experimental design which is non- equivalent control group pretest and posttest design. About 120 participants were used as subjects of the study. Mean and t- tests were used as tools in the analysis of data. The result of the study revealed that there was a significant difference in the pretest and posttest mean scores of the experimental and control group in the topic eclipse. The experimental group achieved a better mean gain score than the control group. This points out that the use of strategic intervention material (SIM) in the experimental group significantly improved the performance of the students. It can be concluded that the performance of students in the experimental group was greatly enhanced after SIM was employed in teaching the lesson. Therefore, the employment of SIM was better and effective than the use of traditional method in teaching some topic in Science. Furthermore, it was recommended that SIM be adopted as instructional material or strategy in teaching science lessons as well as other subjects.

Herrera & Soriano (2016) determine the efficacy of Strategic Intervention Materials (SIM) to the achievement in Physics of a selected group of fourth year public school students in Mat-i, Las Nieves, Agusan del Norte. It is a pretest-posttest quasi-experimental method that aimed to determine the least-learned competence and performance of the fourth year pupils in Physics

before and after utilization of the SIM. The study used the ADDIE model which consisted the five (5) phases namely: Analysis, Design, Development, Implementation and Evaluation. The SIMs that the selected group of students utilized followed careful planning and formulation and were validated and assessed by credible evaluators and students themselves. The said materials' substantial contents were based on least-learned or least-mastered concepts or areas among the suggested ten (10) core topics in Physics. The study results revealed that the utilization of the SIMs was effective in improving the least-learned competence of the learners in Physics as evidenced by its significant increase in their post-test scores. Moreover, the increase in the performance in physics is highly determined by the introduction of SIM in the class and not by the remediation in mathematics.

In the research findings of the study of Anadia & Membrebe (2016), revealed that there were significant differences obtained on the level of academic achievement (pre-and post-test results) on the two methods (conventional and SIM). Also, there is a significant difference to the two methods in improving grade seven students' academic achievement. Apparently, the effect of the use of the strategic intervention material to the profile of grade seven students shows no significant difference on the academic achievement (post-test), thus, the three variables on the profile of the students, namely: its gender, the general average and the reading comprehension does not affect the level of academic achievement of the students on the SIM group. The study suggests that the Strategic Intervention Material (SIM) developed can be adopted as instructional material for the improvement in teaching Science, to facilitate and carry out the three way process of learning, most importantly to improve achievement of the students.

Contreras (2018) study the effectiveness of Manipulative and Interactive Strategic Intervention Material (MI-SIM). MI-SIM is a combination of manipulative and interactive instructional tool that aims to improve the Least Mastered Skills in Science. Cluster random sampling was used for the selection of respondents at Manila Science High School. A pretest was conducted before the treatment to the experimental group. Posttest was then initialized after the treatment. Mean Test and Standard Deviation were used to evaluate the MI-SIM's effectiveness. Results showed that it had exceeded standards in sub-tasking and congruence; consequently, it had met the standards in functionality and technicality. The overall evaluation of MI-SIM revealed that it had exceeded standards and was highly acceptable. Analysis of Covariance was used to test the difference in mean posttest scores of students who experienced conventional and MI-SIM teaching methods. Results indicated that the conventional group's mean posttest score was 36.80 (±5.00), while MI-SIM's group was 31.57 (±4.86). The null hypothesis for the covariate pretest score was rejected while the intervention/method of teaching was not. The researcher recommends further study and evaluation of MI-SIM utilization.

Dapitan & Caballes (2019), □study the effectiveness of SIM in General Biology 2 of STEM class. The study utilized single group pretest-posttest experimental design. About 15 participants were used as subjects. Mean, Standard deviation, and Wilcoxon signed rank test were

the statistical tools employed. The study revealed that students have improved performances after using SIM as depicted in the computed sig value of 0.004 and 0.001 for DNA and Protein synthesis and Recombinant DNA respectively. With these, teachers are encouraged to make and utilize SIM as an effective material to achieve learning objectives.

Aranda et al. (2019) conducted a quasi-experimental research design to investigate the effect of the integration of strategic intervention material (SIM) in teaching grade seven Science to low achieving learners. The study explored the pre-test and post-test performances of SIM and nonSIM group, and to find out the significant difference between the performance of the two groups. The researchers used purposive sampling to identify the respondents. After the pre-test, least learned topics were identified. These topics were Substance and Mixture, Metals and Non-metals and Solution. Descriptive and inferential statistics were employed to analyze and interpret the obtained data. Prior to the intervention of the study, the two groups were equivalent in terms of their academic performance in Science. The post-test result of the SIM group was higher compared to the post-test result of the non-SIM group. Also, a highly significant difference was found between the pre-test and post-test performance of the SIM group after the intervention. The investigation revealed that SIM as an instructional material was effective in teaching grade seven science to low achieving learners.

Sinco (2020), developed and used teacher-made instructional materials otherwise known as Strategic Intervention Materials (SIMs), and investigated the impact of these intervention materials in teaching the identified least learned concepts in Science VI namely: Circulatory System, Nervous System and Respiratory System. The study was a mixed method research which utilized an explanatory sequential design where quantitative data collection and analysis occurs first, followed by a qualitative data collection and analysis. It was revealed that there was a significant difference between the pre-test and post-test performance of the students. The utilization of the SIMs is an effective intervention that made students obtained better scores in the posttest.

Based on the above-mentioned information, the utilization of an intervention material can significantly increase students' performance in the least mastered skills in Science. These studies revealed that the use of SIMs plays a pivotal role in elevating the memory level of the students, in grasping the different concepts in Science, and with the integration of various strategies in the implementation of the material, the teaching-learning process becomes interesting

Effectiveness of Comics in Teaching Science

Hosler & Boomer, (2012) reported the results from the first systematic assessment of how a science comic book can affect student learning and attitudes about biology. Through the used pre- and post-instruction instruments to measure students' attitudes about biology, attitudes about comics, and content knowledge about evolution before and after using the science comic book Optical Allusions in their classes. On the pre-instruction instrument, nonmajors reported the lowest

scores on the content test and attitude surveys relative to the other groups. However, on the post-instruction instrument, nonmajors' content scores and attitudes showed a statistically significant improvement after using the comic book, particularly among those with lower content knowledge at the start of the semester. The improvement in attitudes about biology was correlated to attitudes about comics, suggesting that the comic may have played a role in engaging and shaping student attitudes in a positive way.

Koutníková, (2017), study focused on analysis and reflection on working with comics by students in the preschool teacher training programme. It used of comics to help pre-literacy children understand certain physical phenomena. The study is based on observations of changing perception of phenomena by children as a result of the use of comics accompanied by concept maps. Comics are proven to be a modern pedagogical strategy, which is starting to gain its popularity in teaching about nature study. It is used in research-oriented teaching within the psycho-didactic concept of instruction. The study revealed that comics can help make science concepts interesting and comprehensible for a preschool child.

Affeldt et al. (2018), described a study of 6th grade students´ perceptions (age range 11-13 years) of using comic-based lab instructions in a non-formal inquiry-based laboratory learning environment which focused on the chemistry of water quality. Semi-structured interviews of pairs of students were conducted during their visits to the non-formal laboratory. These 22 interviews (44 students total) were then analysed using qualitative content analysis. Overall, the students' very positive perceptions could be identified with respect to comics- based experimental instructions.

Casumpang & Enteria (2019), studied the effectiveness of developed comic strips as an instructional material on teaching specific science concepts. The study also determined the respondents' perception on the use of developed comic strips with regards to the enhancement of their science process skills. Moreover, the study provided results on the mean difference between the pre-test and posttest performance of the respondents when aided by developed comic strips. The researchers made used of validated rubrics and survey questionnaire as the primary tools of the study. The findings showed that the developed comic strip was effective as an instructional material in teaching science concepts, on waste generation and management topics in particular. It was rated acceptable and commendable by the expert-evaluators. There was a significant difference between the pre-test and posttest mean scores of the respondents. The respondents positively perceived that the developed comic strips had enhanced their inferring and communicating science process skills. Hence, the results further motivate the respondents to appreciate waste generation and management and put value on its effect to human and environment. Future utilization of this comic strip as an instructional material in teaching specific science concepts would raise environmental awareness and campaign.

Özdemir & Eryılmaz (2019), the study involves six instructional comics about heat related concepts having empty speech balloons were constructed and implemented to a group of 6th

graders as balloon completing activities. It was observed that many students completed empty balloons with several wrong statements, and it was concluded that students' wrong statements have crucial feedback for dealing with students' preconceptions about science concepts.

Hidayat, & Rostikawati (2018), concluded that the use of intelligent comics combined unitedly in the learning process with scientific approach significantly influence the science competence of grade 4 elementary school students on the aspects of knowledge and scientific attitude, but does not significantly affect the competence of Science for the aspects of science process skills. This study also concludes that there is no interaction between the learning process as the treatment variable and the involvement of the students in the out-of-school learning guidance (tutorial) as the moderator variable. That is, the influence of the learning process on the students 'competence of Science on aspects of knowledge and scientific attitudes is not contaminated by the students' involvement in the guidance of learning.

Da Silva et. al (2016), indicates that using presentation of comics as a teaching strategy can enhance competence development, assist in the development of innovation and flexibility, and also contribute to reducing the gap between theory and practice. It can also help students develop a critical sense, help establish relationships between events and managerial situations, and encourage the exchange of experiences, assisting in decision-making and allowing students to represent a professional situation based on theoretical precepts. Finally, it contributes to the development of reflective practice in the learning environment and, in particular, promotes the development of creativity, something that was observed throughout the implementation of the strategy.

The study of Kiliçkaya and Krajka (2012) sought to identify whether students liked to create comics to facilitate their learning process. The students spent five weeks creating the comics virtually and in class. At the end of the process, they sent the material produced to the teacher. The material was subsequently reviewed and commented on by the entire class. In the end, of the 25 students who participated in the process, 24 claimed they liked to participate in the activity. The authors indicated that among the contributions of the use of the comic genre in teaching were the development of autonomy, freedom, and creativity and still the fact of being a student-centered education strategy.

III. Methodology

3.1 Type of Research

The study employed one-group pretest–posttest design to determine the effect of a treatment or intervention on a given sample. Samosa (2021) characterized as used in a single group of subjects with the same characteristics and gave the same treatments, assessments, and innovations. In addition, this design has linear ordering that requires the assessment of a dependent variable before and after a treatment is implemented. From this design, the effect of a treatment is determined by calculating the difference between the pretest and posttest. If the pretest and posttest scores differ significantly, then the difference may be attributed to the independent variable.

3.2 Respondents

The study is limited to thirty (30) Grade 11 Accountancy, Business and Management Strand (ABM) learners who are purposively selected which have the similar traits or specific characteristics of the participants particularly learners have a difficulty in learning Photosynthesis from the Graceville National High School in Schools Division of San Jose del Monte Bulacan. The ratio of males to females among the respondents depends on the number of enrollees this A.Y. 2020-2021.

3.3 Instruments

The instrument used in the study was a researcher-made instruments includes the researcher-made pretest-posttest, attitude survey toward utilization of CoSIM as as an innovative material in teaching Photosynthesis were carefully chosen and improved after several consultations and discussions with the science experts from the academe. Important points were chosen that could necessarily represent the essence, substance, and intention of the study.

The first draft of the instruments will be submitted to the science experts for comments, suggestions, and recommendation to improve its presentation. Each item in the instruments was carefully checked and the whole content of the instrument was submitted to the science experts to establish its reliability and validity, it will be piloted to 30 respondents and run in the computation program for test reliability and validity.

The following are the instrument to be used in the research study.

Strategic Intervention Materials

Strategic Intervention Material (SIM) is one of the intervention materials that can be used to promote active learning in the classroom. SIM is designed to help students a needed support to increase and deepen their skills, knowledge and understanding from concrete Science to what is more abstract.

Photosynthesis Achievement tests (PAT)

The test was designed by the researcher. It contained forty (50) multiple choice response test. This was administered before the treatment and after the treatment. The test was used as pre – test and post-test. The (PAT) was to measure the learners' ability to recall, relate, and apply any of information received during the treatment. Based on the test-retest reliability revealed it was acceptable with computed value of .703.

Attitude Survey

Attitude Survey is used to measure the extent of effectiveness of SIMs in Learning the Concepts of Photosynthesis based on the learners perceive experience towards the innovation. The attitude survey composed of 14- items of 4- Likert scale survey. Using the CVR - Lawshe's Content – Validity Coefficient revealed that attitude survey was acceptable based on the computed CVR of 0.829. Likert scale was used to assess the indicators of the study.

Table 1: Likert Scale to Interpret perception towards Attitude of Students towards CoSIM in learning Photosynthesis.

Range of Mean	Scale	Descriptive Level
4.20 – 5.00	1	High Positive Attitude
3.40 – 4.19	2	Positive Attitude
2.60– 3.39	3	neutral
1.80 – 2.59	4	Low Attitude
1.00 – 1.79	5	Very positive attitude

3.4 Data Gathering Procedures

The data from the study were gathered using documentation procedure. This could be made possible by considering the details from the pretest-posttest and attitude test employed in the study. Upon the approval of the final draft of the instruments by the research experts, the researcher wrote a letter to the the School Division Superintendent (SDS) for approval to conduct a research study on the effectiveness of CoSIM (Comics cum Strategic Intervention Material) to improve the academic performance of students in teaching the concepts of Photosynthesis.

Upon the approval and endorsement of the subject SDS, the researcher was all set to report to the School Head of the subject school for the actual conduct of the study. The content of the research study was assessed and evaluated until permission was hereby granted provided that no government funds shall be used during the conduct of the activity, classes will not be disrupted as indicated in DepED Order No. 9 s. 2005 re: "Instituting Measures to Increase Engaged Time-on-Task and Ensuring Compliance Therewith" and proper coordination with the school principal shall be arranged prior to the conduct of the said activity.

Second, all participants will undergo pretested on basic concepts of Photosynthesis. Secondly crafting and validation of CoSIM (Comics cum Strategic Intervention Material) and then will be submitted to LRMDS Coordinator for validation upon approved the materials the participants received CoSIM (Comics cum Strategic Intervention Material) as innovation. Third, all participants will undergo posttested and attitude survey towards the utilization of CoSIM as innovation to improve learners' academic performance in teaching the concepts of Photosynthesis.

Finally, was the Collation and Tabulation of Data. The researcher collated, tallied coded and tabulated all the information acquired from the subjects then analyzed and interpreted the statistical results.

3.5 Data Analysis

In analyzing the data, descriptive and inferential statistics will be employed. Mean was used to determine the average performance of pre-posttest and attitude test. The t-test will be employed to determine if there is a significant difference between the pretest-posttest before and after the implementation of CoSIM (Comics cum SIM) as an innovative material in teaching

Photosynthesis. More so, pearson – product moment correlation coefficient will be used to indicate the significant relationship of the respondent's academic performance and the level of academic performance and the attitudes towards exposure to CoSIM.

III. Results and Discussion

This part present both tabular and textual manner the data gathered from the results of the attitude survey and pretest-posttest of students. The data were treated with appropriate statistical test and were analyzed and interpreted to determine the answers to the questions posed in the study.

Table 2. The students' academic performance before and after the utilization of CoSIM.

	Pretest	Posttest	Gain Score
Mean	19.20	**36.43**	**17.23**

Looking at the Table 2, were the students' academic performance before and after the utilization of CoSIM. Taking into account the data provided on the table, it indicates that before the utilization of CoSIM students' academic performance in pretest were 19.20, then in posttest were 36.43. Hence, the students' gain the score of 17.23. More so, it can be concluded that CoSIM had a positive effect on the performance of the students, as evidenced by the significantly greater mean in the posttest than in the pretest. The study confirmed the finding of Anderson et al. (2012) Salviejo et al (2014), Barredo (2014), Dapitan & Caballes (2019), Sinco (2020), that utilization strategic intervention materials in the least-learned competencies in biology improved the students' academic performance. More so, the study supported the findings of Hosler & Boomer, (2012), Da Silva et. al (2016), Casumpang & Enteria (2019), that comics was effective as an instructional material in teaching science concepts.

Table 3. The level of students' attitude in the utilization of CoSIM

	Mean Score	Interpretation
Attitude	4.75	**High Positive Attitude**

Table 3 established the level of students' attitude in the utilization of CoSIM. Looking forward, the data presented on the table showed that students have high positive attitude in learning biology concepts in Photosynthesis based on the mean score 4.75, it indicates that utilization of CoSIM, the students have enjoyed, appreciated, and interested in learning concepts as exposed to intervention materials. It further agrees with different assertions coming from different existing studies of Hosler & Boomer(2012), Affeldt et al. (2018), and Casumpang & Enteria (2019), comics was effective as an instructional material in promoting positive learning attitude towards science concepts.

Table 4: T-test for pretest and posttest score of students in the utilization of CoSIM

t- test computed value	Degree of freedom	t-test critical value	Probability Level	Decision	Interpretation
16.89	29	2.048	< 0.05	**H_o is rejected**	**Significant**

Upon computing the data, it appeared that the t- value is 16.89 was exceeds in the t- critical value of 2.048 at the degree of freedom of 29. The result is significant at $p < 0.05$. Therefore, the null hypothesis is thereby, rejected. Thus, there is a significant difference in the pretest and post-test scores of students in the utilization of CoSIM. The claim is also supported with Arroio (2011) study and Weber, et al. (2013) stating that the use of visual and text format presentation gives comic a potential in getting away from traditional mode of delivering classes with the use of traditional textbook materials.

Table 5: Test of Relationship between students' academic performance and students' attitude in the utilization of CoSIM

Pearson r	Relationship	Degree of freedom	t- test computed value	t-test critical value	Probability Level	Decision	Interpretation
.76	**High relationship**	28	6.06	2.048	< 0.05	**H_o is rejected**	**Significant**

The data revealed the obtained pearson r value is .76 which denotes high positive relationship. This means the higher the academic performance, the higher is the level of students' attitude toward utilization of CoSIM. Since the t- value, 6.06 is greater than the t- critical value, 2.048 at 0.05 and degree of freedom of 28, giving the researcher reasons to reject the null hypothesis in favor of researcher hypothesis. This may be safely concluded that students' academic performance significantly related to the students' attitude toward the utilization of CoSIM in teaching biology particularly in the concepts of Photosynthesis.

IV. Conclusion

In the light of the findings of the study, the following conclusion was drawn:

1. The results show that the pretest score before the utilization of CoSIM got the mean lower than the mean score of the post-test when the students were exposed to CoSIM.
2. The students have high positive attitude in learning biology concepts in Photosynthesis as exposed to CoSIM.
3. By comparing the students' mean scores using the t-test, data shows that there is a significant difference between the pretest score and post-test scores of the students in teaching biology, particularly photosynthesis concepts.
4. Students' academic performance significantly high positive relationship to the students' attitude toward the utilization of CoSIM in teaching biology particularly in the concepts of Photosynthesis.

V. REFERENCES

[1] Affeldt, F., Meinhart, D. & Eilks, I. (2018). ***The Use of Comics in Experimental Instructions in a Non-Formal Chemistry Learning Context.*** International Journal of Education in Mathematics, Science and Technology (IJEMST), 6(1), 93-104. DOI:10.18404/ijemst.380620.

[2] Anderson, C.W., Sheldon, T.H., & DuBay, J. (2012). ***The effect of instruction on college nonmajors' conceptions of Photosynthesis and respiration***. Journal of Research in Science Teaching, 27 (8), 761-776

[3] Anadia, A J., & Membrebe, B N.(2016). ***Improving Student Achievement for Science in Grade Seven Using Strategic Intervention Materials (SIM)***. Science Education and Teaching.

[4] Aranda, Y A.,Diaz, R A., Sombilon, M., & Gicana, FA. (2019). ***Integrating strategic intervention materials (SIM) in Science to low achieving learners.*** Journal of Science Teachers and Educators. 2 (1).

[4] Arroio, A. (2011).Comics as an Alternative in Natural Science Education: Western Anatolia Journal of Educational Sciences (WAJES).

[5] Bautista, R P., Berdan, M B., & Errabo, D D.(2020). ***Validation and Acceptability of Electronic Intervention Material (EIM) in Grade 7 Biology***. International Conference on Modern Educational Technology.

[6] Barredo, K. (2013). ***Development on the Academic Performance on Science Using Strategic Intervention Material.*** Unpublished Action Research. Schools Division of Muntinlupa City. Department of Education, National Capital Region.

[7] Barredo, K. (2014). ***Evaluating the Effectiveness of Using Strategic Intervention Material in Improving the Academic Performance in Science Strategic Intervention***

Material. Unpublished Action Research. Schools Division of Muntinlupa City. Department of Education, National Capital Region.

[8] Casumpang, P T., & Enteria, O C.(2019). ***Effectiveness of Developed Comic Strips as Instructional Material in Teaching Specific Science Concepts***. International Journal for Innovation Education and Research.

[9] Contreras, S J. (2018). ***Utilization of Manipulative and Interactive Strategic Intervention Material (MI-SIM) in Chemistry 9***. Asian Society of Teachers for Research Journal.

[10] Comighud, SM & Verano, F C. (2020). ***Level of Science Achievement: Basis for the Production of Strategic Intervention Materials (SIMs).*** Journal of Biological Science, 6 (5).

[11] Dahar, M. (2015). ***Effect of the Availability and the Use of Instructional Material on Academic Performance of Students in Punjab (Pakistan)***. Euro Journal Publishing Inc.

[12] Dapitan, D G & Caballes, D. (2019). ***Exploratory Effects of Strategic Intervention Materials in General Biology 2***. **Biometrics and Bioinformatics**,11(3), 37-41.

[13] De Silva et al. (2016). ***The Comics as Teaching Strategy in Learning of Students in an Undergraduate Management Program***.

[14] Mackenzie Management Review, 18 (1), pp. 40-65. http://dx.doi.org/10.1590/1678-69712017/administracao.v18n1p40-65.

[15] Department of Education (2018). **Programme for International Student Assessment: National Report of the Philippines**.

[16] Dy, L. (2012). ***Teaching Physics Through Strategic Intervention Materials (SIM).*** HubPages : Education and Science.

[17] Escoreal, A. (2012). ***Strategic intervention material: A tool to reduce least learned skills in grade 4 science***.

[18] Gary, C. (2012). Connecting Through Comics: Expanding Opportunities for Teaching and Learning: US-China Education Review B 4 (2012) 389- 395, University of South Carolina, USA.

[19] Gultiano, A. (2012). ***Effects of strategic intervention material (SIM) on the academic achievements in Chemistry of public high school students.*** Retrieved from http://www.slideshare. net/neoyen/strategic-intervention-material.

[20] Herrera, F T., & Soriano, A T.(2016). ***The Efficacy of the Strategic Intervention Materials (SIM) to the Achievement in Physics of a Selected Group of Public School Students in Las Nieves, Agusan del Norte***. Annals of Studies in Science and Humanities, 2(2).

[21] Hidayat, N., & Rostikawati, T. (2018). ***The Effect of the Scientific Approach with Comic Intelligent Media Support on Students' Science Competencies.*** **J**ournal Of Educational Review and Research, 1(1). http://dx.doi.org/10.26737/jerr.v1i1.507.

[22] Hosler, J., & Boomer, K B. (2012). ***Are Comic Books an Effective Way to Engage Nonmajors in Learning and Appreciating Science?*** CBE Life Sci Educ, 10 (3), pp. 309–317. doi: 10.1187/cbe.10-07-0090

[23] Kennepohl, D., & Roesky, H. W. (2018). ***Drawing attention with chemistry cartoons***. Journal of Chemical Education, 85(10), 1355-1360.

[24] Kiliçkaya, F., & Krajka, J. (2012). ***Can the use of web-based comic strip creation tool facilitate EFL learners' grammar and sentence writing***? British Journal of Educational Technology, 43(6), pp. 161-165.

[25] Koutníková, M. (2017). ***The Application of Comics in Science Education***. Acta Educationis Generalis, 7(3).

[26] Marimla, A S. & Dimalanta, O G. (2015). ***Development and Evaluation of Strategic Intervention Materials in Science V***. Research Journal of Social Science, 8(12), 1-6.

[27] Paras, S B. (2012). ***Use of Modified Strategic Intervention Materials (MSIM) in Enhancing the Performance of the Grade Five Pupils in Science***. Unpublished Action Research. Schools Division of Dagupan City. Department of Education, Region IV.

[28] Özdemir, E. (2016). Humor in Elementary Science: Development and Evaluation of Comic Strips about Sound: International Electronic Journal of Elementary Education, June 2017, 9(4), 837- 850, Turkey.

[29] Ozdemir, E., & Eryilmaz, A. (2019***). Comics in Science Teaching: A Case of Speech Balloon Completing Activity for Heat Related Concepts***. Journal of Inquiry Based Activities (JIBA), 9 (1), pp. 37-51.

[30] Raw, V. (2015). ***Quality Teaching***. APH Publishing Corp.

[31] Salviejo, E I., Aranes, F Q., & Espinosa, A 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.

[32] Samosa, R C. (2021). ***Cooperative Learning Approach as Innovation to Improve Students' Academic Achievement and Attitudes in Teaching Biology.*** Journal of World Englishes and Educational Practices, 3(1).

[33] Samosa, R C. et al. (2020) ***Understanding the End – to – End Praxis of Quantitative Research: From Scratch to Paper Presentation.*** Book of Life Publication.

[34] Samosa, R C. (2020). ***Effectiveness of Claim, Evidence and Reasoning as an Innovation to Develop Students' Scientific Argumentative Writing Skills***. Unpublished Action Research. Schools Division of San Jose del Monte City, Bulacan. Department of Education.

[35] Sinco, M G. (2020). ***Strategic Intervention Materials: A Tool in Improving Students' Academic Performance***. International Journal for Research in Applied And Natural Science, 6 (5).

[36] Tatalovic, M. (2019***). Science comics as tools for science education and communication: A brief, explanatory study***. Journal of Science Communication, 8(4), 1-17.

[37] Villareal, S J. (2013). ***The Effectiveness of Intervention Materials in Improving Learners' Competence in Grade 7 Students in Biology.*** Unpublished Action Research. Schools Division of Calamba City. Department of Education, Region IV.

[38] Villonez, G L. (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(3), 78-88.

[38] Weber, K., Saldanha, T., De Sousa E Silva., Santos, P., Souza, D., Arroio, A. (2013). Introducing Comics as an alternative Scientific Narrative in Chemistry Teaching: Cilt: 04, Sayı: 08, 2013, 1-14 , Turkey.