BASIC PROCESS SKILLS AND ATTITUDE TOWARD SCIENCE: INPUTS TO AN ENHANCED STUDENTS' COGNITIVE PERFORMANCE

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Major in Science and Technology

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APPROVAL SHEET

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ABSTRACT

This study focused on the correlation of mastery in basic process skills and attitude toward Science to grade 7 students' performance.

From the 200 respondents 74% or most of the students are normally in the age bracket for Grade 7 students which is 11 to 12. One hundred one (101) respondents or 50.5 % of the total respondents are male while 99 respondents or 49.5 % of the total respondents are female.

Although many students are in the "mastered" level, there are also many students in lower level especially in the "low mastery" and "no mastery" level who must be aided to improve their skills and performance.

The students have homogeneity of "high positive attitude" in all the items in the survey of attitude toward Science except in classroom environment.

Many students have "outstanding" performance in Science but there are also many with "Fairly Satisfactory" and "Did not meet expectations" that need immediate attention.

In correlation between attitude toward Science and students' performance, only *understanding dimension* established significant relationship in terms of teaching strategy; all the cognitive process dimensions are not related in terms of academic value; *analyzing* and *creating* dimensions are significantly related in terms of Science activity; and *understanding, applying* and *analyzing dimensions are* significantly related in terms of classroom environment.

In correlation between mastery in basic process skills and performance in Science, observing and predicting skills show significant relation with *remembering* dimension*;* *o*bserving, inferring and predicting skills have significant relationship with *understanding* dimension; only c*lassifying* skill has no significant relationship to *applying dimension ;* communicating and predicting skills are significantly related to *analyzing* dimension; only inferring is significantly related to *evaluating; and* all basic process skills are significantly related to *creating*.

In the light of the aforementioned findings, the following conclusions are drawn:

The null hypothesis stating that the mean level of students' mastery of the basic process skills is not significantly related to performance in Science is *partially supported*.

As per indicated in the findings, the null hypothesis stating that there is no significant relationship between students' attitude and performance in Science is *partially confirmed.*

DEDICATION

This labor of love is whole heartedly dedicated

to

Almighty God

better-half, **Marco**;

dearest offsprings **Rangel, Monique, Miaka** and **Rafael**;

beloved parents, **German and Edita**;

dear siblings, **Vane, Jerome, Dhang and Vinay**;

and my respected bosses, the **students.**

VMM

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

THE PROBLEM AND ITS BACKGROUND

Introduction

The Enhanced Basic Education Act of 2013, states that every graduate of basic education shall be an empowered individual who has learned, through a program that is rooted on sound educational principles and geared towards excellence, the foundations for learning throughout life, the competence to engage in work and be productive, the ability to coexist in fruitful harmony with local and global communities, the capability to engage in autonomous, creative, and critical thinking, and the capacity and willingness to transform others and one's self. For this purpose, the State shall create a functional basic education system that will develop productive and responsible citizens equipped with the essential competencies, skills and values for both life-long learning and employment.

Based on the K to 12 science curriculum's conceptual framework, science education aims to develop scientific literacy among students that will prepare them to be informed and participative citizens who are able to make judgments and decisions regarding applications of scientific knowledge that may have social, health or environmental impacts. It integrates science and technology in the civic, personal, social, economic and the values and ethical aspects of life. It is designed around the three domains of learning science: understanding and aapplying scientific knowledge, performing scientific process and skills and developing and demonstrating scientific attitudes and values.

Science process skills are the things that scientists do when they study and investigate. Observing, classifying, communicating, measuring, inferring and predicting are among the thinking skills used by scientists, teachers and students when doing science. Much of the pleasure of both learning and teaching science is experiencing science. Mastering these process skills will help use develop the kind of science program that mirrors real science (Rezba, et al., 1995).

Science, according to Handlesman et al., as an academic discipline relates learning the key concepts, as well as the processes of science. The increasing value of science process skills poses a serious challenge of finding ways to amend teaching as a means of elevating these educational outcomes. Recent revitalization of interest in developing thinking skills has encouraged added importance on process skills instruction.

Development of basic process skills is important as well as development of proper scientific attitude and values. Science Education aims to train students to think like scientists and emphasis would be expected on the development of attitude that good scientists are able to display (Opulencia , 2011). One of the purpose of teaching is inculcation of desirable attitudes and values (Pacia, 2014). Shaping students' attitudes, behaviors, and motivations is necessary today for without these broader skills and strengths, students will be unprepared for the challenges they, and their world, will face (Miller, 2017).

Process skills and attitude toward Science are important elements that may influence students' performance. According to Johnston (2009), science process skills are significant in improving students' cognitive development and facilitating students' active participation during the teaching and learning process Attitude toward science is positively correlated with science achievement (Papanastasiou and Zembylas, 2004).

Developing mastery in basic process skills and positive attitude toward Science is aiming for quality students' performance. The students' performance (academic achievement) according to Mushtaq and Khan (2012) plays an important role in producing great leader and manpower for the country thus responsible for the country's economic and social development.

The researcher believes that basic process skills mastery and attitude toward Science may affect the performance of Grade VII students. This study was conducted to prove the correlation of the aforementioned variables.

Background of the Study

The basic science process skills are what people do when they do science. Children using the same skills are active learners. They use their senses to observe objects and events and they look for patterns in those observations. They classify to form new concepts by searching for similarities and differences. Orally and in writing, they communicate what they know and what are they able to do. To quantify descriptions of objects of objects and events, they measure. They infer explanations and willingly change their inferences as new in formations become available. And they predict possible outcomes before they are actually observed (Rezba, et al., 1995).

Science process skills form the core of inquiry-based learning. To learn to do science is to master the science process skills and to apply them in scientific investigation (Ngoh, 2008).

As cited by Prudente (2011), the deteriorating performance of students in the National Achievement Test (NAT) in Science and Mathematics is already a proof that there is still a problem.

Based on the spiral progression under the K to 12 Curriculum students who enter the junior high school particularly grade 7, have nearly mastered if not mastered the basic process skills in science. This is very important in order for them to execute the activities required by the curriculum and learn effectively the competencies behind these activities.

On the other hand, positive attitude toward science is very essential. Students with positive attitude toward science tend to have higher scores on the achievement measures (Weinburgh, 1995).

Students' achievement is positively related to learning goal orientation, self-efficacy and meaningful learning (Hacieminoglu, 2015).

As a grade 7 teacher, the researcher observes the low achievement of many students in science. This lowachievement is very evident in the periodical assessments. The researcher opted to conduct this study to find out if Science Process Skills are properly acquired by the students; what are their attitude toward Science and how they may affect the students' performance.

Conceptual Framework

The spiral progression of K to 12 Curriculum is in accordance with Piaget's Theory of Cognitive Development. The level of complexity of the Science concepts and science process skills increases the level of complexity from lower grade to higher grade level. Students' mastery on basic science concept and basic science process skills must be evident after each period. One of the K to 12 Curriculum objectives is scientific literacy. This means that students must be guided to become independent learners by developing their process skills, logical thinking and critical thinking skills.

This study is anchored on Jean Piaget's Theory of Cognitive Development and Albert Bandura's Social Learning Theory.

Piaget's theory states that in order to adapt to an environment, learners face two stages, assimilation and accommodation. According to Wadsworth (1996), aassimilation is the first stage of a cognitive process by which a person integrates new perceptual, motor, or conceptual matter into existing schemata or patterns of behavior. A person can assimilate easily, if a person has similar experiences. On other hand, a child tries to assimilate new stimulus into existing schemata during accommodation wwhen confronted with it. If not possible sometimes, an individual can create a new schema in which to place the stimulus or one can modify an existing schema so that the stimulus fits into it. While constructing new schema, one's environment affects his or her cognitive structure. Piaget's identifies four consecutive stages of intellectual development, generally categorized by age ranges. The last stage, the formal operational stage, begins around 11 or 12 years of age and allows for successful learning of abstract science content matter.

Glencoe (1992) mentioned that the Bandura's Social Learning Theory justified personality as being acquired not only by direct reinforcement of behavior but also by observational learning or imitation. The consequences to a model engaging in a particular behavior influence the observer's willingness to perform that behavior.

Corollary to those aforementioned theories, the following conceptual guide served its purpose.

Research Paradigm

The paradigm of the study focused on determining the significant relationship of Basic Process Skills mastery and attitude toward Science with performance of Grade VII students.

The research paradigm shows the independent variables which include Science Basic Process skills, namely: observing, communicating, classifying, measuring, inferring, and predicting; and students' attitude toward Science which include teaching strategy; aacademic value; Sscience activity; and classroom Environment.

. To measure the students' basic science process skill mastery, a 10-item teacher- made test for each skill with a total of sixty (60) items was constructed.

An attitude toward Science survey was also used as a tool to measure how a student thinks and behaves toward science.

For the dependent variable the performance of Grade VII students in the Fourth grading period is measured in accordance to the following cognitive process dimensions: remembering, understanding, applying, analysis, evaluating and creating. A 60-item multiple choice test was constructed by the researcher.

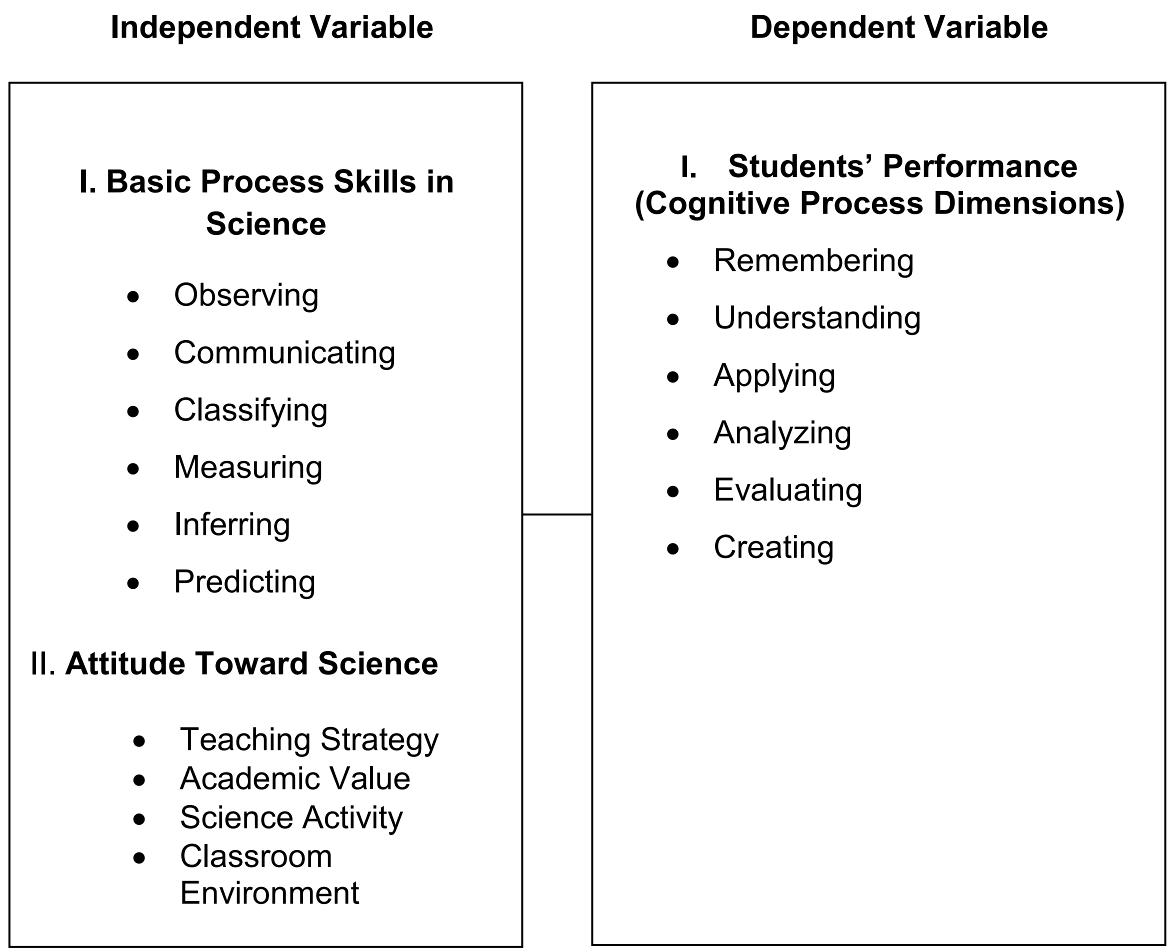

Figure 1. Research Paradigm

Statement of the Problem

This study aimed to determine the relationship of mastery in Basic Process Skills and attitude toward Science with performance of Grade VII students.

Specifically, it attempted to answer the following questions:

1. What is the profile of the students in terms of:

   1.1 age; and
   1.2 gender?
2. What is the level of the students' mastery of Basic Science Process Skills in terms of :

   2.1 observing;
   2.2 communicating;
   2.3 classifying;
   2.4 measuring;
   2.5 inferring;and
   2.6 predicting?

3. What is the perception on students' attitude toward science in terms of :

   3.1 teaching strategy;
   3.2 academic Value;
   3.3 Science Activity; and
   3.4 classroom environment?
4. What is the level of students' performance in science in terms of the following cognitive process dimensions?

   4.1 remembering;

4.2 understanding;
4.3 applying;
4.4 analyzing;
4.5 evaluating; and
4.6 creating?

5. Is the mean level of students' mastery of science process skills significantly related to performance in science?
6. Is there a significant relationship between students' attitude and performance in Science?

Research Hypotheses

1. There is no significant relationship between students' attitude and performance in Science.
2. The mean level of students' mastery of Basic Process Skills is not significantly related to performance in Science.

Significance of the Study

This study was conducted for the purpose of finding out the correlation of mastery of Basic Process Skills and attitude toward Science to students' performance that may serve as basis in developing an intervention program in Science. The result of the research is hoped to benefit the following stakeholders:

Students. This study may encourage students to master Basic Science Process Skills, develop scientific attitude and improve their performance in Science.

Teachers. They may realize the importance of students' mastery of basic process skills and development of scientific attitude for them to find appropriate ways of teaching the subject.

School and Community. The school may serve as motivators to students with Basic Process Skills and attitude toward Science. The community may be inspired to send their children to school to further equip them not only with knowledge, but also with skills and appreciation of education for future employment.

Curriculum Planners. This study may be of help in realigning the curriculum with more emphasis on the mastery of basic process skills in science.

Future Researchers. This may serve as basis of future related studies of similar area of concentration.

Scope and Limitation of the Study

This study focused on mastery of Basic Process Skills and attitude toward Science and how both are correlated to performance of grade VII students. It was conducted at Sta. Catalina National High School, Candelaria, and Quezon during the fourth grading period of school year 2016-2017. There were 200 grade 7 student respondents as basic unit of analysis (See Table 1).

This study dealt with student's basic science process skills such as observing, communicating, classifying, measuring, inferring and predicting. It used 60-item test made by the researcher to identify the level of mastery in Basic

Process Skills in Science (Appendix C) and a 60-item test to determine the mean performance of students in Science (Appendix D).

On the side, an attitudinal inventory was utilized to serve the purpose of the study. The inventory had the following indicators, namely: teaching strategy; academic value; science activity and classroom environment (Appendix B).

Definition of Terms

The following terms are defined for clearer understanding of the variables of the study.

Academic Value as a category of attitude toward Science is defined as students' perception of how important Science is to their lives.

Age. This is the number of years the respondents live since birth up to the time the study is undertaken.

Analyzing. It is defined as the ability where learner can distinguish between parts and determine how they relate to one another, and to the overall structure and purpose.

Applying. This refers to the ability where learner can use information to undertake a procedure in familiar situations or in a new way.

Attitude toward Science. This is an expression of favor or disfavor of the respondents toward an academic discipline.

Classroom Environment. This is a general term for the room and school surroundings and facilities.

Classifying. As used in the study is the skill of observing similarities and differences and interrelationships and by grouping things accordingly to suit some purpose.

Cognitive Process Dimensions. They are from Bloom's revised taxonomy identifying new levels of cognitive learning and serve as the guide in the formulation of assessments and activities in the K + 12 Curriculum; enumerated as remembering, understanding, applying, analyzing, evaluating and creating.

Communicating. This skill enables sharing ideas through talking and listening, drawing and labeling pictures, drawing and labeling graphs and acting things out.

Creating. It is the ability of the learner to put elements together to form the functional whole, create a new product, or point of view.

Evaluating. This skill enables the learner to make judgments and justify decisions.

Gender. This is the state of being a male or a female respondent.

Inferring. This is making statement that goes beyond the evidence and attempts to interpret or explain a set of observation.

Mastery. It refers to the level of expertise or knowledge; or outstanding ability of a person on a certain concept, theory or principle.

Measuring. It is done by comparing an object with a standard unit.

Observing. It is the most basic skill in science done by using our five senses.

Predicting. It is utilized to make a forecast of what a future observation might be.

Remembering. This skill enables the learner recall information and retrieve relevant knowledge from long term memory.

Science Activity as a category on attitude toward Science refer to the task done by students during Science class

Science Basic Process Skills. These terms are sequenced and evolved from Piaget's work about developmental psychology that refer to the basic skills necessary to produce scientific information, perform scientific research and solve problems; enumerated as observing, communicating, classifying, measuring, inferring and predicting.

Students' Performance. This is the students' achievement of the given achievement test.

Teaching Strategy. As a category of attitude toward Science is defined as ways or means the teacher executes the lessons.

Testing. It is one way of exposing an individual to a particular examination in order to obtain score. In this study, testing refers to the administration of two sets of test in determining Basic Process Skills mastery and the mean performance of Grade VII students in Science.

Understanding. This is the skill that permits learner to construct meaning of oral, written and graphic messages.

Chapter 2

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents the related literatures and studies about basic process skills, attitude toward Science and performance of students that plays significant role as source of information during conduct of the study.

Related Literature

Science Curriculum Guide (2012), states that the K to 12 Curriculum is constructed around the three basic dimensions of the nature of science. The first of these is the science content of our scientific knowledge. The other two important dimensions are, science process skills (SPS) and scientific attitudes and values. All these could be applied in our own locality as well as globally.

Skills refer to specific activities or tasks that a student can proficiently do e.g. skills in coloring, language skills. Skills can be clustered together to form specific competencies. De Guzman (2007) iterated that it is important to recognize a student's ability in order that the program of study can be so designed as to optimize his/her innate abilities.

Science Process Skills. According to Karamustafaoglu (2011), understanding of Science process usually refer to skills or abilities that must be owned by the scientists on the process of scientific discovery. These skills are divided into two groups: basic and integrated process skills. The basic process skills include observing, asking questions, classifying, measuring and predicting.

Integrated process skills include, identifying and defining variables, interpreting data, manipulating materials, recording data, formulating hypotheses, designing investigations, making inferences and genralizations.

Panoy (2013) cited that the goal of science education is to develop students' skills and enables individuals and to apply those skills in everyday lives. These skills affect the personal, social, and global life of individuals. Science Process Skills are necessary tool to produce scientific information, to perform scientific research and to solve problems.

Riovero, as cited by Coronado (2016), defines science as more than of scientific knowledge. Science process skills should be used as benchmark in planning lessons, however science process skills should not be presented as separate stand-alone lesson. These skills need to be connected with important concepts. Thus, Science knowledge serves as a background for lessons but should not take up the main lesson. Instead, more emphasis must be given on activities that enhance the understanding of science concepts and improve science process skills. This implies that process skills work hard with the scientific knowledge and scientific attitudes to help students to think systematically

Scientific knowledge includes theory, principles and laws forming content part of sciences. Ways to knowledge acquisition are ways to get scientific knowledge. One of the ways to knowledge acquisition is science process skills. Science process skills are the basic skills of facilitating learning in science, allowing students to be active, developing a sense of responsibility, increasing the permanence of learning and providing research methods (Erturk and Kaptan, 2010).

Science process skills as the building blocks from which suitable science tasks are being constructed must be considered by the new national science curricula and the way they are expressed in textbooks. To develop science process skills. Science content taught in science classrooms should be used (Nyakiti et al, 2010)

Science process skills form the core of inquiry-based learning. To learn to do science is to master the science process skills and to apply them in scientific investigation (Ngoh, 2008).

Teachers with sufficient Science Process Skills can teach efficiently and their students perform effectively (Miles, 2010)

Attitude. Cognitive theories of attitude formation tend toward more reasoned, informational approaches to forming an attitude. An attitude is formed on the basis of cognition when one comes to believe either the attitude object possesses (un)desirable attributes, or that the attitude object will bring about (un)desired outcomes" (Hogg & Cooper, 2007,).

As mentioned in the study of Opulencia (2011) Science Education aims to train students to think like scientists and emphasis would be expected on the development of attitude that good scientists are able to display.

According to Yara, as mentioned by Hebrio (2013), attitude as a concept is concerned with an individual way of thinking, acting and behaving. It has very serious implications for the learner, the teacher, the immediate social group with which the individual learner relates and the entire school system. Attitudinal acts are formed as a result of some kind of experiences. They may also be learned simply by following the example or opinion of parent, teacher or friend. This mimicry or imitation, has also a part to play in the teaching and learning situation. In this respect, the learner draws from his teachers' disposition to form his own attitude, which may likely affect his learning outcome.

Teaching and learning are lifelong process. The purpose of teaching at any level is to bring fundamental changes in the learner. Such changes may be in the form of acquiring intellectual skills, solving problems and inculcation of desirable attitudes and values. Teachers adopt different approaches to help students acquire knowledge, skills and experience (Pacia, 2014).

It is therefore in the interests of society, and the responsibility of educators, to improve students' attitudes toward science, and to prepare students to live in a highly scientific and technological society. The future of our society will be determined by citizens who are able to understand and help shape the complex influences of science and technology on our world (Ungar 2010).

Education is no longer enough to focus only on the transfer of knowledge and skills. Shaping students' attitudes, behaviors, and motivations is necessary today for without these broader skills and strengths, students will be unprepared for the challenges they, and their world, will face (Miller, 2017).

According to Zeidan and Jayosi (2015), positive attitude toward science makes the students more interested in focusing on science process. In other words, when the students understand the science process skills, science becomes more interesting to them, which increases the positive attitudes towards science.

A highly motivated student is usually one with a positive attitude toward the subject s/he is learning. Therefore, in order to improve students' attitudes toward science, faculty must motivate students, which they can do through their teaching styles and by showing them the relevance of the learning topics to their everyday lives. In addition, they must create the learning environment that helps motivate students not only to come to classes but also want to learn and enjoy learning (Movahedzadeh, 2011).

The continuing decline in numbers of students choosing to study science requires a research focus on students' attitudes to science if the nature of the problem is to be understood and remediated. Starting from a consideration of what is meant by attitudes to science it considers the problems inherent to their measurement, what is known about student's attitudes toward science and the many factors of influence such as gender, teachers, curricula, cultural aspects and other variables (Osborne and Chin , 2003).

Focus shifts to skills and values in Physics teaching, complemented with greater research on skills and values development. She pointed out that transferability of skills and values to many areas of life and their crucial importance in scientific literacy and sustainable development (Talisayon, 2004).

Cognitive Process Domain. In 1956, Benjamin Bloom along with a group of like-minded educators developed a framework for classifying educational goals and objectives into a hierarchical structure representing different forms and levels of learning. This framework was published as Bloom's Taxonomy of Educational Objectives and consisted of the following three domains: Cognitive (remembering; understanding; applying; analyzing; evaluating; and creating), Affective (receiving phenomena; responding to phenomena; valuing; organization; and internalizing values) and Psychomotor (origination; adaptation; complex overt response; mechanism; guided response; set; and perception).

Each of these three domains consists of a multi-tiered, hierarchical structure for classifying learning according to increasing levels of complexity. In this hierarchical framework, each level of learning is a prerequisite for the next level, i.e., mastery of a given level of learning requires mastery of the previous levels. Consequently, the taxonomy naturally leads to classifications of lower- and higher-order learning. In higher education, the cognitive domain has been the principal focus for developing educational goals and objectives while the affective and psychomotor domains have received less attention. Bloom's taxonomy has stood the test of time, has been used by generations of curriculum planners and college and university professors, and has become the standard for developing frameworks for learning, teaching, and assessment. In 2001, a former student of Bloom's, Lorin Anderson, and a group of cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists published a revision of Bloom's Taxonomy entitled A Taxonomy for Teaching, Learning, and Assessment. The revision updates the taxonomy for the 21st century, and includes significant changes in terminology and structure. In the revised framework, 'action words' or verbs, instead of nouns, are used to label the six cognitive levels, three of the cognitive levels are renamed, and the top two higher-order cognitive levels are interchanged. The result is a more dynamic model for classifying the intellectual processes used by learners in acquiring and using knowledge. The revised taxonomy identifies the following new levels of cognitive learning (arranged from lower-order to higher-order levels of learning): Remembering – retrieving, recognizing, and recalling relevant knowledge from long-term memory; Understanding – constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining ;Applying – using information in new ways; carrying out or using a procedure or process through executing or implementing; Analyzing – breaking material into constituent parts; determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing; Evaluating – making judgments based on criteria and standards through checking and critiquing; defending concepts and ideas and Creating – putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing (Bloom's Taxonomy of Educational Objectives and Writing Intended Learning Outcomes Statements, 2014).

Bloom's Revised Taxonomy can be useful for curse design because the different levels can help the students move through the process learning-from mos fundamental remembering and understanding to more complex evaluating and creating (Forehand, 2010).

Bloom's taxonomy is a classification of learning objectives originally developed for general educational purposes. The taxonomy was subsequently revised to expand beyond cognitive processes and to include an additional knowledge dimension. The revision was prompted by psychometric measurements indicating inconsistencies in the original taxonomy, and the revised taxonomy has been adapted for use in many disciplines (Lo et al., 2016).

The stated dimension which was the Revised Bloom's Taxonomy were recently used and adapted by the Department of Education in the Assessment of the Learning Outcomes of the students. These concepts are recently used to measure the learning of the students in K+12 Curriculum since its goal is the attainment of standards in terms of content and performance, was therefore a critical and evidence of learning and authentic in nature (Postrado 2016).

Students' Performance. As students progress through the curriculum, faculty may need to find ways to promote recall knowledge for more advanced topics while continuing to develop their ability to apply and analyze information. Examinations with well-designed Multiple Choice Questions that prospectively target various cognitive levels can facilitate assessment of student performance (Tiemier, 2009).

Students' Performance. To evaluate their academic performance in science, achievement test is given to the students. Science achievement refers to the accomplishment of the students in his school work. It is the measure of knowledge, understanding, skills and appreciation attained by the students in Science as indicated by his scores in the achievement test (Cabantuando, 2009).

Teaching competence, attitude of teacher and students, library facility, educational attainments of parents, parents' attitude toward study of their children, and attitude toward their study significantly influence the academic performance of students (Blancia, 2003).

Students in urban areas performed better than those in rural areas. Availability of enough qualified teachers determines students' performance (Richardson 2008).

Communication, learning facilities and proper guidance shows positive impact on the student performance (Mushtaq and Khan, 2012).

Students who have positive achievements are those who have positive attitudes and they think that they are successful, sufficient, powerful, and they have confidence in them (Kirikkaya, 2011).

Related Studies

Science Process Skills. Panoy (2013) tested a strategy that directly used the skills that involved in each category of Bloom's Taxonomy as the Independent variable. He deliberately conducted the study that investigated on a new teching strategy called differentiated strategy and tested its effect on the Science process skills development. His study was formed with aim of helping teachers devise a strategy that will suit the continously growing diversity among learners at present. The skills that he had tested on his study are the Measuring, Comparing, Classifying and Problem Solving. It proven the null hypothesis that states that there was a significant difference between the mean gain score of the pupils in the experimental and control groups in terms of skills in comparing, measuring, and problem solving. Thus, it can say that still, science is a subject that requires several strategies to cope up with vast changing learning environment of the students.

According to the study conducted by Akben (2015), the importance of science literate individuals having scientific process skills and using the inquiry method as a teaching method during lessons are frequently emphasized. However, when the level of incorporation of this method in the books which are the main resources for the courses is examined, it is seen that the experiments in the books tended to be at the structured inquiry level. This can make students acquire limited basic skills. Akben's study was designed to make prospective classroom teachers realize new experiments that they can develop by adopting a critical look at the experiments in textbooks. The prospective teachers developed experiments at different levels of inquiry, identified the science process skills which can be developed using these experiments, and expressed the understanding they developed with this practice. As a result of this research, conducting the experiments included in the course books at different levels of inquiry, the prospective teachers realized the skills that can be developed in students, the relation of these experiments with the daily life, and the fact that conducting experiments can increase students' interest in the course.

Learning of science is a process of construction and reconstruction of previously held personal theories. It is a process of continually refining existing knowledge and constructing concepts in intricate organized networks that are unique to each child and that provide explanatory and predictive power and have used input from outside sources (Martin, 2009).

Based on the study of Sukarno, et al. (2014), it is concluded that science teachers' understanding of science process skills (SPS) is still low.The low science teacher understanding to SPS have implications for science teaching-learning activities, so that science teaching-learning activities be poor to student teaching-learning activity development. Some implications the low SPS of science teachers, among others: still lack science knowledge generally for science teachers, the low of learning quality which stimulates development of students science process skills,lack of students science process skills and the low students mastery of science concepts generally.

Gurces, et al. (2015) did a study in order to determine using level of 10th and 11th grade students' science process skills. Science process skills predict knowledge and ways to knowledge acquisition. Among students participating different high schools, a significant difference is determined in terms of basic, casual and experimental process skills. According to the findings of Gurces, et al., it can be explained that students' attending schools which are general achievement level or acceptance order can cause a significant difference in terms of potential use of science process skills. This situation may stem from different instructional methods, teachers' content knowledge and efficiency in the schools. In comparison of 10th and 11th grade students in terms of basic, casual and experimental process skills, it is seen that 10th grade students had higher means than 11th grade students at all. There is a significant difference between 10th grade students and 11th grade students only in terms of basic process skills. Because 11th grade students solve problems based on knowledge due to preparation to entrance of university exams, this situation may restrain their science process skills.

Aydogdu (2015) conducted a study that showed one of the results that indicated that overall science process skills of science teachers differed on the frequency of use of these skills in the classroom and on in-service training on these skills.

Akman, et al. (2012) conducted a study that revealed the effect of "Constructivist Science Teaching Program" developed by researchers for efficient and lasting acquisition of scientific processing skills by 6 year olds attending pre-school education institutions. The result of the study, found significant difference between the Preschool Scientific Processing Skills Scale scores of the children in the experimental group who received Constructivist Science Teaching Program and those of the children who received traditional teaching program.The scores of the experimental group were found to be higher than the scores of the children in the control group. This result indicated that Constructivist Science Teaching Program administrated to children attending pre-school education groups is effective in the acquisition of scientific processing skills.

The study of Baldwin and Wilson (2017) concluded that shared book strategy allowed students to build both science and literacy skills to support future science learning. The hands-on, outdoor activity allowed students to connect talk with their everyday lives and to bridge expectations. Preschool is the perfect time to engage students in scientific talk and scientific inquiry.

Teaching approaches in a science class can provide opportunity to inculcate science process skills. These skills need to be realized by teachers that it is important in the learning of science and it serve as a scaffold to other cognitive skills such as logical thinking, reasoning and problem solving skills. It is especially important that instruction to the task is clear and useful. Students should be aware the science process skills that were to be acquired and they should be guided through exploration questioning. This implied that teachers should always give guidance throughout the experiment or lesson in order for the students to realize they are actually learning to acquire the science process skills (Rauf , et al., 2013).

Attitude toward Science. Attitude and self-efficacy in science as technology as well as student achievement in science process skills were measured in the study of Baker, et al. (2002). The study found significant improvement in attitudes toward technology, self-efficacy toward science, and modest, yet significant, improvements for geographic data analysis for students who used paper maps.

Oh and Yager (2004) on their study stated that while students' negative attitude toward science are related to a traditional approach in science instruction, their positive feelings are associated with constructivist science classrooms. The authors also commented that if students are provided with too much scientific information, they will have a more negative attitude. Thus, the authors suggested that the learning environment should be designed in such a way as to allow students to attain scientific knowledge and gain a more positive attitude toward science.

The study conducted by Hacieminoglu (2015) has findings indicating that generally the students had low level of positive attitude toward science. This may be brought by teachers' different application of science and technology curriculum and varying classroom environment.

Turner & Peck (2009), pointed out the result of the Relevance Of Science Education (ROSE) project which recorded that interest was negatively correlated with the United Nations comparative national index of human development. The results suggests that children generally are or become less interested in Science and technology when and where its education is the strongest.

The results of the survey conducted by Sanja et al. (2012) on student's attitudes towards science and mathematics indicated that students value demonstrations, applications and practical, hands-on experimentation, and that after these types of classroom activities they express positive attitude towards science and mathematics.

The study of U. Narmadha and S. Chamundeswar (2013), investigated attitude towards learning of Science and academic achievement in Science among students at the secondary level that resulted to their positive correlations.

Cognitive Process Dimension.The study of Faustino (2012) in two-group experimental study of high and low performance, there was significant difference in the cognitive learning outcomes of high and low students' performance. It was noticeable that high-performing students could provide very good analogies, editorial cartoons, poems and slogans. There was minor difference in the reflective responses between the two-groups because of the depth of the students' responses varied. The difference in the study was that the researcher used affective domain of Revised Blooms Taxonomy. The findings from the study suggested that the use of any cognitive strategy is feasible for students in a regular class, the learning outcomes of the student resented in the research though should be a sole basis for choosing the effective strategy because learning is also influenced by the students' level of task knowledge.

Students Performance.As found by Biglete (2013), there was a significant correlation between students' performance in Physics and that of reading comprehension skills in terms of literal level, problem solving proficiency in terms of data interpretation and level of use in Mathematics information processing in terms of metacognitive solving and strategic approach.

Bayat, et al. (2013) aimed to define the relationship between reading comprehension and achievement in science. Associational model was used as a method, and 132 eighth grade secondary school students constituted the participants of the study. It was determined that there is a certain level of relationship between success in reading comprehension and success in science.

Teacher qualification accounted for approximately 40 to 60 percent of the variance in average of students' achievement in assessment. (Huang & Moon, 2009).

Wendell and Rogers (2013) in their study found out that engineering design-based science curriculum was associated with significant science content gains by elementary students, and these gains exceeded those achieved when the same teachers used their school or district's status quo science curricula.

Mervis (2016) evaluated the result of 2015 Trends in International Mathematics and Science Study (TIMSS) and some of his evaluations included that the international average of the role of technology was 32% that includes use of computers in eighth grade math classes varies from 65% in Sweden to 4% in Malta .Students with ready access to computers scored only four points higher than those without such access. ; and eighth grade science students who "rarely or never" miss class scored 95 points higher than those who are absent once a week which suggests that time on task does affect how much students learn.

The foregoing related literature and studies provide enlightenment and direction to the course of this study. This research was timely needed to address the decreasing performance of students in science. The methodology used was carefully chosen to be most appropriate for questions being asked.

Chapter 3

RESEARCH METHODOLOGY

This chapter covers the methods and procedure to be used in the conduct of the study. These include research design, respondents of the study, research instruments, research procedure and statistical treatment of data.

Research Design

This study utilized descriptive correlation design. Descriptive correlation research can be either quantitative or qualitative. It can involve collections of quantitative information that can be tabulated along a continuum in numerical form such as scores on a test (Knupfer and McLellan, 2001). It involves gathering data that describe events and then organizes, tabulates, depicts and describes the data collection (Glass and Hopkins, 1984). It often uses visual aids such as graphs and charts to aid the reader in understanding the data distribution. Relatively, the study involved gathering of data of respondents and interpreting these data through tables and graphs.

The researcher looked into the students' level of mastery of basic process skills and attitude and their mean performance in grade 7 Science.

Respondents of the Study

The objective of the study was to measure the level of the mastery in basic process skills, attitude toward Science and the performance Grade 7 students.

The respondents of the study were selected by purposive sampling. Purposive sampling is also known as judgmental, selective, or subjective sampling where a sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study (Crossman, 2017). The two hundred (200) students were selected from the population Grade 7 students of Sta. Catalina National High School, Candelaria, Quezon enrolled during school year 2016-2017. They consisted the five sections taught by the researcher (Table 1).

Table 1. Population of Grade 7 Respondents

Section	Male	Female	Total
Narra	20	23	43
Yakal	13	30	43
Apitong	20	20	40
Mahogany	20	16	36
Mangrove	21	17	38
Total	94	106	200

Research Instruments

The main instruments of the study were the two sets of teacher made test which are the Science Process Skill Test and Science Achievement Test and the Science Attitudinal Survey.

Part I. Science Process Skills Test

The test is teacher-made and served the purpose of measuring student's mastery of Science Basic Process Skills. This is a test composed of 60 items which is divided into ten item-test for every component of Science Process skills such as observing, communicating, classifying, measuring, inferring and predicting.

The first part of the test is about observing which is composed of pictures and diagram that students have to observe carefully. This part tests students' sharpness in observing, specifically in using the sense of sight. The second part which is about communicating is divided into two: Communicating with a Map, where students are required to write the location of the object by consulting the map; and describing the cylinder, where students are required to write sentence/s that describe the location of the cylinder. Classifying is the third part of the test where students need to classify the given units, by putting them in the proper column of the quantity they measure. The fourth part about measuring is divided into matching the instrument and the quantity it measures and solving simple problem of conversion. The last part of the test is identifying the correct inference and predictions, respectively (see Appendix C).

PART II. Achievement Test

The test is a teacher-made achievement test that covered the topics included in the Fourth Grading Period and validated by selected Science teachers. This is composed of ten item-test for every dimension of cognitive process dimensions such as remembering, understanding, applying, analyzing, evaluating and creating. In the first part which is under remembering dimension, the students are required to recall simple information in order choose the correct answer from the choices. The second part under the understanding dimension, the students are asked to put the sub-topics on their main topics' column. In applying dimension which is the third part of the test, the students had to match information in column A to Column B. The fourth part under analyzing dimension, students are required to provide a word for each sentence to complete the analogy. Identifying where the sentence is true or false is the fifth part of the test under the evaluating dimension. Lastly the test under creating dimension is divided into the following three sub-parts: making simple diagram showing weathering, giving simple ways to help lessen the rate of global warming and drawing a diagram of solar ecplise. The final form was reproduced and distributed to the respondents at specified time upon approval of the School Principal.

PART III. Inventory on Attitude toward Science

This is a 20-item researcher made survey divided into four sub-parts that will determine the mean attitude of students towards Science in terms of teacher's strategy, academic value, Science activity and classroom environment.

Research Procedure

The study involved two phases: constructing the test and survey questions by developing the test and survey forms subject for validation and assembly of the final form.

Phase I consists of constructing the survey form and test based on the table of specifications and test domains. Phase II covers field test subjecting the result to appropriate statistical treatment.

Students' mastery in science process skills was measured through teacher-adapted test with 60-item, multiple choice type of assessment.

Inventory on students' attitude toward Science consisting of 20 items was administered for the purpose of the study.

Teacher-made test of 60 items was administered to students to assess their performance in the fourth grading period.

The tests and inventory were administered to Grade VII students of Sta. Catalina National High School after validation of selected science teachers.

Statistical Treatment of Data

All collected data were collated for analyses. Appropriate statistical measures were used and employed to quantify the data and to answer the problem set for the study.

Descriptive statistics such as frequency count and percent distribution, mean and standard deviation were used to describe the respondents' profile.

Frequency count determines the number of respondents who were subjected to the assessment of science process skills.

Arithmetic Mean was used to assess students' mastery of basic process skills and performance in science.

Mean Percentage Score was used to determine the average score in the Science Process Skill Test and in the Achievement Test.

Standard Deviation was used to get the average of how distant the individual scores or perception are from the mean of the tests.

Weighted Mean was computed to determine the level of students' attitude toward science.

Inferential Statistics of Pearson Product-Moment-Correlation Coefficient was employed to determine the relationship of Scientific Attitude and mastery in basic process skills to performance in Science and their significance.

Chapter 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the analysis and interpretation of the data according to the problems presented in this study.

Profile of Respondents

Respondents' profile was described in terms of age and gender.

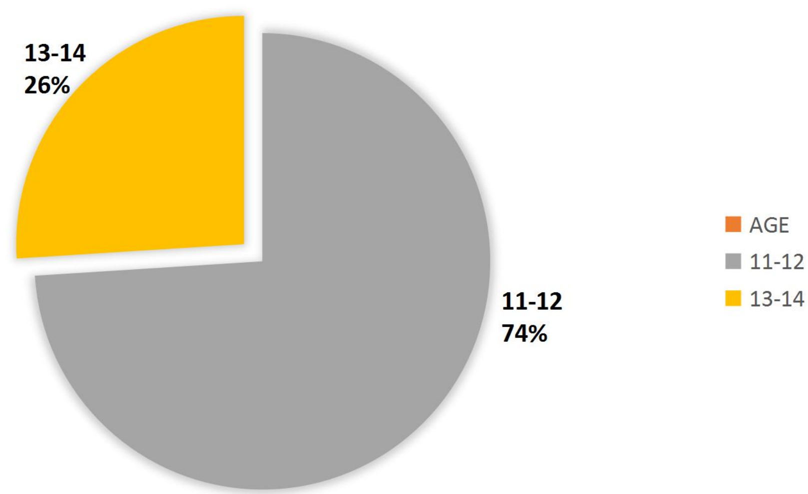

Figure 2. Distribution of Students according to Age

Figure 2 presents the distribution of students according to age. The 200 students have ages that range from 11 to 14 years. The youngest student in this group is 11 years old and the oldest is 14 years old. The biggest percentage fell on the age group of 11-12 years old with 74%. Most of the students are normally in the age bracket of Grade 7 students.

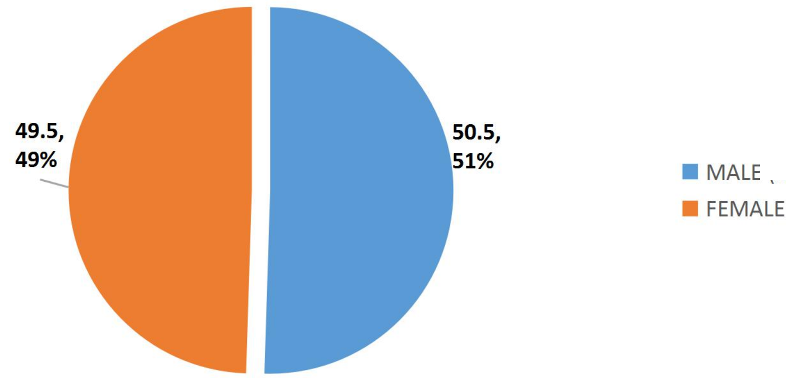

Figure 3. Distribution of Students According to Gender

Figure 3 shows the frequency count and percent distribution of the students' gender. One hundred one (101) respondents or 50.5 % of the total respondents are male while ninety nine (99) respondents or 49.5 % of the total respondents are female. The distribution of gender in the Grade 7 students was almost equal.

Level of Students' Mastery in Basic Science Process Skills

Table 2. Distribution of Respondents as to Mastery in Basic Science Process Skills

	Obs		Comm		Class		Meas		Infer		Pred		
Score	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	**VI**
9-10	23	11.5	101	50.5	76	38	73	36.5	12	6	20	10	M
7-8	59	29.5	19	9.5	48	24	59	29.5	46	23	52	26	NM
5-6	68	34	60	30	42	21	34	17	91	45.5	72	36	MTM
3-4	42	21	16	8	18	9	19	9.5	41	20.5	39	19.5	LM
0-2	8	4	4	2	16	8	15	7.5	10	5	17	8.5	NM
Total	200	100%	200	100%	200	100%	200	100%	200	100%	200	100%	

Legend: 9-10- Mastered (M); 7-8- Near Mastery (NM); 5-6 - Moving Toward Mastery (MTM); 3-4- Low Mastery (LM); 0-2 - No Mastery (NM) Obs-Observing; Comm-Communicating; Class-Classifying; Meas-Measuring; Infer-Inferring; Pred-Predicting; VI-Verbal Interpretation

Table 2 reveals that the biggest percentage of students are “moving toward mastery” in terms of observing, inferring and predicting. Observing as fundamental science process skill is essential to the development of the other science process skills and the result may imply that students’ mastery in observing greatly affects their mastery in other process skills.

Almost half of the students “mastered” the communicating skills. The result may imply that using maps or graphical representations, and diagrams that can be found in the test for this skill aid students in answering.

The biggest percentage in classifying skill is occupied by students who “mastered” it. The result may imply that many students mastered the units used in different basic quantities in Science as included in the test for the said skill.

Many students which occupied the biggest percentage in measuring skill, “mastered “it. The result may imply that many students mastered the different measuring instruments in Science and they also mastered solving simple conversion of units.

The result reveal that there are many students who fell in “Low Mastery” and “No Mastery” level in different process skills. This may imply that aid or intervention program must be given to these students for them to improve their level and achieve scientific literacy.

Students' Mean Attitude towards Science

The following tables show the result of the survey of students' attitude toward Science in four categories namely: teaching strategy, academic value, Science activity and classroom environment. Each category is composed of five indicators where the students provide their level of agreement.

Table 3. Mean Attitude of the Respondents towards Science as to Teaching Strategy

Item	$\bar{x}$	SD	Interpretation
The teacher…			
1. provides visual aids and other supporting materials related to the lesson.	4.8	0.7	High Positive Attitude
2.uses intervention materials like activity cards on difficult topics.	4.9	0.4	High Positive Attitude
3. provides activities that encourage working in groups.	4.6	0.6	High Positive Attitude
4. makes learning easy and fun.	4.4	0.8	High Positive Attitude
5. is very helpful to students during class.	4.7	0.6	High Positive Attitude
Over all	**4.67**	**0.36**	**High Positive Attitude**

Legend: 4.21- 5.00- Strongly Agree (High Positive Attitude); 3.21-4.20-Agree (Positive Attitude); 2.41-3.20-Undecided (Neutral); 1.81-2.30-Disagree(Low Positive Attitude); 1.00- 1.80-Strongly ; Disagree (Very Low Positive Attitude)

The data reveal that students have "high positive attitude" in Science in terms of Teaching Strategy. Standard deviation obtained indicates homogeneity of Students' responses on the indicated category of attitude toward Science. The data may imply that students' perception on teaching strategy is uniform. The students perceive their teacher as someone who is helpful, uses variety of instructional materials and makes Science learning easy and fun. The result is in line with Cuaresma (2014), that states that since all the science curriculum variables are significant, teachers should think of an effective teaching strategy since different lessons needs different teaching approach. Teacher must be innovative, creative and resourceful in teaching to maintain the attention of the students needed in the class. The curriculum makers should continuously check if the curriculum existing is suited to the needs of the students.

Table 4. Mean Attitude of the Respondents toward Science as to Academic Value

Item	$\bar{x}$	SD	Interpretation
1. Mankind benefits from Science.	4.4	0.8	High Positive Attitude
2. Science is essential to our daily lives.	4.5	0.7	High Positive Attitude
3. Science is one of the important steps in achieving one's dream.	4.2	0.7	Positive Attitude
4. He/she has to work hard to pass his/her Science subject.	4.5	0.7	High Positive Attitude
5. Science can lead the way to a better future.	4.4	0.8	High Positive Attitude
Over all	**4.4**	**0.4**	**High Positive Attitude**

Legend: 4.21- 5.00- Strongly Agree (High Positive Attitude); 3.21-4.20-Agree (Positive Attitude); 2.41- 3.20-Undecided (Neutral); 1.81-2.30-Disagree(Low Positive Attitude); 1.00- 1.80-Strongly Disagree (Very Low Positive Attitude)

The obtained data indicate that majority of the students have "high positive attitude" toward Science as to academic value. The data may imply that students know the importance of Science. They also that Science play an important role in our everyday lives. Students value Science as a very important subject that they have to work hard in order for them on to achieve their dreams.

Table 5. Mean Attitude of the Respondents toward Science as to Science Activity

Item	$\bar{x}$	SD	Interpretation
1. Science activities are interesting and fun.	4.4	0.7	High Positive Attitude
2. He/She enjoy interacting with group mates during activities.	4.5	0.8	High Positive Attitude
3. Science activities help to improve one's skills.	4.5	0.6	High Positive Attitude
4. He/ She enjoy learning new things with his or her group mates during Science activities.	4.4	0.6	High Positive Attitude
5. He/She learn more about the lesson after doing Science activities.	4.5	0.7	High Positive Attitude
Over all	**4.5**	**0.5**	**High Positive Attitude**

Legend: 4.21- 5.00- Strongly Agree (High Positive Attitude); 3.21-4.20-Agree (Positive Attitude); 2.41- 3.20-Undecided (Neutral); 1.81-2.30-Disagree(Low Positive Attitude); 1.00- 1.80-Strongly Disagree (Very Low Positive Attitude)

Table 5 shows that all the five indicators resulted to "high positive attitude". The data may imply that students are interested in Science activities; and enjoy and learn more when working in groups.

Table 6. Mean Attitude of the Respondents toward Science as to Classroom Environment

Item	$\bar{x}$	SD	Interpretation
The school has…			
1.enough laboratory instruments for Science activities.	3.89	0.94	Positive Attitude
2. classroom that permits students to do Science activities well.	3.36	1.37	Neutral
3.classroom that turns into Science laboratory during Science class.	3.13	1.41	Neutral
4. a library with latest Science books that can be used as references when researching.	3.44	1.18	Positive Attitude
5. classroom that is a safe place to conduct Science activities.	3.22	1.35	Undecided
Over all	**3.41**	**0.84**	**Positive Attitude**

Legend: 4.21- 5.00- Strongly Agree (High Positive Attitude); 3.21-4.20-Agree (Positive Attitude); 2.41- 3.20-Undecided (Neutral); 1.81-2.30-Disagree(Low Positive Attitude); 1.00- 1.80-Strongly Disagree (Very Low Positive Attitude)

Table 6 presents the mean attitude of the respondents toward science as to classroom environment.

It is revealed that students have “positive attitude” toward laboratory instruments and are “neutral” about whether their classroom is safe and is conducive to Science activities. This may be due to the fact that the Science Laboratory of the school is occupied as a classroom by a section of Grade 9 students to augment the scarcity of classrooms. Student-respondents cannot use the laboratory for its purpose although it has many instruments for Science activities.

To alleviate the situation, Science teachers have to bring laboratory instruments to their class if needed. For this reason students see just a fraction of the laboratory instruments of the school. Students have “positive attitude” toward library resources which may be due to the fact the school library does not fit the room it occupies therefore the books cannot be arranged as they are supposed to be arranged. The situation may have influenced student’s perception since they are not able to see all the books that they can borrow and use. In addition to this, students who would like to use the library find it uneasy to use the school library since some teachers without advisory class and have no place to stay due to lack of faculty room, stay in it during vacant time.

The results may imply that there is a need to improve school facilities since students were not able to give the highest rate for school environment.

Students' Performance in Science

Table 7. Distribution of Students as to Performance in Science

Score	Rem		Und		App		Anal		Eval		Creat		VI
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	
9-10	14	7	43	21.5	44	22	62	31	7	3.5	40	20	O
7-8	47	23.5	40	20	39	19.5	54	27	60	30	58	29	VS
5-6	84	42	52	26	51	25.5	37	18.5	99	49.5	45	22.5	S
3-4	44	22	43	21.5	28	14	28	14	27	13.5	34	17	FS
0-2	11	5.5	22	11	38	19	19	9.5	7	3.5	23	11.5	DNME
Total	**200**	**100**	**200**	**100**	**200**	**100**	**200**	**100**	**200**	**100**	**200**	**100**	

Legend: 9-10- Outstanding (O); 7-8 Very Satisfactory (VS); 5-6 Satisfactory (S); 3-4- Fairly satisfactory (FS); 0-2 Did not meet expectations (DNME); VI-verbal interpretation; Rem-Remembering; Und-Understanding; App-Applying; Anal-Analysing; Eval-Evaluating; Creat-Creating

The data show that even though only 7% of students are "outstanding" in remembering, the percentage is greater in other dimensions except in evaluating. The data may imply that many students may not be good in memorizing but can still perform well in other more complex dimensions. Few students are "outstanding" in evaluating dimensions which may imply that many students find the test in this dimension, which is True or False Test, complex. Biggest percentage in analyzing was occupied by students in outstanding level. This may imply that many students enjoy and find analogy test easy. There are students who "did not meet expectations" and the biggest percentage fell on applying. This findings may imply that many students find it difficult in matching information. As a whole there is a need for intervention program to help these students improve.

Correlation of Variables

Correlation between Students' Performance and Attitude towards Science

Table 8 reveals the relationship between students' performance in Science as to remembering, understanding, applying, analyzing evaluating and creating with attitude toward Science in terms of teaching strategy, academic value science activity and classroom environment.

Table 8. Correlation between Students' Performance and Attitude towards Science

Variables	Teaching Strategy	Academic Value	Science Activity	Classroom Environment
	r-value	r-value	r-value	r-value
Remembering				
Understanding	0.163*			0.141*
Applying				0.248**
Analyzing			0.283**	
Evaluating				
Creating			0.243 **	

*Legend: ** r value is significant at p <.01; * r value is significant at p <.05*

Only u*nderstanding* dimension has significant relationship with attitude toward science as to teaching strategy. The data may imply that teaching strategy greatly influences students' *understanding* as supported by the study of Adu & Olatundun (2007) that emphasized teachers' strategies to be strong determinants of students' performance in secondary schools.

The data also reveal correlation of students' performance in the dimensions of *analyzing* and *creating* to positive thinking about their Science activities. This may imply that when students think positively about their activities they can perform better in more complex cognitive domains such as analyzing and creating. Students tend to be more creative when they have positive outlook in the tasks they are doing.

Findings further reveal that a conducive environment may be provided for the students to effectively understand and apply concepts, theories and principles in Science.

All in all, the result of correlation of attitude toward Science and student's performance is partly in order of the findings of Godwin U. A. and Okoronka U., (2013) that attitude alone has little or no effect on the students' academic performance which could probably be attributed to other factors that affect achievement such as abstract nature and the quantative nature of the subject.

Table 9. Correlation between Students' Mastery in Basic Process Skills and Performance in Science

Basic Process Skills	**Cognitive Process Dimensions**					
	Rem r value	**Und r value**	**App r value**	**Anal r value**	**Eval r value**	**Creat r value**
Observing	0.203**	0.187**	0.192**			0.183**
Communicating			0.141*	0.142*		0.369**
Classifying						0.216**
Measuring			0.155**			0.251**
Inferring		0.245**	0.291**	0.268**	0.200**	0.367**
Predicting	0.177**	0.195**	0.258**	0.247**		0.335**

*Legend: ** r value is significant at p <.01 ; * r value is significant at p <.05*
Rem-Remembering; Und-Understanding; App-Applying; Anal-Analysing; Eval-Evaluating; Creat-Creating

As gleaned in the table, process skills are correlated to students' performance in the cognitive process dimensions of r*emembering, understanding, applying, analyzing, evaluating* and *creating*.

Observing and predicting show significant relationship to *remembering*. The data are supported by the findings of the study of Ranpura's (2013) who pointed out that memories can be reinforced independently of context by paying careful attention and by consciously attempting to remember. This may imply that memories start with what you observe and the first way to increase your memory is to make sure that you experience the world as clearly and meaningfully as possible.

Communicating, classifying and measuring have no significant relationship with *understanding.* The findings may imply that students who communicate, classify and measure satisfactorily do not necessarily mean that they understand the lesson well. In order for students to construct oral, written and graphic messages, they should know how to observe, infer and predict phenomena.

Only classifying skill is not significantly related to *applying* dimension. This result may imply that the skill of grouping things is not necessarily important to use information to undertake a procedure in familiar situations or in a new way.

Communicating, inferring and predicting have significant relationship with *analyzing* dimension of performance. The findings is approximately in accordance to the study conducted by Chebii (2011) that students with mastery in basic process skills in Science are likely to use the information well in applying. Table 9 farther reveals that students can only distinguish parts and determine how they relate to one another and the overall structure well when they know how to communicate, infer and predict well. It is supported by the study conducted by the National Research Council Framework (2012) that once collected, data must be presented in a form that can reveal any patterns and relationships and that allows results to be communicated to others. Because raw data as such have little meaning, a major practice of scientists is more to organize and interpret data through tabulating, graphing, or statistical analysis. Such analysis can bring out the meaning of data and their relevance so that they may be used as evidence.

Inferring and predicting skills are significantly related to *evaluating* dimensions which may imply that to make judgment and justify decisions, there is a need to go beyond the evidence and interpret or explain a set of observations as well as make a forecast of what will happen in the future.

The findings reveal that basic process skills are significantly related to *creating* dimension of performance. The results may imply that in order for the students to form new product or point of view, they should master the Science basic process skills. This is supported by the study of Aktamis and Ergin (2008) concluding that Science process skills improve scientific creativity and students' performance.

Chapter 5

SUMMARY, FINDINGS, CONCLUSION AND RECOMMENDATION

This chapter presents the summary of the findings established from the data gathered in the study. It also gives the conclusion and the recommendation derived from summary of findings of the study.

Summary of Findings

1. From the 200 respondents 74% or most of the students are normally in the age bracket for Grade 7 students which is 11 to 12. One hundred one (101) respondents or 50.5 % of the total respondents are male while 99 respondents or 49.5 % of the total respondents are female.
2. Although many students are in the "mastered" level, there are also many students in lower level especially in the "low mastery" and "no mastery" level who must be aided to improve their skills and performance.
3. The students have homogeneity of "high positive attitude" in all the items in the survey of attitude toward Science except in classroom environment.
4. Many students have "outstanding" performance in Science but there are also many with "Fairly Satisfactory" and "Did not meet expectations" that need immediate attention.
5. In correlation between attitude toward Science and students' performance, only *understanding dimension* established significant relationship in terms of teaching strategy; all the cognitive process dimensions are not related in terms of academic value; *analyzing* and *creating* dimensions are

significantly related in terms of Science activity; and *understanding, applying* and *analyzing dimensions are* significantly related in terms of classroom environment.

6. In correlation between mastery in basic process skills and performance in Science, observing and predicting skills show significant relation with *remembering* dimension*; o*bserving, inferring and predicting skills have significant relationship with *understanding* dimension; only c*lassifying* skill has no significant relationship to *applying dimension;* communicating and predicting skills are significantly related to *analyzing* dimension; only inferring is significantly related to *evaluating; and* all basic process skills are significantly related to *creating*.

Conclusions

In the light of the aforementioned findings, the following conclusions are drawn:

The null hypothesis stating that the mean level of students' mastery of the basic process skills is not significantly related to performance in Science is *partially supported*.

As per indicated in the findings, the null hypothesis stating that there is no significant relationship between students' attitude and performance in Science is *partially confirmed.*

Recommendations

Based on the findings of the study and the conclusion drawn, the following are recommended:

1. Since the students' mastery of inferring and predicting skills is "moving toward mastery" while their mastery in the skills of observing, communicating, classifying and measuring is "near mastery" they may be encouraged and assisted to improve those skills to higher level of mastery if not mastered through tutorials, workshops and intervention programs.
2. Students may be encouraged to raise the level of their performance in Science, from level of satisfactory to very satisfactory or higher through Science intervention programs.
3. Science enhancing and student-centered strategies may be applied by Science teachers or instructors to improve the performance of students by emphasizing basic process skills and by giving them group activities that need collaborative effort.
4. School support in the areas of building more rooms for Science-related activities like laboratories and e-classroom is needed.
5. For more comprehensive findings, further studies on the same area of concentration may be conducted for improving Science education where the students will be benefited.

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APPENDIX A

Letter Requesting Permission to Administer Questionnaire

Republic of the Philippines
Laguna State Polytechnic University
San Pablo City Campus
Brgy. Del Remedio,San Pablo City
Graduate Studies and Applied Research Thesis Writing

RAQUEL P. MARCUAP
District Supervisor
Candelaria East District
Candelaria

Madam:

Greetings of love and peace!

I am currently working on my thesis entitled **"Mastery in Basic Process Skills and Attitude toward Science: Input to Grade 7 Students' Performance"** as a partial fulfillment of the requirements for the degree Masters of Education Major in Science and Technology.

In this connection, I would like to seek your permission to utilize the data gathered in Sta. Catalina National High School through testing and survey. Rest assured that all the data and information shall be used only for academic purposes.

I am hoping for the positive regards on this matter. Thank you very much and God bless!

Very truly yours,

VERONIQUE M. MARANAN
Researcher

Noted by:

PERLA M. GUEVARRA, Ed. D.
Thesis Adviser

Approved/ Disapproved:

RAQUEL P. MARCUAP
District Supervisor
Candelaria East District

APPENDIX B

Survey Questionnaire on Attitude toward Science

Name______________________________ **Section**___________________

Age_________________________________ **Gender**___________________

Instructions: Below are statements pertaining to your attitude toward Science in terms of Teaching Strategy, Academic Value, Science Activity and Classroom Environment. Opposite each statement are five (5) options for your choice. Put a tick (/) under the appropriate column that corresponds to your answer.

5- Strongly Agree
4- Agree
3- Undecided
2- Disagree
1- Strongly Disagree

I. Teaching Strategy	**5**	**4**	**3**	**2**	**1**
My teacher …					
1. provides visual aids and other supporting materials related to our lesson.					
2. uses intervention materials like activity cards on difficult topics.					
3. provides us activities that encourage us to work in groups.					
4. makes learning easy and fun.					
5. is very helpful to students during our class.					
II. Academic Value	**5**	**4**	**3**	**2**	**1**
1. Mankind benefits from Science					
2. Science is essential to our everyday lives.					
3. Science is one of the important steps in achieving my dreams.					
4. I work hard to pass my Science subject.					
5. Science can lead the way to a better future.					

III. Science Activity	**5**	**4**	**3**	**2**	**1**
1. Science activities are interesting and fun					
2. I enjoy interacting with my Science group mates during science activities.					
3. Science activities help me to improve my skills.					
4. I enjoy learning new things with my group mates during Science activities.					
5. I learn more about the lesson after doing Science activities.					
IV. Classroom Environment	**5**	**4**	**3**	**2**	**1**
The school has					
1. enough tools for Science activities.					
2. classroom that permits us to do our Science activities well.					
3. classroom that turns into Science laboratory during Science class.					
4. a library with latest science books that can be used as references when researching.					
5. classroom that is a safe place to conduct our Science activities.					

APPENDIX C

Science Basic Process Skills Test

Name______________________________ Section____________ Score_____

This is a test on the Science Basic Process Skills.

A. Observing:

Directions: Read and answer each item carefully. Encircle letter of the correct answer . Do not leave any item unanswered.

1. What can be the observation from the illustration of the energy pyramid?

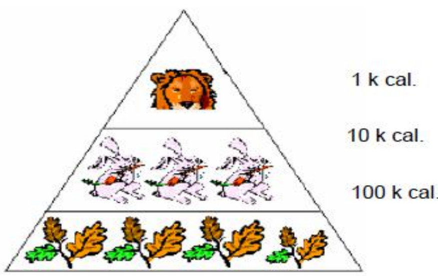


Figure 1. Energy Pyramid

a. The lion gets the most energy.
b. The plants get the most energy.
c. The energy increases going up the pyramid.
d. Both A and B.

2. Which is/are the producer/s in the illustration?

a. lion b. rabbits
c. plants d. all of the above

3. From Figure 2, which phase of matter has the most closely packed molecules?

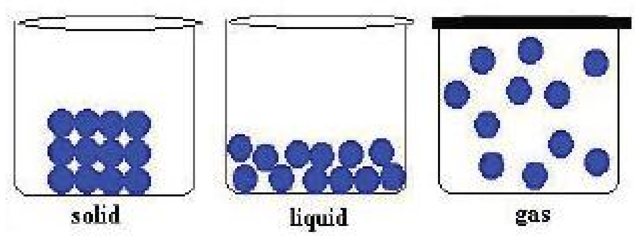


Figure 2. Molecules of matter

a. solid b. liquid
c. gas d. none

4. Observe the aquarium picture illustrated below. Which of the following is an observation?

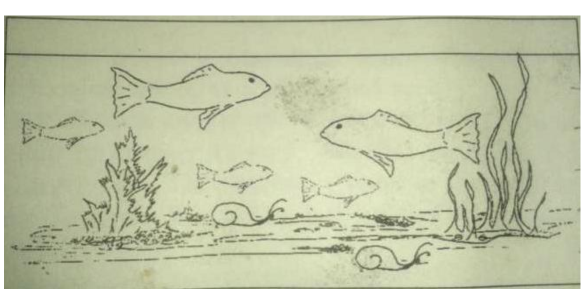


Figure 3. Aquarium

a. Snails and fish do not like each other.
b. More fish could live in the aquarium.
c. Fish near the top are breathing air.
d. Some fish are bigger than the other.

5. Which is NOT an observation of the aquarium picture?

a. The plants will not have enough air.
b. There are two snails in the aquarium.
c. The aquarium is not completely full.
d. Snails are not in the bottom of the aquarium.

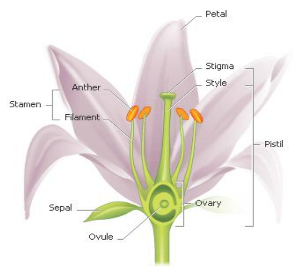


Figure 4. Parts of a Flower

6. From the picture, which part of the flower connects the stigma to the ovary?
a. receptacle b. ovule c. style
d. peduncle

7. Which part of the flower is connected to anther?
a. filament b. petal c. stigma d. stamen

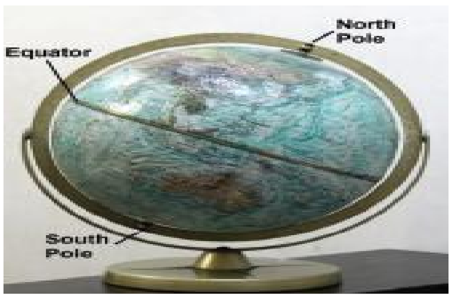


Figure 5. Globe

8. Which is an observation of the picture of the globe?
a. The globe is divided into halves by the equator.
b. The globe is a model of the earth.
c. The globe is tilted.
d. All of the above.

9. In what direction does the energy flow?

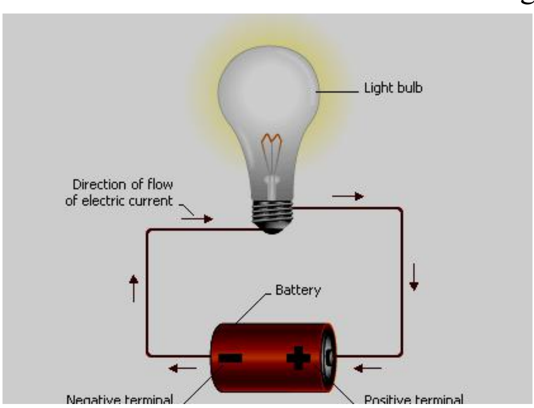


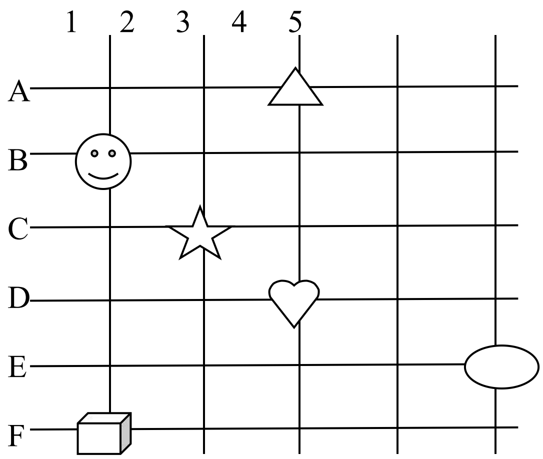
Figure 6. Electric Circuit

a. Clockwise
b. Negative Terminal to Light bulb to Positive Terminal
c. Positive Terminal to Negative Terminal to Light bulb
d. All of the above

10. Which is the source of energy in Figure 6?
a. Light bulb
b. Wires
c. Battery
d. Terminal

B. **Communicating:**

Directions: Write your answer on your answer sheet.



Communicating with a map

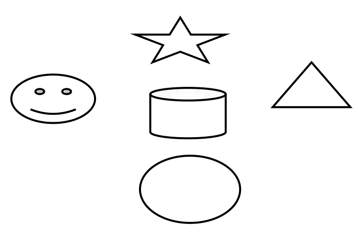
Write the location of the object by consulting the map.

Example: box F1

1. Star ____________________
2. Triangle ____________________
3. Circle ____________________
4. Heart ____________________
5. Happy Face____________________

6-10. Describe the location of the cylinder. Answer in five sentences. Consider the following Rubrics for scoring.

Criteria	5 pts.	4 pts.	3 pts	2 pts	1 pt.
Sentence that describes the position of the cylinder.	5 different sentences describing the position of the cylinder.	4 different sentences describing the position of the cylinder.	3 different sentences describing the position of the cylinder.	2 different sentences describing the position of the cylinder.	1 sentence describing the position of the cylinder.



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____

____

____

____

C. Classifying:

Directions: Put each of the following unit into its proper column

Meter Gram Liter Hour Celsius

Kelvin Minute Gallon Pound Feet

MASS/ WEIGHT	LENGTH	TIME	VOLUME	TEMPERATURE

D. Measuring

D1. Directions: Match the instrument in Column A with the physical quantity it measures in column B. Write the letter of the correct answer.

COLUMN A	***COLUMN B***
_______1. Thermometer	a. Volume
_______2. Stopwatch	b. Temperature
_______3. Balance scale	c. Time
_______4. Graduated cylinder	d. Length
_______5. Meter stick	e. Mass/ Weight

D2. Solve the following.

6. How many seconds are there in 5 minutes? _____________

7. Rafael has a 2-feet stick. If there are 12 inches in 1 foot, how long is the stick in inches? _________

8. There are 1000 meters in 1 kilometer. A bus travelled 5500 m. Find the distance travelled by the bus in kilometer. _________

8. Monique waited for the result of the test in 3 hours. How many minutes are there in three hours?_____

10. Marc put 1 liter of water on the tank. How many milliliters are there in 1 liter? ________

E. Inferring:

Direction: Encircle the letter of the correct answer.

1. The salt added to one glass of water does not dissolve right away.

a. The water contains large amount of dissolved salt already.
b. The water is cold and it needs stirring to dissolve the salt.
c. The salt is too hard to dissolve.
d. All of the above.

2. One night, you noticed that one star is brighter than the others.

a. It is closer to earth that is why it is brighter than others.
b. The star is going to explode.
c. The star is not actually a star but a planet.
d. None of the above

3. These rocks are found near a volcano.

a. It is formed from lava.
b. It will form sedimentary rocks in the future.
c. It will transform into metamorphic rock in the future.
d. None of the above.

4. The paint of the roof fades easily.

a. It will be painted soon.
b. The sun and the rain contribute to its fading .
c. The owner of the roof will change the brand of his paint.
d. None of the above.

5. The water in the river is drying up.

a. The organisms in the river will die.
b. There will be a drought.
c. The ocean will be dried up too.
d. The water shed dried up and the trees were cut.

6. The rock has a crack in it.

a. The rock is undergoing chemical and physical changes.
b. It will turn into soil in the near future.
c. It is subjected into different weather condition.
d. Both A and B.

7. The heat is trapped inside the container.

a. The heat will accumulate and soon the container will explode.
b. Something is keeping the heat from escaping the container.
c. The container will melt.
d. All of the above.

8. You hear a loud siren nearby.

a. There is an emergency.
b. There is a fire.
c. There is fire drill.
d. All of the above.

9. The sky has few featherlike clouds.

a. There will be a storm.
b. The weather is fine.
c. It will rain afterwards.
d. None of the above.

10. There is a spot in the front yard where no plant does not grow.

a. It will be planted tomorrow by the gardener.
b. Someone may have spilled a toxic substance there.
c. I will investigate the reason about it later.
d. None of the above.

F. Predicting:

Direction: Encircle the letter of the most appropriate prediction for each of the given situation.

1. A passenger boat is over loaded with passengers.

a. The passengers are in a hurry.
b. The passengers are careless.
c. The boat might sink later .
d. Both A and B

2. Many motorists do not use helmet when riding their motorcycle.

a. Many motorists are careless.
b. Many motorists are not afraid of what will happen to them during accident.
c. Many motorists will have serious injury once they meet an accident.
d. Both a and b.

3. The girl is shaking an unopened bottle of soft drink in her hand.

a. The soft drink will spill out in bubbles when she open the bottle later.
b. The liquid in the bottle is forming bubbles.
c. The girl is playing with her drink.
d. The girl is mixing the liquid in the bottle.

4. A glass of milk was left forgotten in a table.

a. It does not taste good.
b. It is full cream milk.
c. The one who made it is in a hurry.
d. It will be spoiled after some time.

5. The temperature in polar region is rising.
a. It will cause melting of glaciers.
b. It will cause rising of water level.
c. It will affect polar bears.
d. All of the above.

6. The sky is dark.

a. It is night already.
b. The sky is full of nimbus clouds.
c. It is going to rain.
d. The sun is covered by clouds.

7. The earth is rumbling near the volcano.

a. The rumbling is caused by the volcano.
b. The rumbling is a tectonic earthquake.
c. In about two minutes, the volcano is going to blow sky-high.
d. All of the above

8. There is a strong earthquake.

a. Many structure will collapse.
b. It is caused by sudden movement of the plates.
c. It is caused by volcanic eruption.
d. It is a natural phenomenon.

9. Miaka observed that termites are present in her wooden file cabinet.

a. There is a queen termite nearby.
b. The termites are eating her files.
c. Soon her files in the cabinet will be destroyed
d. None of the above.

10. A plant was kept in a place with no sunlight.
a. It cannot make its own food properly.
b. The plant will wilt and eventually die.
c. It cannot photosynthesize.
d. All of the above.

APPENDIX C.1

Table of Specification for Science Basic Process Skill Test

Skill	Objective	Number of Items	Item Placement
Observing	-Identify the observation from the illustration	1	A1
Observing	-Identify the producer from the illustration	1	A2
Observing	-Identify the most closely packed molecules.	1	A3
Observing	-Identify the correct observation of the aquarium.	1	A4
Observing	-Identify which is not an observation of the aquarium picture	1	A5
Observing	-Identify which is not an observation about an aquarium picture	1	A6
Observing	-Observe a picture to identify a part of a flower.	1	A7
Observing	-Identify the correct observation of the globe.	1	A8
Observing	-Observe and trace the flow of energy.	1	A9
Observing	-Observe and trace the flow of energy.	1	A10
Communicating	-Write the location of the object by consulting the map.	5	B1-B5
Communicating	-Write sentences that describe the location of the cylinder.	5	B6-B10
Classifying	- Classify the given unit according to the quantity it is used.	5	C 1- C10
Measuring	-Match the instrument to the quantity it measures.	5	D 1- 5
	-Solve word problems about measurement	5	D 5-10
Inferring	-Choose the inference from the given choices.	10	E 1 - 10
Predicting	-Choose the correct prediction from the given situation.	10	F 1 - 10

APPENDIX D

Achievement Test

Name______________________________ Section___________________ Score_____

Directions: Read and answer each item carefully.
A. For items 1 -10, encircle the letter of the correct answer.

1. What is that part of the world between the North Pole and the equator?

a. Northern Hemisphere c. Equatorial Region
b. Southern Hemisphere d. North Pole

2. What is the starting point of the longitude?

a. Equator c. International Date Line
b. Tropic of Cancer d. Tropic of Capricorn

3. What is meaning of "G" in the acronym PAGASA?

a. Government c. Geo-Science
b. Geographical d. Geophysical

4. What is an area of land on a slope which drains its water into a stream and its tributaries?

a. Ground water zone c. Watershed
b. Aeration zone d. Ridge

5. In temperate countries, it is used to grow seedlings in the late winter and early spring and protect plants from extreme weather condition.

a. Orchidarium c. Vineyard
b. Greenhouse d. Terrarium

6. What is the most abundant gas in the atmosphere?

a. Oxygen c. Nitrogen
b. Carbon Dioxide d. Ozone

7. It is the layer of the atmosphere closest to the earth?

a. Stratosphere c. Ozone Layer
b. Exosphere d. Troposphere

8. It is the darkening of the sun or moon due to shadows cast to them.

a. Eclipse b. Monsoon c. Solar Flare d. Sky Light

9. It is the second brightest object in the sky and Earth's natural satellite.

a. Sun b. Moon c. Star d. Comet

10. It is the movement of earth as it spins on its own axis.

a. Rotation b. Revolution c. Tilting d. Orbiting

B. For items 11-20, classify the following information to which topic they belong. Write the letter in their proper column:

a. Shadows
b. Global Warming
c. High number of endemic plants and animals
d. Green House
e. Tilting of the Earth
f. Auroras
g. 17.5 thousand km. coastline
h. Earth's rotation and revolution
i. 5th Mineral Country in the world
j. 2nd to United States in terms of geothermal deposit

The Philippine Environment (11-14)	Solar Energy and the Atmosphere (15-17)	Seasons and Eclipses (18-20)

C. For items 21-30, match the information in column A to column B. Write the letter of the correct answer.

Column A	Column B
___21. Philippines is a tropical country.	a. It has fertile arable lands, high diversity of plants and animals, extensive coastlines and rich natural deposits.
___22. Philippines is considered rich in natural resources.	b. Many jet aircrafts fly in it.
___23. There are many watersheds in the Philippines.	c. Sea breeze occurs at day time and land breeze occurs at night time.
____24. Philippines is located in the Pacific Ring of Fire.	d. It is summer at this time.
____25. Stratosphere is very stable.	e. There is a solar eclipse.
____26. Exosphere is the upper limit of our atmosphere that merges into space.	f. It is cold at this time.
____27. Land heats and cools faster than sea.	g. It is located near the equator.
____28. In June, the North Pole tilted toward the sun.	h. Satellites are stationed in this area.
____29. In June, The South Pole is pointed away from the sun.	i. The richness of the Philippines in terms of mineral resources is attributed to it.
____30. The sun was blocked by moon.	j. Mt. Apo, Mt. Makiling, Mt. Banahaw, Tiwi, La Mesa Dam, Pantabangan Dam, Angat Dam

D. For items 31- 40, identify the relationship of the first two paired words. Write the word that expresses a relationship most similar to the relationship expressed in the first paired words.

31. 23.5 ^{o}N	: Tropic of Cancer	;	23.5 ^{o} S	: ____________
32. East	: Pacific Ocean	;	West	: ____________
33. Latitude	: Equator	;	Longitude	: ___________
34. Mt. Apo	: Davao	;	Mt. Banahaw	: ___________
35. Troposphere	: Weather	;	Thermosphere	: ___________
36. Burning	: Carbon dioxide	;	Propellants/ Refrigerants	: ____________
37. Northeast	: Amihan	;	Southwest	: ___________
38. Day	: Rotation	;	Year	: ___________
39. Solar and lunar	: Eclipse	;	Rainy and dry	: ___________
40. Planet	: Earth	;	Galaxy	: ___________

E. For items 41-50, write TRUE if the statement is true and FALSE if the statement is false.

_______41. The starting point for the latitude is the Equator.

_______42. Latitude 66.5^{o} is the Tropic of Cancer.

_______43. Watersheds include bodies of water only.

_______44. When a piece of rock is exposed to the sun, its inner part expands because it heats up faster than the outer part.

_______45. Meteors or rock fragments burn up in the exosphere.

_______46. Air in the surroundings move toward the place where cold air is rising.

_______47. When air from land will move out to replace the rising warm air, it is called land breeze.

________48. Direct rays means that the rays of the sun hit the ground at 90 degrees.

________49. When a light source is blocked by an object, a shadow of that object is cast.

________50. A solar eclipse occurs when Moon comes directly between Sun and Earth.

F. For items 51 -60…

F.1 Make your own simple diagram or illustration that will show the four stages of weathering of rocks (4pts.). Consider the following Rubrics for scoring:

Criteria	4 pts.	3 pts.	2 pts.	1 pt.
Illustration or diagram showing weathering	Shows 4 stages	Shows 3 stages	Shows 2 stages	Shows 1 stage

F.2 Give 3 simple ways on how you can help lessen the rate of Global Warming (3pts.)

Criteria	3 pts.	2 pts.	1 pt.
Ways to help lessen the rate of Global warming.	Give 3 different ways.	Give 2 different ways	Give 1 way

F.3. Draw a diagram of solar eclipse showing the correct position of sun, earth and moon (3 pts.)

Criteria	3 pts.	2 pts.	1 pt.
Diagram or illustration.	Shows correct position of sun, moon and earth with complete label.	Shows correct position of sun, moon and earth with incomplete label.	Shows correct position of sun, moon and earth without label.

APPENDIX D.1

Table of Specification for Cognitive Achievement Test

Cognitive Process Dimension	Objective	Number of Items	Item Placement
Remembering	Identify the part of the world between the North Pole and the equator	1	1
Remembering	Identify starting point of the longitude	1	2
Remembering	Identify meaning of "G" in the acronym PAGASA.	1	3
Remembering	Identify the area of land on a slope which drains its water into a stream and its tributaries	1	4
Remembering	Identify the place that is used to grow seedlings in the late winter and early spring and protect plants from extreme weather condition.	1	5
Remembering	Identify the most abundant gas in the atmosphere	1	6
Remembering	Identify the layer of the atmosphere closest to the earth	1	7
Remembering	Identify the phenomenon which is the darkening of the sun or moon.	1	8
Remembering	Identify the second brightest object in the sky and Earth's natural satellite	1	9
Remembering	Identify the movement of earth as it spins on its own axis.	1	10
Understanding	Classify the given information to which topic they belong.	10	11-20
Applying	Match the information in column A to column B	10	21-30

Analyzing	Identify the word that will complete the analogy of the sentence	10	31-40
Evaluation	Identify whether the sentence is true or false.	10	41-50
Creating	Make simple diagram or illustration that shows the four stages of weathering of rocks	4	51-54
Creating	Give 3 simple ways on how you can help lessen the rate of Global warm	3	55-57
Creating	Draw a diagram of solar eclipse showing the correct position of sun, earth and moon.	3	58-60