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Physics Performance and Science Interest: A Basis for Proposing an Intervention Program

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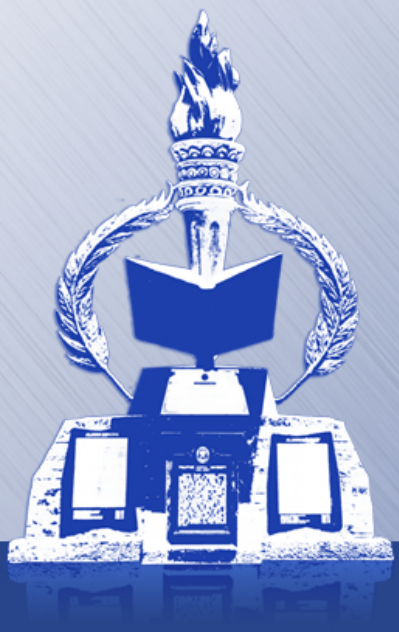

Philippine Normal University
National Center for Teacher Education

PHYSICS PERFORMANCE AND SCIENCE INTEREST; A BASIS FOR PROPOSING AN INTERVENTION PROGRAM

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ABSTRACT

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The study aimed to determine if the Immaculate Conception Parochial School (ICPS) fourth year students' interests affect their science academic performance. A causal-comparative descriptive research design was used, with the researcher-made instrument called Student Interest Inventory Survey (SIIS) as the main instrument. The instrument basically determined the students' level of interest in the four disciplines of Science namely Integrated Science, Biology, Chemistry and Physics. One hundred fourteen (114) fourth year students coming from intact sections of ICPS were selected to answer the instrument. Data analysis was done using both descriptive and inferential statistics. Specifically, the Pearson Correlation Coefficient was used to determine the existing relationship between the students' science academic performance and their level of interest. In addition, ANOVA was applied to establish significant differences in the students' science academic performance when they were categorized according to their

interest. Results revealed that the average science academic performance of the ICPS students is 81.80% (approaching proficiency).

Likewise, the NAT score was within the 35%-65% Mean Percentage Score (average). The data also showed that the interest level of the students in both Integrated Science and Biology was higher (MI – moderately interested) than that in Chemistry and Physics (SI-somewhat interested). Finally, the statistical analyses of the data revealed that there were no significant differences in the students' academic performance in Physics when they were categorized according to their level of interest. More so, there was no significant relationship between the students' level of interest in science and their science academic performance.

In conclusion, ICPS students have not fully mastered the knowledge and skills in and were not fully developed the competencies in the subject. Students will learn best if the subject is concrete and can be related to everyday existence. Student's interest in science is not a predictor of academic performance. The sampled population was too small to capture a general scenario, thus it is not necessarily mean as a general rule that interest is not correlated to student performance. In this manner, an intervention program could be developed to enhance interest in science, specifically intended for Grade 7, who will undergo the transition program of the K-12 curriculum.

With the given findings and conclusions, ICPS administration must evaluate the science program and offer remedial intervention programs particularly in Physics. Interesting activities should be provided by the teacher; therefore, there is a need for teachers to update themselves with content and pedagogy. Create an intervention program to address the varied interest of the students to improve their level of interest. Use this program, assess, and can be extended to different level.

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CHAPTER 1

THE PROBLEM AND ITS BACKGROUND

Introduction

The development of the innate characteristics of a child depends on how interesting a certain activity is. A student who is interested in a subject matter may pursue exciting course work, partake enthusiastically in class discussions, and consequently gain high grades in projects and academics (Abdon, 2008). Likewise, a student who is interested in outdoor activities that involve socializing with people may join extra-curricular works and maybe involved in outreach programs. On the other hand, other students may not participate in any activity offered in the school simply because they are not interested at all. If students get interested with some subjects, it is likely that their performance could be good and the reverse is true (Nyamba & Mwajombe, 2012).

Various research studies found out that interest is an important factor in learning. According to Li as cited by Lee, Chao and Chen (2011), the role of interest in the classroom setting is required to meet students' intellectual needs in determining what to learn and how well a student participates in an activity. The interest of students is reflected into the course through attention level in class, interest in learning the material, perception of a course's intellectual challenge, and acquired competence in the field (Abrantes, Ferreira & Cardoso, 2007). Similarly, Abdon (2008) stated that when the student is interested in the course he is taking, chances are, he is motivated to study and will be able to sustain challenges of the course, perform the required tasks and actively participate. Students may perceive themselves as learning more if

they are interested which will reflect their overall evaluation of the learning process (Tynjälä, as cited in Abrantes et al. 2007) and may reject learning environment that contradicts their preferences (Hsu 1999, as cited in Abrantes et al. 2007). Therefore, if students are allowed to pursue their interests, they stay involved for longer periods and exhibit creative practices in doing sciences (Seiler, 2006). Consequently, if a student is not interested in science, he tends not to take concepts being taught (Hofstein & Namlok-Naaman, 2011).

Interest plays a very important role in the learning process and in determining what to learn and how well a student participates in an activity. Student interest reflects output into the subject, such as attention level in class, interest in learning the material, perception of a course's intellectual challenge, and acquired competence in the field (Abrantes, et al. 2007). Students reject a learning environment that runs contrary to their preferences (Hsu 1999, as cited in Abrantes et al. 2007) and they perceived themselves as learning more if they are interested (Tynjälä, as cited in Abrantes et al. 2007). Hence, teachers are challenged to redirect the interest of the students to be more focused and develop their disposition to learn.

The above mentioned relationships explains why studies on the correlation between individual interest and learning outcomes such as grades and test scores as dependent variables frequently used correlational approach. Positive correlations have been observed between interest and a variety of standard learning outcomes such as test score, grades and grade point average (Krapp, Hidi & Renninger 1992). It was even mentioned by Scheiefele, 1996 (as cited by Krapp 1999 that when interest and achievement correlation is compared with the result of prediction studies and other measures of motivations, the correlation is more stable and mostly higher. Another study by Ainley, Hidi and Berndorff 2002) revealed that there is a positive

correlation between interest and achievement. In the said study, the effects of specific individual interest domains and general individual interest in learning were studied. MANCOVA was used with general individual interest in learning and the four specific interest domains (personal health, animals and pets, TV and movies and science) related to the four texts were entered as covariates. Gender was also included as a factor. Results showed that significant within-subject variability across the set of text titles was associated with general individual interest in learning and two of the four specific individual interest domains. These were the domains of personal health, and animals and pets. The specific individual interest domain of personal health was significantly associated with topic interest for the Body Image title, whereas individual interest in animals and pets was associated most strongly with Chameleons and less strongly with Body Image. Furthermore, the contribution of gender over and above the effects of the specific individual interest domains was not significant. These among other related studies were used as bases by various education systems across regions in determining the learning outcomes / performance of their students as reflected in their grades and test scores.

In the Philippines, the assessment of the learning outcomes is used primarily as a quality assurance tool to tract student progress in the attainment of standards, promote self-reflection and personal accountability for one's learning, and provide a basis for profiling of student's performance (DepEd, 2012). The performance of the students shall be described in their report cards. Grades in the different subject areas serve as evidence of the students' learning or attainment of performance standards.

In the national evaluation level, the Philippine National Achievement Test (NAT) is used. It is a system-based assessment specifically designed to gauge learning outcomes across target

levels in an identified period of basic education. The Mean Percentage Score (MPS) indicates the ratio between the number of correctly answered items and the total number of test questions or the percentage of correctly answered items in the test. The national MPS target is 75.00 which is interpreted as moving towards mastery (National Educational Testing and Research Center [NETRC], 2013).

In the National Capital Region (NCR) 2013-2014 NAT, result shows that of the five subject areas, science got the lowest MPS, which is 44.34 which is verbally interpreted as Average Mastery (DepEd Malabon, s. 2014). In the Division of Malabon, science is on the least rank of the five subject areas with MPS of 45.81 (Average Mastery). With the NAT results, policy recommendations have been formulated to improve the performance of the student. Sadly, the same poor science performance in ICPS was observed, with a computed MPS of 35.2 (Average Mastery). The low performance in the national evaluation is further confirmed by the low final grades of the students in science, particularly in Physics which is the concern of this study.

To further strengthen the alarming problem of low performance of students in science, this study specifically mentions as a background of the problem the key results of the participation of the Philippines in the TIMSS 1995, 1999 & 2003. TIMSS is being conducted by the International Association for the Evaluation of Educational Achievement (IEA). Previous results (1995, 1999 and 2003) reported that the Philippines is lagging behind its neighboring countries. In the 1995 TIMSS, the Philippines ranked 39th in Science out of 42 participating countries, in 1999 she ranked 3rd from the bottom with 38 participating countries and in the 2003

TIMSS, the Philippines ranked 4th from the bottom with 32 participating countries (Martin, Mullis, Gonzalez & Chrostowski, 2004).

Through the literature presented on the effect of interest to achievement, the researcher sought to gain a broader understanding of the interest in science of the ICPS students and its possible relationship with their performance and consequently use it as a basis for the development of an intervention program to enhance their interest.

Conceptual Framework

There have been major trends in the study of interest since its origin around 1910. According to Dewey, interest means a unified activity, a state that man is totally engaged until accomplishing his ends and has intellectual property (Dewey, 1913). The concept of Dewey on interest explains the engagement of a student in performing activities until accomplishing his goals. A student who is being totally engaged in an activity can perform tasks though the interesting activity maybe complex. Finally, when interest has an intellectual property, a student can easily perceive the activity and allow a student to think reflectively.

Hidi, Krapp and Renninger (1992) categorized interest into two: individual interest and situational interest. Individual interest is the preference for certain topic or a general liking for the subject (Hidi & Anderson, 1992). It is a deep-seated interest characterized by the desire to develop competence and demonstrate involvement in a particular field (Schunk, D.H, Pintrich, P.R, & Meece, J.L, 2008). It develops slowly and tends to be long lasting and is considered relatively stable. According to Lai (2010), individual interest, being an individual focus, is driven by personal interest, on a basis of prerequisite knowledge combined with emotions and the subsequent willingness to spend more time in learning. It leads to persistence at a task over a

long period of time, closer attention, ability to focus and increase learning and enjoyment even among young children. People working with individual interest are involved in activities that are purposeful, sustained and ever deepening (Hidi & Harackiewicz, 2000), which may be used as a predictor of academic achievement. Individual interest increases learning due to increased engagement, acquisition of expert knowledge, and involvement in more challenging tasks.

Individual interest can address both the process and progress of a student learning overtime. According to Krapp (1999), the changing structure of a person's long lasting individual interest for content and individual personality development begins at a very early age. Relative preferences for particular objects can be developed among children to their cognitive engagement (Krapp, 1986 as cited by Krapp 2002. A student may value and engage in learning tasks because he has a personal interest in the content, task and activity (Krapp, et al.1992). Students may be interested in Integrated Science, Biology, Chemistry or Physics when they enter their science classroom. This personal interest is enhanced if the students are allowed to promote their sense of autonomy, when school work is challenging and relevant, when they are given with choices and between ways of completing tasks, encouraging students to explore and pursue their interest, building on their backgrounds and prior experiences (Lepper & Henderlong, 2000; Pintrich & Schunk, 2002), all the more if these pertain to the subject matter they are interested in. Situational interest, on the other hand, refers to an interest that people acquire by participating in an environment or context. It is evoked by certain conditions in the environment and represents a more immediate affective reaction that may or may not last (Hidi & Harackiewicz, 2000).

Individual interest is said to have two phases, emerging individual interest and well-developed interest. According to Krapp, et al (1998), emerging interest is characterized by strong positive feelings, knowledge and stored value in relation to a person and content. The student values the opportunity to do things given the choice (Flowerday & Schraw, 2003). When curios, the student begins to ask questions about the content of emerging individual interest (Renninger, 1990) where students may redefine and even exceed tasks demands in their work (Lipstein & Renninger, 2006). If in case student's curiosity was not satisfied, the resourcefulness in the students comes out. Emerging individual interest is not self-generated. It requires external supports such as models, peers and experts to support and contribute to the increased understanding (Renninger, 2000). It may also need encouragement to persevere when confronted with difficulties (Renninger & Shumar, 2002). On the other hand, well-developed individual interest is conceptualized by positive feelings and more stored value than emerging individual interest (Renninger, 1989, 1990).

Another concept of interest is the one linked to motivation theory. Motivation theories regarded interest as motives. In extrinsic motivation theory, interest depends on the students' needs or wants. A student has been reinforced to perform a task because of rewards such as high grades. Sometimes students tend to neglect how the grades were acquired since their interest is in rewards. A student may employ cheating just to get an answer rather than solving for the answer. In intrinsic motivation, interest has been considered to be an implicit aspect of intrinsic motivation where students seek opportunities to master the tasks and develop competencies (Hidi, 2000).

The conceptual framework of the study as shown in Figure 1 presents how the above concepts of interest are used in the study. The study is anchored to interest theory particularly to individual interest. An individual interest or personal interest has been described as a dispositional trait or characteristic quality of a person that is stable, such as gender, prior knowledge, and experience and relatively stable performances for certain content areas. Since individual interest refers to the liking or preference to a certain activity or subject area, the interest levels of the students in the four disciplines of science namely Integrated Science, Biology, Chemistry and Physics were regarded as the independent variables and the Physics performance as the dependent variable. The Physics performance of the students as measured by their grades in Physics was correlated to their interest which was assumed to be hypothetically affected. More so, the achievements of students in science as measured by the NAT science scores was correlated to their interest to supplement whatever result obtained in the correlation between Physics performance and interest. The performance of the students and its possible relation to the interest of the students in science, served as the basis for proposing an intervention program. This program is intended particularly for Grade Seven students so that their interest in Physics can be developed at an early stage. The proposed intervention program is composed of related and challenging activities that may enhance grade seven students' interest in science particularly in Physics.

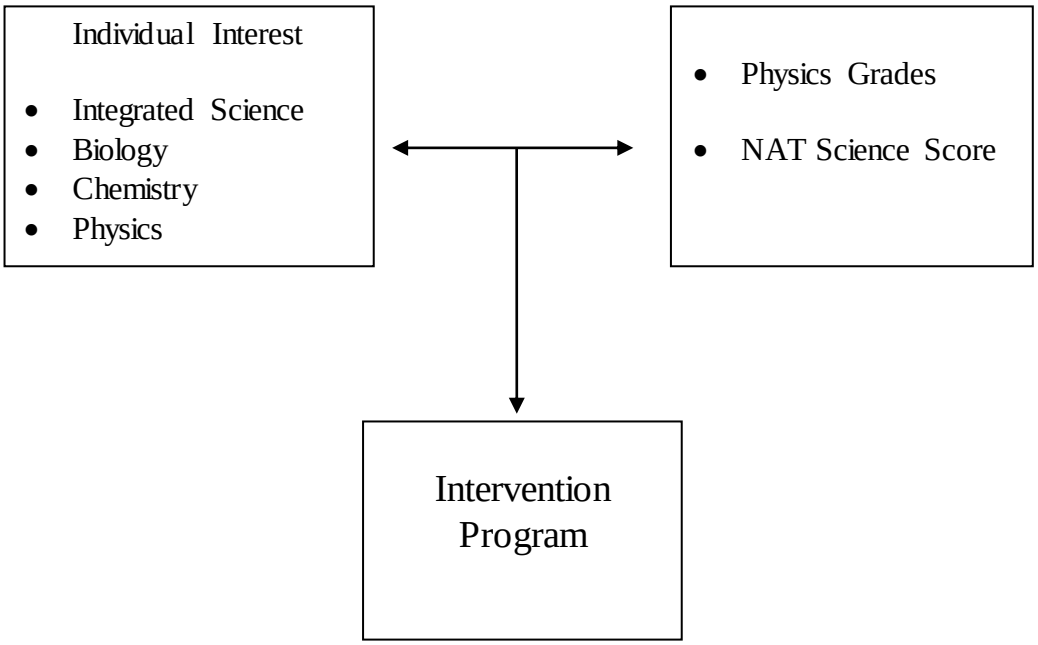

Figure 1. Conceptual Framework of the Study

Statement of the Problem

The main goal of the study was to assess if the ICPS fourth year students' level of interest in science affects their academic performance. Specifically, it aimed to determine the relationship between the students' level of interest in science and their academic performance. The following problems were posed.

1. What is the performance of the students in terms of:
    a. Grades in Physics
    b. NAT Science Scores
2. What are the students' levels of interest in the four disciplines of science, namely: Integrated Science, Biology, Chemistry and Physics?

3. Are there significant differences in the grades in Physics and NAT science scores of the students when they are categorized according to their level of interest?
4. Is there a significant relationship between the students' interest in science and their grades in Physics ?
5. What intervention program may be proposed based on the results of the study?

Research Hypothesis

1. There are significant differences in the grade in Physics and NAT science scores of students when they are categorized according to their level of interest in science.
2. There is a significant relationship between the students' interest in science and their grades in Physics and NAT Science scores.

Significance of the Study

The findings of this research study will be useful to the ICPS and its stakeholders in planning activities to improve the quality of science education offered in the institution.

Specifically, the results of the study will be of great help to the following:

Teachers. Teachers will better understand that there are personal factors that could affect the academic performance of the students. Knowing the students' interest would allow the teachers to provide appropriate activities that will improve their competencies. Moreover, the result of this study can be useful to the teachers as they attempt to address the individual needs of the students.

School Administrators. School administrators will become more conscious of the interest and the academic performance of the students so that they could come up with more flexible and

attainable programs that will further stimulate the students' interest and consequently improve their learning.

Parents. Parents will be more responsive to the concerns of their children and give further support for whatever undertakings their children will have and provide guidance for their future profession.

Future Researchers. And lastly, this study would be useful to future researchers. It is hoped that this study will pave the way for more meaningful and comprehensive research endeavors.

Scope and Delimitation of the Study

The study focused on the grades in Physics and the NAT Science scores of ICPS students and it possible correlation. The results of this study served as a basis for the proposed intervention program for Grade 7 students to further develop their interest in Physics at an early stage. The respondents of the study were the three sections of the fourth year students of Immaculate Conception Parochial School, Malabon City for the school Year 2013-2014. They were chosen because they are the group who took the NAT and have learned the four disciplines of science from which their level of interests were assessed. The performance of the students in science is reflected in the Physics grades and NAT science scores. Grades in Physics were taken from the Registrar's Office (with the necessary consent solicited) and the NAT scores were requested from the National Educational Testing and Research Center (NETRC). The interest in science of the students was obtained from the results of the Science Interest Inventory Survey (SIIS).

Definition of Terms

To provide a common reference regarding the meanings of some terms used in this study, the following terms were operationally defined:

Performance in Physics. It refers to the averaged grades in Physics of the fourth year ICPS students of SY 2013-2014.

Science Interest. It refers to student's preference: liking, disposition, and willful participation; and enjoyment in a certain topics or activities on Integrated Science, Biology, Chemistry and Physics as indicated in the researcher-made SIIS instrument.

Intervention Program. It refers to the proposed program intended to develop the interest of Grade 7 ICPS students in Physics.

Interest levels. It refers to the Likert-scaled degree of interest as highly interested (HI=3), moderately interested (MI=2), somewhat interested (SI=1) and not interested (NI=0).

Performance. It refers to the accomplishment of an understanding of concepts measured against set known standards as reflected in grades in Physics and NAT science scores of the fourth year students for SY 2013-2014.

NAT Science Score. It refers to the raw scores or the correct answers obtained by the students in the National Achievement Test in Science.

CHAPTER 2

REVIEW OF RELATED LITERATURE

This chapter presents the review of related literature from various researches which were used as bases and guide in the development of this study. The key concepts presented include interest in science, academic performance in science, determinant of science academic performance, interest and academic performance in science, and various science intervention programs and activities.

Science has become the backbone of success in each and every field of life, from discovering cures for diseases to creating innovative technologies. Science helps us understand things which actually led to inventions which made life easier, from cave dwellers to skyscrapers. It has also developed the field of medicine, where during the ancient time, many people died because there were no medicines to cure the disease. Science concepts are everywhere and are very relevant to the development of principles which are the bases for everyone's life and it is an essential tool in achieving one's goal. The 1987 Constitution of the Philippines, Article XIV Section 10, states that Science and Technology are essential for national development and progress such that the State shall give priority to research and development, invention, innovation and their utilization, and training and services to science and technology education. The education sector plays an important role in the attainment of this national goal. Thus, each and every Philippine school is challenged to fully implement a science curriculum that provides understanding of basic concepts and processes in an integrative way (Philippine Constitution, 1987).

The program standard of the 2010 Secondary Science Curriculum (SEC) is for the learner to demonstrate understanding of basic concepts and processes through integrative manner, to solve problems critically, to think innovatively, and make informed decisions to protect the environment, conserve resources and sustain quality life (DepEd, 2010). Basic concepts and processes in science are taught in the four discipline standards namely Integrated Science, Biology, Chemistry and Physics. In Integrated Science, the learner acquires understanding of fundamental concepts and processes in Chemistry, Physics, Space Science, and Ecology. In Biology, the learner acquires understanding of the basic concepts on balance of nature, cell, life energy, and structure and life function of organisms, genetics, evolution and biodiversity. In the same manner, in Chemistry, the learner acquires understanding of the basic concepts in chemical system, chemical reactions and behavior of gases, solutions and colloids. Lastly, in Physics, the learner acquires understanding of the basic concepts in Newtonian mechanism, electromagnetism, electronics, wave motions, acoustics, optics, thermodynamics and nuclear energy. Teaching the four disciplines of science is enhanced by other disciplines for the students to analyze and solve problems, think critically and innovatively, and make informed decisions in order to protect the environment, conserve resources and sustain quality live, as patterned from the program standard of SEC (DepEd, 2010). In the process of acquiring knowledge in each of the four disciplines of science, students 'interest would play a vital role.

Interest in Science

Interest was defined in many ways based on previous studies done. In everyday usage, interest almost always refers to positive feelings and likewise refers to an attraction, a preference or passion (Valsiner, 1992) as cited by Swarat (2008). In a psychological state, interest is

characterized by a high level of attention, intensive effort, and prolonged engagement with an activity and accompanied by feelings of pleasure and a sense of achievement (Hidi, 2000; Renninger, 2000). For instance, if a student is exposed to a certain activity, that individual learns eagerly with a focus on his prerequisite knowledge and emotions (Lee, 2001). Emotional interest leads students to be energized, excited and emotionally engaged in the subject through the material which enhances student's attention, and making it easier to encode information. Furthermore, students who enjoy learning science tend to be emotionally attached and perceive learning as a meaningful activity. This means that the students are more likely to adjust to their learning and to solve problems creatively (Glaser-Zikuda, Mayring & von Rhoeneck 2003 as cited in PISA 2006). Therefore interest is a subjective feeling of value of an individual towards an object, purpose, reward or situation and if one is interested in a thing, he is ready to devote more attention and to strive (Johnson, 1972 as cited by Adodo & Gbore, 2012). In addition, teacher's immediacy stimulates students' emotional encouragement, like verbal and non-verbal behaviors which uses eye contact, movement, facial expressions, and vocal variety.

Other meanings of interest have been given. Krapp (1992) and Prenzel (1988) proposed three general perspectives on interest to help us further understand the diverse body of interest research. The three approaches cover personal interest (an individual disposition), interestingness (an aspect of the context), and interest as a psychological state (situational interest). An individual interest or personal interest has been described as a dispositional trait or characteristic quality of a person that is stable, such as gender, prior knowledge, and experience and relatively stable performances for certain content areas. The second characteristic of the learning situation which is assumed to be capable of arousing the individual interest regardless of

personal preferences is the interestingness of the situation (Krapp, 2002). Thirdly, according to Krapp (1999), psychological state is the actualized interest that takes into account the interaction between individual and situational interest. On the other hand, the psychological state of interest shows students' positive emotion and heightened concentration towards an activity (Hidi & Renninger, 2000).

Hidi and Renninger (2006), define interest as a motivational factor, as a psychological state of engaging or the predisposition to reengage with particular classes or objects, events or ideas over a period of time. Likewise, Schunk, Pintrinch, and Meece (2008) defined interest as people's liking and willful engagement in an activity. Many people say that interest generates effort to increase work performance and so was also found out that interest is an important factor in learning. New Jersey State Department of Education (as cited by Apat Sr., 2006) said that students who are interested in what they are doing , truly understand the lesson, stay involved over a longer period of time and to take advanced lessons voluntarily. According to Krapp (2002), interest is an essential motivational factor for effective learning which also develops individual interest and confidence. More so, students who are exposed to an exciting lecture in a subject maybe stimulated and pay more attention in class than they have ever before, but this may evaporate as soon as the lecture ends. However, if teachers can create and maintain situational interest, the exploration and subsequent "aha" moments will eventually increase their personal deep-seated interest in the subject (Rotgans & Schmidt 2010). Another perspective of viewing interest is explained by the Person-Object Interest (POI) relational concept. It represents a specific relationship between a person and an object (Lewin, 1936). An object of interest can refer to concrete things or topic (Schiefele & Krapp, 1996), a subject matter, or abstract idea.

Prenzel (1988) use the term object engagement which indicates situation-specific interaction between a person and an object. If there is object engagement between the person and the object, there is transaction (Fink, 1998). If the engagement has intention and purpose, it develops an action of interest. Repeated engagements with specific aspects of the object stabilize relationship, creating dispositional readiness and willingness to re-engage contents related to the subject. Interest comes from the interactions of individuals with the activities and contexts they experience (Renninger & Hidi 2002). It is a phenomenon that emerges from an individual's interaction with his environment (Hidi & Renninger 2006) and the relations between the individual and an activity or a set of activities in a given area (Schiefele 2009). In other words, interest refers to the individual's relatively enduring psychological disposition (preference) to re-engage in particular classes of objects, events or ideas overtime and its content (Hidi & Reninger 2006). Thus, if the interaction during an experience is positive, interest is likely to emerge as a response to the situation.

In educational research, interest is linked with a love of learning (Hidi ,Renninger, & Krapp 2004), habitual preference and a characteristic of developing self or personality (Krapp, Renninger, & Hoffman 1988). Moreover, Gardner and Tamir (as cited by Trumper 2006; Lai 2010; and Nyamba & Mwajombe 2012), defined interest as preference to engage in some types of activities over the others. More so, students who experience cognitive interest are pulled toward a subject because they possess a clear structural understanding of the course content (Mazer 2013).

In another view, Bolarin as quoted by Adodo and Gbore (2012) mentioned that "interest in more than a discipline, is the key to educational successes" where a student will learn better in

subjects if they have some degrees of likeness toward the subjects. This likeness specifically in science subjects can be reflected in a study conducted by the Programme for International Student Assessment (PISA).

PISA periodically makes an assessment of the extent to which students have acquired the knowledge and skills needed for full participation in the society, focusing on student competencies in the key subject areas of reading, mathematics and science. In particular, PISA 2006 assessment focused on the science knowledge and skills and the attitudes of the students towards science. In order to measure the students' general interest in science subjects, students were asked set of questions on: their level of interest in human biology, astronomy, chemistry, physics, the biology of plants and geology; their general interest in the ways in which scientists design experiments; and their understanding of what is required for scientific explanations. The results showed that students were found to be interested in learning about science and had fun doing it (63%) and others simply wanted to acquire new learning (67%). While the majority of students (68% on average) reported an interest in human biology, students reported less interest in astronomy, chemistry, physics, the biology of plants and the ways in which scientists design experiments (between 46 and 53% on average). Even smaller proportions of students reported interest in what is required for scientific explanations and in geology (36 and 41% on average, respectively) as reported in OECD (2007).

In the same context, TIMSS 2011 made an international assessment of more than 600,000 4^{th} grade and eight grade students from 63 countries. Zeroing into the findings on linking students' positive attitude toward science and their achievement, TIMMS 2011 used the *Student Like Learning Science Scale* to determine the students' degree of agreement with six statements

like, "I enjoy learning science" and "I learn many interesting things in science". For the grade eight students, among the 16 participating countries who teach science subjects separately, average percentage of students liking Biology is 36%, followed by earth science with 33%, Physics with 26% and Chemistry for 25%.

With focus on Physics subject and student interest, Lavonen, Byman, Meisalo and Uitoo (2005) revealed the findings of their study entitled *Pupil Interest in Physics: A survey in Finland.* The research investigated pupils' interest in learning Physics in terms of content and contexts. The Relevance of Science Education (ROSE) Project questionnaire designed by Schreiner and Sjoberg (2004) was administered to the 3626 (15 years old) ninth grade secondary school pupils in 61 schools in Finland . The most interesting thing, especially for girls, was connected with artifacts and technological processes. The result showed that among the physics lessons, pupils were most interested in the topics related to natural phenomena, astronomical context, and astronomy in general. In a similar study, this time considering the students' interest in science and gender differences, results showed that girls were more interested in content and contexts connected to human biology and health education, whereas boys were more interested in understanding and using electrical and mechanical equipment. Generally, boys and girls were not interested in acquiring skills where they need to think scientifically, which was not as interesting as the context connected to a human being.

In a related study, Havard 1996 (as cited in Osborne 2006) made use of sixth form (year 12) students to look into the attitude to the study of sciences at the advanced level and the factors that influence them in taking those subjects. A purposive sample of 175 competent students was taken from the four schools in Gloucestershire, UK. The findings revealed that the attitudes to

biology are significantly different from attitudes to the physical sciences, and the perception of difficulty influenced student choice. The paper suggests that the problem that lies in Physics is that over 50% of the students did not enjoy Physics at all or they enjoyed it just a little, whereas over 60% enjoyed Biology a lot or quite a lot.

In another study by Samuel & Ogunkola (2011) entitled *Science Teachers' and Students' Perceived Difficult Topics in the Integrated Science Curriculum of Lower Secondary Schools in Barbados,* the perception of students and teachers of secondary schools in Barbados of the difficult topics in the lower secondary school science curriculum, and the relationships of some student-related variables on student perception of difficult topics was determined. Two fourth form students from the eight purposively selected schools were selected as the participants for the study. A questionnaire composed of three parts such as interest scale; study habits and topic difficulty scale were used to gather data. The results showed that Biology is more interesting and easier to study because it mainly involves studying the human body while many of the concepts taught in Physics and Chemistry are abstract and not experienced in everyday life. The findings indicated that most students generally experienced the highest levels of difficulty in Physics and Chemistry particularly on concepts such as: components of air, energy, and physical and chemical changes. On the other hand, Biology areas of healthy lifestyles, light and eye, and sound and the air were found to be comparably easier to understand.

Similarly, the study of Baram-Tsabari, Sethi, Bry and Yarden, (2010) entitled *Identifying Students' Interests in Biology Using a Decade of Self-Generated Questions,* investigated the progress of Kindergarten to graduate students' interest in different biological topics. The MadSci Network, an award-winning independent non-profit organization operating from a server

in Scottsdale, Arizona, USA, which covers all branches of science, receives 90 to 150 questions daily, mostly answered automatically by the site's search engine. From 1995 to 2006, over 146,000 questions were already sent to the network. Among the different branches of science, biology is the most popular field of interest. The result suggests that Biology is the most popular science subject among students and adults. Interest in human biology among adolescents is probably due to the approach of puberty and related interests in one's body. For adults, health issues may be contributory to becoming interested in the same.

In another study done by Mavrikaki, Koumparou, Kyriakoudi, Papacharalampous and Trimandili (2012) entitled *Greek Secondary School Students' View about Biology,* investigated students' views about Biology and the factors that affect them. A questionnaire measuring individual interest and perceived difficulties in Biology was administered to the 368 Greek students. Results showed that the Greek secondary students have neutral overall views about biology, that they are slightly positive about Biology's usefulness in their lives and perceive it as an easy subject rather than interesting. It was revealed that more than a quarter of students (26.4%) find no interest in it, in contrast to 32.8 % who are interested.

Christiduo (2006) in his study entitled *"Greek Students' Science- Related Interests and Experiences: Gender Differences and Correlations"*, aimed to determine the topic of interest of the Greek students and experiences and activities that enhance learning science. This study explored the science-related interest of the 583 ninth grade Greek students approximating 15 years old from the forty randomly selected schools to represent the lower secondary schools. Questionnaires including items on science-related topics that are of interest to students, out-of school and science – related experiences were used to gather data. There were 108 items

referring to different scientific areas such as Astrophysics and Universe, Earth Science, Human Biology, Zoology, Botany, Chemicals, Light, Colours and Radiation, Sounds, Energy and Electricity, and Technology. Items for out - of school include activities that were not strictly related to specific areas such as visiting science centers, science museum, collecting fruits or recording videos. The instrument was scored in four-point Likert scale. The obtained data from each part were subjected to factor-analysis. The results showed that the students are primarily interested in learning about Human Biology, health and fitness. Hence, integration of such topics in teaching Chemistry and Physics can compensate for the lack of interest in Chemistry and Physics. For the most popular out-of-school experiences the Greek students are mainly related to using electronic devices or instruments and computers. It indicates that there is a need for the Greek science curriculum to become more appealing to students, by integrating topics and experiences that are interesting and relevant to them.

In a related study, the Philippines took part in the administration of the Relevance of Science Education (ROSE), an international comparative programmed of research that explores the relevance of school science education from the perspective of the students. The ROSE instrument is a 250-item questionnaire that uses a 4-point scale, either 'Disagree – Agree' or 'Never – Often'. Talisayon, De Guzman and Balbin (2006) in their study entitled Science-*Related Attitude and Interest of Students*, presented the Filipino students profile of interest and experiences related to what they want to learn about, their future jobs, attitude towards science classes, science-related experiences, and as a researcher. The sample is composed of 6,943 Grade 10 students, (age 15) in 148 high schools in 15 regions of the country. Reports showed more than 90% of students indicated positive science –related interests and experiences. It was

also revealed that the most popular topics students wanted to learn about were Biology topics followed by Physics, despite the fact that Physics is perceived as a difficult subject.

Academic Performance in Science

Performance generally refers to how well a student is accomplishing his tasks and studies. Whether a student finds difficulty in doing a task, slow in acquiring the concepts of a lesson or was able to accomplish an assigned task with quality and accuracy, defines performance. For Lee, Chao & Chen (2011) academic performance is the subsequent result of the learning problem of any student at any educational level.

Normally, academic performance is defined in terms of examination performance from standardized tests, be it local, national or international assessments. There are different international testing programs that measure student performance in reading, math and science on a regular basis. Trends in International Mathematics and Science Study (TIMSS) is a major source of internationally comparative information on the mathematics and science achievement of students in the fourth and eighth grades and on related contextual aspects such as mathematics and science curricula and classroom practices across countries. Programme for International Student Assessment (PISA) produced by Organisation for Economic Co-operation and Development (OECD) measure performance in math, science, and reading of 15-year old students. With the international comparisons, education policy makers, teachers and parents can assess educational performance in a wider perspective and allow countries to gauge their progress against the most successful education system in the world and to consider a wider range of policy options as to "what works"(Stewart, 2012).

In the Philippines, the national indicator for academic performance is scores obtained from standardized examinations known as the National Achievement Test (NAT). This standardized examination is designed to gauge the learning outcomes of Filipino students in the five major subjects: Araling Panlipunan (Social Studies), Filipino, Math, English and Science. Generally, DepEd guidelines contained in DepEd Order circular no.266 s. 2011, specifically defines that considering the criteria of Achievement/Mastery Level, a Filipino student must at least obtain a Mean Percentage Score (MPS) of 75% or above to meet the national target. An MPS value of 75%, however, does not mean that the students failed. Verbal interpretations of scores ranging from 15% to 85% would reflect "Very Low Mastery" to "Moving towards Mastery". (See Appendix B).

A student, who has difficulty in understanding concepts or cannot perform the required performance task, may end up with low grades or the student may even fail. Grades are indicators of relative knowledge and skills that is; if a student performance is comparative with the performance of other students. The sole purpose of grades is to accurately communicate to others the level of academic achievement that a student has obtained (Snowman & Beihler, 2003). It is believed that a grade is a primary indicator of such learning and serves as the vital basis for determining the learner's level of acquisition of knowledge. If a student earns high grades, he may have learned a lot; while low grades indicate lesser learning (Habig, 2011). Likewise, grades are used to measure if the program standard was attained by the students. Based on the DepEd Order No. 70, a student who received a grade below 75% indicates no mastery of the science concepts at all, therefore, the student needs to repeat or re-enroll the subject (DepEd, 2003).

Determinants of Academic Performance in Science

The effect of learning preferences, socioeconomic background (Ajayi & Muraina 2011) quality and quantity of school resources, and self-motivation such as students interest (Udegbe, 2009) are vital determinants of school performance. Researches have been conducted on the field of students 'academic performance to identify and analyze some determinants of performance in test scores. Usefulness of these studies lies in the need to start corrective measures that improve the performance of students.

Learning Preferences

Students can acquire knowledge, understanding and skills in different ways based on their own preference and on their own initiatives. There are different learning style preferences that suit the characteristics, strength, and weaknesses of the students. A learner's preference when matched with appropriate teaching styles their performance maybe increased and enhanced.

A famous quote of Confucius (551-479 BC) "I hear and I forget. I see and I remember. I do and I understand" gives the idea that even before, people have recognized the importance of different learning preferences. These quotations demonstrate that each individual has a way of acquiring knowledge. Learning preferences according to Reid 1995 (as cited by Mlambo 2012) is a person's natural, habitual and preferred way of integrating new information. It indicates individual differences where each individual has his learning style that is most effective to them. Students seem to learn better when information is put into words, yet, others seem to learn better when it is presented in the form of pictures (Ormrod 2008). Flemming (2001-2011), described four learning preferences namely: visual learners where students prefer information to be

presented on the whiteboard, flip charts, walls, graphics, pictures; auditory learners where students prefer to sit back and listen and finds it useful to record lectures for later playbacks and reference; read/write learners where students prefer to read the information for themselves and take a lot of notes and lastly; kinesthetic (or tactile) learners where these learners prefer to be actively involved in their learning and thus would benefit from active learning strategies in class as cited in Mlambo (2012) .

Tenedero (2001) in his book, *Breaking the IQ Myth*, stated that the individual learning style preferences should be accommodated through complementary educational, instructional teaching and counseling interventions that will result to increased academic performance and improved attitudes towards learning. This implies that there is a need to identify the personal learning styles of individual students. Learning styles refers to the biological and developmental set of characteristics that makes identical instructional environments, methods and resources effective for more learners and ineffective for others.

Socioeconomic Status

Another factor to consider that affects performance is socioeconomic status. Socioeconomic status is conceptualized as the social standing of an individual or group which is usually measured as a combination of education and occupation, income and place of residence. Socioeconomic status according to Peragine and Serlenga (2007) is measured by the parents' academic and professional qualification and family income. In their study entitled *Higher Education and Equality of Opportunity in Italy* they equated two Italian macro regions which are south and north centers which were grouped in terms of graduates and the income distribution among the graduates. The study looked into how each individual achievement differs according

to the family background, as measured by the level of parental education. The findings show that there is a strong family effect on the performances of the students. The students belonging from higher social economic background performed better than the other students associated with low social economic background. A student belonging a social higher economy has parents who: first, can provide the necessary materials available for the students such as but not limited to computers, books, and alternative activities; second, professional parents can assist their children in doing their assignments and can be a role model to them, especially if their parents are successful in their own fields; and lastly, parents can inculcate in the minds of their children the value of education; that education is wealth that no one can take it away from them.

A supporting study made by Barry (2006), studied on the effect of socioeconomic status on academic achievement examined the different factors that influence test scores. Composite scores of the 10th grade from the educational longitudinal study of 2002 were examined using a four part model which includes student score performance, school, and family and peer factors. The data consisted of 1,221 public, Catholic and other private schools. The sampling technique used a national probability sample of 752 public, private and Catholic schools during the SY 2001-2002. Results show that the socioeconomic status had the greatest impact of test scores in relations to the other variables.

Other studies have repeatedly found out that socioeconomic status affects students learning outcomes (Eamon, 2005; Jeynes, 2002). According to Eamon (2005), low socioeconomic status hinders access to resources leading to additional stress and conflicts at home including academic achievement. In addition, the study found out that family activities which include parents attending school activities, spending quality time with children, family

vacations, doing fun activities, increases test scores. Students who have a low SES earn lower test scores and are more likely to drop out of school because of the limited resources both the home and the school is providing (Eamon 2005).

Likewise, the result of PISA study showed that there is a positive relationship between the economic status of a student's family and academic performance. It can be said that those students with families who are financially in a good conditions are more successful compared to those who are not. The students with more affluent families obtain better grades compared to those with poorer families (OECD, 2003).

Moreover, another international comparative study entitled *Families, Economies, Cultures, and Science Achievement in 41 Countries: Country-, School-, and Student-Level Analyses***,** by Chiu (2007), examined the links between students 'families and science achievement of 107,834 fifteen-year-olds across many countries with the use of countries science tests and questionnaire responses. Findings revealed that there is a strong relationship between family income and science academic achievement, depending on the income distribution in the country. Results further showed that students had higher science scores if they were native born, lived with two parents, lived without grandparents, lived with fewer older siblings , had more educational resources, had more family involvement, lived in wealthier countries, or lived in countries with more equal distributions of household income. Likewise, in wealthier countries, family involvement, blended families, and number of siblings showed stronger links to science scores. Result shows that family constructs were linked to academic achievement in all 41 countries, and the links were stronger in more economically and culturally developed countries.

In addition, Blanden and Gregg (2004) in their study on family income and educational attainment showed that children with poorer backgrounds have inferior educational outcomes than their wealthier peers. It is evident that there is a relationship between family income and educational attainment in UK and these relationships have been strengthening through time. The data gathered found evidence that income have a causal impact on educational outcomes (OECD, 2010).

School Resources

School resources which include human resources and physical resources were found to have a great impact on student performance. Effective human resources require motivational ability and reward system that encourages quality work. Trained teacher will display the necessary pedagogical skills which will promote students' academic performance. Likewise, physical facilities are of great importance. Practical lessons in science were taught theoretically because of the lack of laboratory which compromised the teaching of science concepts which may end up with a negative effect on the students 'performance (Nambuya, 2013).

Irungu and Grace (2011) investigated the determinants of academic performance in Kenya Certificate of Secondary Education Examination (KCSE) in public secondary schools in Kiambu County, Kenya. Using four research questions guides, the study adopted the ex-post-facto research design. Simple stratified random sampling techniques were used to select the sample; 260 teachers, 246 students, 36 principals and the County Director of Education (CDEO) Kiambu County. Data was collected through the use of questionnaires for students and teachers, while interview schedule was used to collect data from the principals and the County Director of Education. The findings revealed that, majority of the teachers (72.8%) did not use apparatus in

the teaching of science subjects while 55.6% of the students felt that their science laboratories were not well equipped. From the study, 55.7% of the schools had no libraries and where they existed, they were poorly equipped. Lecture method was more widely used than any other method of teaching. Again further 63.8% of the sampled students had scored 201-300 marks out of 500 marks at primary school level hence poor academic background. Most teachers lived outside the schools as indicated by 57.3% of the students' respondents, hence remedial teaching during morning and evening was not possible. From the study majority of the students (56.9%) revealed that, the syllabus was never covered before the end of every year.

On human school resource in the person of teachers, Salami and Olotu (2014) sought to examine teachers' awareness and improvisation skills of scientific visual resources as a determinant to pupils learning outcomes in basic science and technology. Ex-post facto type of the causal comparative research design was employed using 55 basic science and technology teachers and 550 pupils. Two instruments were used to collect data for this study; Teachers' Awareness and Improvisation Skills Questionnaire (0.69) and Pupils Achievement Test in Basic Science and Technology (0.7). Data collected were analyzed using mean, standard deviation, percentage and multiple regressions. The result indicated that teachers' awareness on ways of improvisation was average and their improvisation skills were very low. Pupils' achievement in Basic Science and Technology was average. Furthermore, there is no significant joint influence of teachers' awareness and improvisation skills of scientific visual resources on pupils' attitude to and academic achievement on Basic Science and Technology.

Another school resource factor was confirmed by the study of Adesoji and Olatunbosun (2008). The study constructed and tested an eight-variable model for providing a causal

explanation of achievement of secondary school students in chemistry in terms of student variables - attitude to learning chemistry, background knowledge in Integrated Science, teacher variables - attitude to chemistry teaching, attendance at chemistry workshop and school environment related variables-class size, laboratory adequacy and school location. The study adopted an ex-post facto research using the population of 621 senior secondary III chemistry students and 27 Senior Secondary III chemistry teachers in Oyo State, Nigeria. Four sets of instruments were used; these were chemistry Achievement Tests (SACS), Teacher. Attitude Towards Chemistry Teaching Scale (TATCTS) and Laboratory Adequacy Inventory (LAI). The results revealed that 7.20% of the total effect on achievement in chemistry was accounted for by all the seven predictor variables when taken together. It was also revealed that only four variables -school location(X1) laboratory adequacy (X3), teachers' attitude to chemistry teaching(X5) and teachers' attendance at chemistry workshop(X4) had direct causal influence and also made significant contributions to the prediction of achievement in chemistry (X8) (the criterion variable).

Motivational Factors

Other factors for the students to have a better performance are motivational factors such as rewards, praises and external feedbacks, and interest. According to Deci, Vellerand, Pelletier and Ryan (1991), motivation is understood as an individual response to internal as well as external rewards, teachers' praise and positive feedback. Likewise, Lumsden (1994), quoted, a student who is naturally motivated has the desire to participate in a learning process. At the same time, Walter and Hart (2009) defined motivation as an individual's desire, power and tendency to act in a particular way.

Mark Lepper (1988) quoted, "a motivated student who takes an activity for its own sake, for the enjoyment it provides, the learning it permits or the feelings of accomplishment it evokes" are known to intrinsically motivated. Intrinsic motivation is a free-choice, and no reward is being offered. Intrinsic motivation is enhanced by allowing the students to promote their sense of personal autonomy especially if the activity is challenging and relevant to students.

Lepper, Henderlong and Iyengar (2005) worked on the age differences in intrinsic and extrinsic motivation and the relationships of each to academic outcomes. The study examined an ethnically diverse sample of 797 3rd-grade through 8th-grade children. Using independent measures, the authors found intrinsic and extrinsic motivation to be only moderately correlated, suggesting that they may be largely orthogonal dimensions of motivation in school. Consistent with previous research, intrinsic motivation showed a significant linear decrease from 3rd grade through 8th grade and proved positively correlated with children's grades and standardized test scores at all grade levels. On the other hand, extrinsic motivation showed few differences across grade levels and proved negatively correlated with academic outcomes.

Lepper and Henderlong (2000) and Pintrich and Schunk (2002) stated that providing students with choices among activities and between ways of completing the tasks, encouraging the students to explore, pursue their interest, building on their background and prior experiences improved intrinsic motivation. On the other hand, when students are required to engage in a task, they are not motivated to do, but can be encouraged to do the task. This situation demonstrates extrinsic motivation. Educators can encourage them to collaborate, incorporate fantasy in activities and provide feedback that is informative and frequent are extrinsically motivated (Lepper & Henderlong, 2000; Pintrich & Schunk 2002). At the same time, parents

can also be source of external motivations. Parents inculcate in the minds of their children that learning is worthwhile and commonly fun and satisfying by responding their queries, encouraging exploration, and exposing them to the world. Examples of extrinsic motivations are grades, recognition, or even punishment which are found everywhere and frequently used within the society.

The last motivational factor that this review will discuss is the student interest. From the many factors discussed in the previous paragraphs, student interest as a predictor of performance in various subjects is given emphasis in this section. The study of Carmichael and Hay (2008) entitled *Middle School Students' Interest in Statistical Literacy*, presented research reviews on the concept of interest and its motivational influence on learning. There were two phases of review conducted, from searching specific questions and generalizing related contexts. Searching made use of data bases of academic journals and abstracts which include A+Education, Emerald, ERIC, Expanded Academic, JSTOR Education, Proquest, PsycINFO, SAGE, SpringerLink and Wiley Interscience and Google Scholar. In addition, secondary searches such as bibliographies and searches using citation indexes were also conducted in each phase. In the end only fourteen (14) studies were included in the review. The findings show that very little research has examined the positive affect such as interest on learning in the middle- school statistics context. Findings also revealed that interest development will be the result of complex interaction of classroom influences and individual factors namely: knowledge of statistics, enjoyment of statistics and their perceptions of competency in relation to learning of statistics.

Kpolovie, Joe and Okoto (2014), with their study entitled *Academic Achievement Prediction: Role of Interest in Learning and Attitude towards School* made use of multiple

prediction design , to determine the degree of relationship and prediction that the interest of the students in learning and attitude to school individually and collectively have on their academic achievement. Stratified sampling was used to draw 518 which is far above the recommended sample size of 370 samples with the aid of random numbers from 14459 who enrolled from 2012/2013 Senior Students Certificate Examination (SSCE) in Bayelsa State. The instrument used in data collection was the Interest and attitude to School Scale and was administered towards the expirations of the registration period for the 2013 May/June SSCE. The academic achievement data were collected from the results of 2013 May/June SSCE by the West African Examination Council (WAEC) in the four subjects namely Mathematics, English Language, Biology and Economics and subjected to multiple regression statistical technique for data analysis. The findings of this study showed that students' interest in learning and their academic achievement are significantly correlated positively. It was also revealed that students 'interest in learning significantly predicts their academic achievement.

With Mathematics as the subject of interest, Heinze, Reiss, and Ausburg (2005) focused on students' mathematics achievement and their interest in math, and the relationship between the two. The sample consisted of 500 German students from Grade 7 and 8. Achievement test was administered to Grade 7 and in the middle of Grade 8 to measure the basic competencies in Geometry and another test after the students participated in a regular teaching unit on reasoning and congruence geometry. Result shows that even high achieving students encountered problems with generating proof ideas and chain of argument. Low achieving students showed additional deficits with respect to mathematical facts and proving. They were having a hard time mastering argumentation tasks that require multi-step solutions. After the second test was administered, the

Grade 8 students answered questionnaires consisted of 48 items on the development of interest and motivation in mathematics and evaluated topics like interest, motivation, pleasure, fear, boredom and self-regulation on a five-Likert scale. Results show that students have no fear in mathematics classroom, show an acceptable self-motivation, not bored in mathematics lessons and have little interest in mathematics. Summarily, the study found out that interest is regarded as a predictor of mathematics achievement.

Interest and Academic Performance in Science

Regardless of the objective of the activity, a student is interested in classroom subject matter and seeks out more challenging activities, participates actively in class discussions, and earns high marks on assigned projects, will get high grades. According to the U.S. Department of Education 2010 (as cited by Hayden, Ouyang, Scinski, Olszewski, & Bielefeldt 2011), the more interested students are in a subject, the more involved they become in their assignments, putting effort into their studies and engaging in deeper levels of thinking. If student gets interested with a subject it is likely that their performance could be good and the reverse is true (Nyamba & Mwajombe, 2012). Likewise, Adeyamo (2005) stated that the importance of interest in whatever a person does cannot be underestimated when it comes to making choice; this is because interest is of considerable importance and very crucial in predicting students' performance. In addition, Krapp (2002), as cited by Apat Sr. (2006), said that being interested is an essential motivational factor for effective learning which develops individual's personality and confidence.

Various researchers have indicated positive relationship between student interest and learning outcomes in science. In a study conducted by Agogo, Odoh and Simon (2014), interest

and sustenance as correlates of students' performance in Senior Secondary chemistry in Ogbadibo Local Government Area of Benue State, Nigeria was investigated. Descriptive survey design was employed with five research questions and two hypotheses. The sample of 242 chemistry students' S.S II was used. The instrument was the Interest and Sustenance in Chemistry Questionnaires (ISCQ), divided into sections A and B. Mean and standard deviation were used to answer the research questions while the hypotheses were analyzed using Pearson Product Moment Correlation Coefficient before conversion to t-test for test of significance. From the analysis, it was found that there is a significant relationship between interest in chemistry and the students' performance in the subject. It was recommended that chemistry teachers should use all available instructional materials to arouse students' interest and sustain it so as to enhance performance.

Considering Biology subject this time, Trumper (2006) conducted a study. As part of the ROSE Project, on students' interest in biology at the end of their compulsory schooling in Israel, and its relation to their views on science classes, out-of-school experiences in biology, and attitudes to science and technology, results showed that their overall interest in learning biology was relatively positive but not high. It was also mentioned that girls showed greater interest in it than boys.

As far as Physics is concerned, student interest has likewise been considered in many researches. For one, Harlow, Harrison, and Meyertholen have studied the correlation of student performance in a large 1st year university physics course in consideration with the reasons for taking the course and whether or not the student took a senior-level high-school physics course. Performance was measured both by the Force Concept Inventory and by the grade on the Final

Examination. Students who took the course primarily for their own interest outperformed students who took the course primarily because it was required, both on the Force Concept Inventory and on the Final Examination.

On a more global context, Yang (2008) studied students from seven countries and found out that those who have both confidence and interest in learning science performed better in science than those with mid-and-low interest. In the PISA 2006 report, results suggest that of the 52 participating countries, students with higher general interest in science performed better in the science assessment. The strongest association between the students' general interest in science and their performance was observed in France, Japan, Korea, Switzerland, and Finland. It was also conveyed that enjoyment in learning science as reported by the students is positively associated with student performance in the United Kingdom, Australia and New Zealand and they had an above-average mean performance (OECD, 2009). These results confirm the various studies and researches enumerated above only in a much wider scale.

Development of Science Intervention Program

Knowing the factors that contribute to the academic performance of the students, particularly the low performing one may lead to implementation of corrective measures that improve the performance of the students in Physics. A study by Hulleman and Harackiewicz (2009), tested on the activities in the classroom that inspire students to connect course materials to their lives to motivate them to learn. Field experiments with high school students showed that relevance intervention increased interest in science and course grades for those with low expectations. The intervention is specifically designed to enhance the relevance of science to students and classroom performance, specifically for those who are disengaged in school.

Science courses with personal relevance and meaning may engage students in the learning process which may allow them to develop interest and promote science career path. Students were randomly assigned within classroom to write an essay about the usefulness and utility of science in their lives and another write about the materials they are studying which is done in the first semester.

As a result of the findings of the study made by Kpolovie, Joe and Okoto (2014), which showed that students' interest in learning and their academic achievement are significantly correlated positively, one of the recommendations is to device modern methods of teaching to arouse students 'interest in learning each of the various subjects. Another recommendation was suggested borne out of the study done by Hidi, (2001). Because of the probable effect of comprehension and learning vis a vis readers 'interest , the process of attention, motivation and reading which may facilitate the effect of interest on learning, the study stressed the importance of utilizing the students 'interest in the classroom for potential improvement of reading, learning and academic performance. Wade (2007) on the other hand, reviewed works done on text-based interest that can create interest for the majority of readers. Findings on the review led Wade to recommended exceptional strategies for creating interest in text for learning practice.

Another consideration in coming up with interventions to improve science performance was suggested as an offshoot of the results of the studies done by Hulleman and Harackiewicz (2009); Swarat (2008) and Perkins, Gratny, Adams, Finkelstein & Wieman (2005). All three studies conducted recommends for coming up with a relevant intervention, which encouraged students to make connections between their lives and what they were learning in their science courses.

On a larger scale, system policies and programs are implemented to further student performance in science. In Uganda, for example, a deliberate program to popularize science in school at all levels of education was recommended to be developed. It had to include the use of print and electronic media to promote science and the creation of science centers where students can revisit and relate science to life. In addition, reviving of science fairs in school and making it student-based instead of teacher-based was recommended to possibly raise student interest in science (UNCST, 2012).

From the recommendations cited above, this study considered appropriate insights in the development of the proposed intervention program. As defined by the California Evidence-Based Clearing House for Child Welfare (CEBC 2015), relevant intervention programs are those that have direct potential to impact success from the early childhood years, programs that highlights school readiness and development, as well as those that address any social, emotional or learning barriers to achievement during the K-12 years.

In the development of an intervention program, considerations like target population, activities that fit, persons responsible to implement the program, expected outcomes, financial considerations, time frame and program assessment must be included and thoroughly identified to ensure successful implementation.

Synthesis

Science plays an essential role in nation building and the education sector has to implement a program to attain the national goal. The learners need to be equipped with fundamental knowledge and skills in the field of science and this is a big challenge on the part of the school system. There are many factors that contribute to the acquisition of knowledge and

skills, one of which is the interest of the students. Interest has been defined in different ways. From the psychological point of view, it deals with the preference and the engagement into a certain activity. Emotionally, interest refers to one's enjoyment in an activity, how a person deals with situations, be it positive or negative. Interest as a motivational construct refers to the willful engagement in a certain activity. Interest plays an important role in the field of education, since interest refers to the liking or love for learning. A student may be interested in Biology, Chemistry, Integrated Science or Physics differently. The studies of Samuel, Ogunkola (2011), Havard (1996), and the result of TIMSS 2011 show that Biology is the most interesting subject among the four disciplines of science. On the contrary, many studies also confirmed that Physics along with Chemistry is the least interesting. The performance of Filipino students in science is low as reflected in the TIMSS and NAT Science scores which were confirmed by the low Physics grades of ICPS students. Considering the low performance, several determinants such as learning styles, socioeconomic status, school resources and motivational factors were discussed. Results showed that these factors have a positive effect on performance. Previous studies show that interest has a positive relationship with performance, that when a student is interested in the subject, most likely the student will have a good performance (Abrantes, (2007), Nyamba & Majombe, 2012, Hayden, et.al. 2011, Adeyamo, 2005 & Trumper, 2006). Given the fact that interest has a positive effect on the performance of the students, therefore this particular study is proposing an intervention program to enhance the interest of the students that later on improve their academic performance.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter presents the methodologies that were used in the conduct of this study and includes the discussion of research design, sampling, respondents, data gathering instruments and the statistical analysis.

Research Design

This study employed the descriptive causal-comparative method of research also known as ex post facto. Causal - comparative research describes conditions that already exist (Gay, 1976). It is a form of investigation in which the researcher has no direct control over independent variable as its expression has already occurred or because they are essentially non-manipulable (Kerlinger, 1973). According to Gay (1976), it is a research in which the researcher attempts to determine the cause, or reason, for existing differences in the behavior or status of groups of individuals.

In employing the causal–comparative research, the researcher started with the analysis of the dependent variables, (grades in Physics and NAT science scores). Then the independent variable (Individual Interest), was also studied in retrospect for their possible relationship to, and effects on, the dependent variable.

Locale of the Study

This study was conducted at the Immaculate Conception Parochial School (ICPS), a private non-profit Catholic educational institution situated in Concepcion, Malabon City, offering basic education, from Kindergarten to high school. ICPS is a diocesan school run by a

diocesan priest and is governed by the Diocese of Caloocan under the umbrella of the Manila Ecclesiastical Province School Systems Association (MAPSA). The school was granted recognition for the preschool in 1973, grade school in 1975 and high school department in 1990.

Respondents of the Study

Purposive sampling was utilized in selecting the respondents of the study. The researchers handpick the cases to be included in the sample on the basis of their judgment of their typicality or possession of the particular characteristics being sought (Cohen, Manion & Morrison, 2007). From the name itself, purposive sampling is building up samples that are agreeable to their specific needs or they have been chosen for a specific purpose. The 114 fourth year students comprising 65 males and 49 female were the respondents of the study. The population includes all the 4^{th} year High school students in school year 2013-2014, who have completed the course and who were present during the administration of the NAT and the SIIS survey.

Instrumentation

The following instruments were used to facilitate data gathering for the study.

A. Grades in Physics

The researcher considered the final grades in Physics of the fourth year students in SY 2013-2014 to evaluate and interpret science academic performance. The grades are reflected numerically in the report cards of the students. Based on the Department of Education criterion, the numerical grades were presented with a letter equivalent (DepEd Order No. 31, s. 2012). The lowest possible grade that may appear in the report card of the students is 70% and the highest possible grade is 100%. The passing mark is 75% which means a grade below 75% is a

failing mark. A student who fails needed to re-enroll the subject of deficiency. Table 1 shows the interpretation of grades with its letter equivalent.

Table 1
Table of Interpretation of Physics Grades

Grade Range	Proficiency Level	
90% & above	Advanced	(A)
85% - 89%	Proficient	(P)
80% - 84%	Approaching Proficiency	(AP)
75% - 79%	Developing	(D)
74% & below	Beginning	(B)

The level of proficiency at which the student is performing is based on the numerical grades acquired after summing up the results of students performance. A student at the Advanced level exceeds the core requirements in terms of knowledge, skill and understandings, and can transfer automatically and flexibly through authentic performance. To be in the Proficient level, a student must have developed the fundamental knowledge and skills and core understandings, and can transfer them independently, through authentic performance. For Approaching Proficiency Level, a student has developed the fundamental knowledge and skills and core understandings, and with little guidance from the teacher and with some assistance from peers. A student who possesses the minimum knowledge and skills and core understandings, but needs help throughout the performance authentic tasks is in the Developing Level. Lastly, at the Beginning Level, the student struggles with his understanding prerequisite and fundamental knowledge and skills have not been acquired or developed adequately to aid understanding.

B. NAT Science Scores

The National Achievement Test (NAT) is a Philippine made standard test designed to determine pupils/students' achievement level, strengths, and weaknesses in the five curricular subjects, namely: Aralin Panlipunan, Mathematics, Science, English and Filipino, at the end of the school year. It was developed to measure what the 4th year know and can do in these subject areas. The NAT was taken by the fourth year students in March 2014, which serves as exit assessment of the secondary level of basic education (pursuant to DepED Order No.5, s.2005). The NAT scores are released only by the NETRC upon the request of the school for research purposes. Table 2 shows the range per scale of the scores in the 60-item test in science, with descriptive interpretations and Mean Percentage Score equivalent (MPS).

Table 2
Table of Interpretation of NAT Science Scores

Range	Remark	Mean Percentage Score
57.50-60.00	Mastered	96%-100%
51.50-57.49	Closely Approximating Mastery	86%-95%
39.50-51.49	Moving Towards Mastery	66%-85%
20.50-39.49	Average	35%-65%
8.50-20.49	Low Average	16%-345
3.50-8.49	Very Low Average	5%-15%

For the purpose of this study, the NAT science raw scores considered was based on the NAT taken last March 2014 and released December 2014 reflecting student performance for School Year 2013-2014.

C. *Science Interest Inventory Survey (SIIS)*

The interest level of the students in the four disciplines of science namely Integrated Science (I), Biology (B), Chemistry (C) and Physics (P) was measured and interpreted through the researcher –made instrument named Science Interest Inventory Survey (SIIS). The interest level of the students in the four disciplines of science was measured through their responses in the given rating scale. The SIIS is made up of forty item interest inventory with a forced-choice scale. In a forced-choice format, respondents are not given specific option to reflect a "nonresponse" type choice, such as "no opinion", "don't know", "not sure", or "not applicable". Students must choose a specific answer to the survey item. The elimination of the ''nonresponse'' choices in the forced choice format encourages respondents to provide an actual response, thus increases the number of survey records with responses that are usable for analysis (Lavrakas, 2008). The SIIS made use of the following responses: Highly interspersed (HI), Moderately Interested (MI), Somewhat Interested (SI) and Not Interested (NI). Table 3 shows the interpretation per range scale.

Table 3
Interpretation of Interest Level

Range	Interpretation/Remarks
2.28-3.00	Highly Interested
1.52-2.27	Moderately Interested
0.76-1.52	Somewhat Interested
0-0.75	Not Interested

A highly interested student is having full attention, involvement and enjoyment in a particular discipline. A student is having full attention when he is concentrating on what is being said, rather than just passively hearing the message. With the high attention displayed by the

student, there will be high engagement level to activities and the students find satisfaction in the activity. For moderately interested student, he is having more attention, participation and enjoyment. The student may lose focus for a while because of some distracters around but can easily regain attention. Somewhat interested are those who are having little attention, participation and enjoyment. This group of students is easily distracted and loses their focus often. Not interested are those who have no attention, participation and enjoyment. This group of students is those who don't care at all.

The preparation of the SIIS has three phases which involved the development of questionnaire, validation of instrument, and pilot testing. The first phase involved the review of related literature to determine the appropriate instrument to be used in measuring the interest levels of the students in the four disciplines of science. The researcher came across the instrument, Science Interest Inventory by Wheeling Jesuit University/ Challenger Learning Center (1998-2005) and used it as a reference. This is a printable interest inventory survey where a student can explore his interest by answering the survey or the student can answer it on line. The SIIS was developed to measure the interest level of the students in Integrated Science, Biology, Chemistry and Physics.

In the formulation of questions, general questions on the topics, activities, skills and even feelings of a student toward any of the four disciplines were considered. The revisiting of the curriculum, competencies given in the NAT, and the common mindsets of students were reflected in the formulation of questions. The first 10 items (1-10) are items on Integrated Science, 11-20 on Biology, 21-30 on Chemistry and 31-40 on Physics. The prepared instrument

was presented to the ICPS science teachers for comments and suggestions. The same was also presented to the thesis advisers for corrections, and revisions.

The instrument was externally validated by experts from different fields of discipline and professions. To ensure that the instrument was valid, high school faculty, science professors, guidance counselors and psychologists were consulted for content, language and the format with the use of the evaluation instrument developed by the researcher (See Appendix C). Table 4 presents the profile of the validators.

Table 4
Profile of Validators

Validator	Description	Degree
1	Psychology Professor	EdD in Admin and Supervision
2	Physics Professor	MA in Physics Ed
3	Biology Professor	With MA Units
4	Chemistry Professor	With MA Units
5	Guidance Counselor	EdD in Higher Education

The researcher made sure that the validators are all practicing educators so that they will have current experiences in the field. The validators are from a public school in Metro Manila. In interpreting the scores given by the validators, the researcher made use of the Table of Interpretation of Percent agreement as shown in Table 5.

Table 5
Interpretation of Percent Agreement

Range	Interpretation/Remark
100.0	Perfect Agreement
90.0 ‹ p‹ 100.0	Very high agreement
80.0 ‹ p ≤ 90.0	High agreement
60.0 ‹ p≤ 8.0	Marked substantial agreement
40.0 ‹ p ≤ 60.0	Moderate agreement
20.0 ‹ p ≤ 40.0	Low agreement
0.0 ‹ p ≤ 20.0	Negligible agreement
0.00	No agreement

Table 6 presents the experts validation results considering acceptability and agreement of the SIIS instrument.

Table 6
Experts' Validation of SIIS Instrument

Area	Acceptability			Agreement[a]	
	Mean	SD	Remark	Percent[b]	Remark
I. Content	2.20	0.792	Satisfying	72.0	Marked Substantial
II. Language	2.48	0.816	Satisfying	74.7	Marked Substantial
III. Format	2.92	0.410	Good	92.0	Very High
All Areas	2.53	0.741	Good	80.4	High

a. consistency
b. using linear weights

Both the Content and the Language validity of the instrument were found to have satisfying acceptability and were marked substantial in terms of agreement. Format validity obtained the highest score on agreement. This result gave the researcher the impression that as a whole the SIIS instrument was good and is fit for use to gather data for this study. The minor corrections suggested by the expert validators were considered for the further revision of the

instrument. In as far the computed mean value of 2.79 and a standard deviation of 0.504 are considered, an overall verbal remark of "Clear items" was given to the SIIS instrument.

For the internal validity of the instrument, the Cronbach Alpha reliability was used. Table 7 shows the interpretation of Cronbach Alpha Coefficients

Table 7
Interpretation of Cronbach Alpha Coefficient

Range	Remark
alpha > 0.900	Excellent
0.700 < alpha ≤ 0.900	Good
0.600 < alpha ≤ 0.700	Acceptable
0.500 < alpha ≤ 0.600	Poor
alpha ≤ 0.500	Unacceptable

Cronbach Alpha Reliability Test is a widely accepted measurement of internal consistency. Reliability is the degree of consistency and precision or accuracy that a measuring instrument demonstrates (Gay, 1976).

The reliability is established using a pilot test by collecting a much smaller number of subjects who are not included in the sample. The purpose of the pilot testing is to see how the respondents react with the questionnaire, if the items are clear enough and easy to understand, if there's a need to add more items in a certain area, or, if there are some items which are not popular that they would not like to respond to.

The fourth year high school students of La Naval Academy, Navotas City (n=20) served as the tryout group for the Science Interest Inventory Survey (SIIS) instrument. The group of students who performed the pilot testing has the same characteristics as that of the respondents of the study. A letter of request for the administration of the instrument was presented to the

Principal and was approved. The data collected from the pilot test was considered, analyzed and used by the researcher to determine whether or not the instrument will be able to measure what it intends to measure. Table 8 shows the internal consistency test results using Cronbach Alpha Coefficient Reliability Test.

Table 8
Results of the Cronbach Alpha Coefficient Reliability Test.

Domain	Clarity			Internal Consistency	
	Mean	SD	Remark	Alpha	Remark
Integrated Science	2.78	0.471	Clear	0.694	Acceptable
Biology	2.84	0.452	Clear	0.874	Good
Chemistry	2.78	0.531	Clear	0.850	Good
Physics	2.78	0.552	Clear	0.830	Good
All Domains	2.79	0.504	Clear	0.917	High

The results imply that the items included in SIIS instrument were clear and showed high consistency as an instrument to assess students' interest (See Appendix D).

Data Gathering and Procedure

Prior to the conduct of both the pilot and the actual survey, the necessary permits (See Appendix A.1 to A.3) were secured from the Principal and the School Director of Immaculate Conception Parochial School (ICPS), Malabon City and the Principal of La Naval Academy, Navotas City. For the actual survey, the researcher personally administered the SIIS instrument. The objective of the survey and the mechanics on how to accomplish it were discussed with the students. It was also reiterated that their identity will be kept confidential. It took the students

five to seven minutes to answer. The data were collated carefully and were subjected to statistical analysis.

Statistical Analysis of Data

In this study, the following statistical tools were used to analyze and interpret the gathered data.

1. Frequency distribution was used to identify the number of respondents that belong to particular level of proficiency, the mean percentage score and the level of interest in science;
2. Percentage frequency distribution was used to express the relative frequency of grades, NAT scores and interest level in science;
3. Mean was used to interpret the experts' assessments of the research instrument (SIIS), and the students' scores in the test. Mean was also used to describe the level of interest of students, science grades and the NAT scores (science);
4. Standard deviation was used to find out if the averages of two or more sets of data are truly different.
5. Pearson Product-Moment Correlation (Pearson r) was used to measure the association of the interest level in science and the science academic performance of the students. Table 9 shows the basis for the interpretation of the Pearson r.

Table 9
Table of Interpretation of Pearson r

Range	Interpretation
$\|r\| = 1.000$	Perfect positive/negative rectilinear correlation
$0.900 < \|r\| < 1.000$	very high positive/negative rectilinear correlation
$0.800 < \|r\| \leq 0.900$	high positive/negative rectilinear correlation
$0.600 < \|r\| \leq 0.800$	marked substantial positive/negative rectilinear correlation
$0.400 < \|r\| \leq 0.600$	moderate positive/negative rectilinear correlation
$0.200 < \|r\| \leq 0.400$	low positive/negative rectilinear correlation
$0.000 < \|r\| \leq 0.200$	negligible positive/negative rectilinear correlation
$r = 0.000$	no rectilinear correlation

6. One way ANOVA (Analysis of Variance) is a statistical technique used to test if three or more means are equal. Specifically, it was used to find out if there are significant differences in the Physics grades and NAT Science scores of the students when categorized according to their level of interest in science. Table10 shows the interpretation of p-level values in an ANOVA test.

Table 10
Interpretation of p-level

Range	Remark
$p \geq 0.050$	not significant
$0.010 \leq p < 0.050$	Significant
$0.001 \leq p < 0.010$	highly significant
$p < 0.001$	extremely significant

CHAPTER 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter contains the presentation, analysis and interpretation of the data gathered, which are the student's science performance, science interest level and the relationship between the interest level in science of ICPS students and its relationship to their science performance. The problems cited in Chapter 1 are hereby presented with corresponding responses.

In order to determine the relationship between interest level in science and science performance, the following responses were evaluated and interpreted. In addition, the interest level in science of the students was investigated in determining its contribution to the performance of the students.

Research Question # 1: What is the performance of the students in terms of grades in Physics and NAT Science Scores?

a. Grades in Physics

Science performances of the students were represented by the grades obtained from the completion of their Physics class, which covered first to fourth quarters. Table 11 shows the percentage and frequency distributions of the mean average performance of the students as categorized by proficiency levels.

Table 11
Mean Averaged Performance of ICPS 4th Year Students

Level	f	%	X_L	X_H	Mean	SD
Advanced	15	13.2	89.61	93.66	91.59	1.299
Proficient	20	17.5	84.54	89.32	89.92	1.590
Approaching Proficiency	29	25.4	79.62	84.39	81.63	1.431
Developing	50	43.8	75.09	79.46	76.90	1.379
All levels	114	100.0	75.09	93.66	81.80	5.472

The above result in Table 11 is quite alarming because even if the two higher levels of proficiency (A- 13.2% + P-17.5%) are added, the result is 30.7 percent which is very low compared to the 43.8 percent developing level. In the developing level, the students have acquired the minimum knowledge, skills and core understandings but need help throughout the performance of authentic tasks (DepEd Order no. 31, s. 2012). Therefore, it is implied that teachers have the responsibility to choose the method of instruction and teaching strategies appropriate to the needs of the students entrusted to his care. The results clearly show that more than half of the students did not perform well in Physics subject (43.8% + 25.4%) which suggests dire need for teachers' guidance.

The highest grade obtained by a student as seen in Table 11 is 93.66 and the lowest grade is 75.09. In general, the mean average performance of the fourth year students is 81.80, which verbally means approaching proficiency (AP). In the approaching proficiency level, students have developed the fundamental knowledge, skills and core understanding and can transfer understanding through authentic performance tasks with little guidance from the teachers or assistance from peers (DepEd Order : No.31 s. 2012). Based on the 75% passing mandated

passing rate of the DepEd, AP performance is a better level. However, a mean average of 82 reflects that the science performance of the 4th year level students as a whole is not competitive. As Habig (2011) mentioned, if a student earns high grades, he may have learned a lot, while a low grade indicates a lesser learning, but nevertheless, the fundamentals were acquired. It is therefore worth noting that in this particular level of proficiency, teachers as facilitators of learning play a big role in improving the present performance of their students.

The obtained mean average performance was referred by the researcher to the science teachers, science moderator and the academic coordinator. The reasons for the relatively low grades were discussed by the science coordinator and the academic coordinator with the researcher. According to them, the students are having a hard time comprehending classroom discussions, as well as expressing themselves because of the following causes; Physics is more of computation, formulae, and deals with abstract concepts. In addition, the teacher's teaching strategy, commitment and competence should likewise be considered. The teacher assigned to teach Physics is not a major of the discipline. As the saying goes, "You cannot teach what you do not have". Furthermore, discussion with the concerned teachers and coordinator said that the lessons' importance and relevance were not integrated in the everyday life of the students. This is supported by Samuel and Ogunkola (2011) who said that many of the concepts in Physics are abstract and not experienced in everyday life. If this is the scenario, there is a possibility that lesser learning will be acquired by the students. The lack of preparation and the poor quality of teaching personnel may also be contributing factors to consider. These revelations somehow explain the reflected poor performance of the ICPS students.

b. **NAT Science Scores**

Pursuant to DepEd Order No. 5, s. 2005, NAT serves as an exit assessment from the secondary level of basic education. The performance of the students is compared with the national populace whose rating is expressed in mean percentage score (MPS) or percent of correct responses (PCR). This is an indicator or measures of the school's accomplishment in terms of quality, students' aptitude and mastery in the basic academic learning areas.

In March 2014, near the end of the school year, all Filipino fourth year students took this national assessment, which includes ICPS. Table 12 shows the NAT result of ICPS 4^{th} year students.

Table 12
ICPS NAT Science Results for 2013-2014

Level	f	%	X_L	X_H	Mean	SD
Moving Towards Mastery	1	0.9	40.00	40.00	40.00	0.000
Average	52	45.6	21.00	39.00	26.54	4.697
Low Average	61	53.5	9.00	20.00	16.41	2.895
All levels	114	100.0	9.00	40.00	21.24	6.560

Table 12 results show that most of the students or 61 examinees got the lowest mean score of 16.41 which is equivalent to an MPS level interpreted as low. Only one student or 0.9 % is moving towards mastery level. However, the average mean score of 21.24 implies that the students in general falls within an MPS range of 35%-65% and therefore belong to the average level of performance. MPS below 75% means that the examinee's test performance does not belong to the upper 75% of the total number of students who took the test. The standard criterion

set by the DepEd in terms of achievement level is 75% which is the national target. Therefore, the performance of the ICPS students is below the national standards.

A similar dismal result was experienced by the Division of Malabon (to which ICPS belongs) as reflected in the NAT results of 2012 (Malabon Division Memo, 2013). The Division provided intervention programs, one of which is the parallel test environment or the so called-mock test, incentive program, tutorial and remediation intended for the public schools. Being a private school, ICPS was not a recipient of the mentioned intervention program except, the Mock-test. The Mock test is an examination taken as practice before the actual administration of the official test. NAT or any kind of examination is a pressured situation and providing an experience on the same test would make it easier for the students to take on the actual examination. These intervention programs initiated by the Division are but limited to the public schools.

The result of the divisions' initiative was positive as revealed by the NAT 2014 results. Among the 16 divisions in the NCR, the Division of Malabn belonged to the top three performing school. Specifically, in science subject, the division ranked 4 with MPS of 45.81, though still far beyond the national target of 75%. (Division Memo 0390 s. 2014). Unfortunately, as an individual school, ICPS was not part of this recognition because of the obtained MPS of 35.4% based on the PCR of 21.24.

Since ICPS is a private institution, the school management employed its own intervention programs which include review days which are scheduled every Saturday of January and February given by the 4^{th} year teachers. There are five subjects covered in the NAT (Math, Science English, and Filipino & APAN) and each subject was allotted an hour for review.

Despite the given review days, the NAT scores were still low. These realizations imply that ICPS on its own must double its efforts in coming up with better intervention programs that will address student performance issues.

Research Question# 2: What is the student's level of interest in the four disciplines of science, namely: Integrated Science, Biology, Chemistry and Physics?

The interest level of the students in science was evaluated through the researcher- made instrument- Science Interest Inventory Survey (SIIS). The questionnaire was administered last March 2014. Table 13 exhibits the students' level of interest per discipline.

Table 13
Interest Level of Students by Discipline

Discipline	Level	f	%	X_L	X_H	Mean	SD	Remark[a]
Integrated Science	All levels	114	100.0	0.40	2.80	1.90	0.479	Moderately Interested
	HI	16	14.0	2.50	2.80	2.64	0.126	
	MI	77	67.5	1.50	2.40	1.93	0.269	
	SI	20	17.5	0.80	1.40	1.25	0.176	
Biology	All levels	114	100.0	0.10	3.00	1.80	0.525	Moderately Interested
	HI	11	9.6	2.50	3.00	2.72	0.183	
	MI	77	67.5	1.50	2.40	1.90	0.283	
	SI	25	21.9	0.60	1.40	1.15	0.244	
	NI	1	0.9	0.10	0.10	0.10	0.000	
Chemistry	All levels	114	100.0	0.00	2.70	1.48	0.657	Somewhat Interested
	MI	53	46.5	1.50	2.40	1.95	0.285	
	SI	45	39.5	0.50	1.40	1.10	0.271	
	NI	11	9.6	0.00	0.40	0.24	0.152	

Physics	All levels	114	100.0	0.00	3.00	1.53	0.678	Somewhat Interested
	HI	10	8.8	2.60	3.00	2.74	0.135	
	MI	50	43.9	1.50	2.40	1.91	0.274	
	SI	47	41.2	0.60	1.40	1.06	0.264	
	NI	7	6.1	0.00	0.40	0.20	0.163	

Legend: **HI**-Highly Interested **MI**-Moderately Interested **SI**-Somewhat Interested **NI**-Not Interested

Table 13 discloses that majority of the students were moderately interested in Integrated Science while the smallest percentage of them were not interested. This proves that the most of the students are having more attention, participation and enjoyment in the field of Integrated Science (See Appendix D for verbal interpretation of MI). Particularly on the topics; inventions and discoveries in science, joining field trips, environmental problems and laboratory activities (See Appendix E). Similar results were observed in countries that are teaching General or Integrated Science. It was revealed in the study that thirty five percent (35%) of international students on the average, like learning science and about twenty one percent (21 %) do not like learning science which was partly contributed by the high level of difficulty of the science being studied (Martin, Mullis, Foy & Stanco, 2012).

In Biology, results show that more than half or 67.5 percent of the students are moderately interested while the smallest percentage or 0.9 percent are not interested in this subject. The mean (1.8) shows that as a whole, the fourth year students are moderately interested. Referring to the verbal interpretation of MI (See Appendix E), on the context of interest in the Integrated Science, it can be viewed that most of the students are having more attention, participation and enjoyment. Tally sheet on topics of interest per indicator

(Appendix E) revealed that topics of interest among the students in Biology include animals and other forms of life, how the human body works, how traits are transferred, evolution, growth and development, plants and their uses and simulation activities (computer games). However, they are not interested in the concept of mutation.

The above result is in agreement with the PISA 2006 report where Biology was found to be the most popular to the students reflecting a 68% interest in Human Biology (OECD, 2009). This is also true with the 2011 TIMSS report. Across countries teaching separate sciences, the average percentage of students liking Biology got the highest percentage (36%). The studies of Baram-Tsabari, Sethi, Bry & Yarden, (2010), and Samuel & Ogunkola, (2011) showed the same trends.

In Chemistry, Table 13 shows that as a whole the students are somewhat interested in Chemistry. It is implied that the students are having little attention, participation and enjoyment. (See Appendix D). The result is found to be similar with the with the PISA 2006 report (OECD 2009) as well as the studies of Samuel, et.al. (2011) and Martin, Mullis, Foy & Stanco (2012) . Accordingly, students are less interested in Chemistry because concepts taught are abstract. This low interest can be attributed to the lack of appeal and relevance of the subject for students (Christoduo, 2006). The SIIS results (See Appendix E) revealed that the topics in Chemistry where students are interested in are those that affect life, experiments, chemicals /radiation and its effect on human life and discoveries. But among the topics of least interest among the ICPS students are physical and chemical changes which are in agreement with the findings of Samuel et.al (2011). This is an indication that students become interested in Chemistry topics if they

involve concrete, observable and directly manipulated activities through experimentation, investigation and not abstract topics as Osborne & Collins (2003) put.

Table 13 also reveals that the students are somewhat interested in Physics. This result is similar to that of Chemistry when interpreted. This implies that Chemistry and Physics are the least appealing subjects among the students as compared to Integrated Science and Biology. Likewise, PISA 2006 revealed that the least popular and most difficult subject is Physics (OECD, 2009). The same was also observed in the 2011 TIMSS result (Martin, et. al. 2012), in the study conducted by Christoduo (2006), Havard, (1996 in Osborne, 2006), Lavonen, et al. (2008), and Samuel et.al. (2011). This result is similar to the results to the findings on Chemistry subject since in both subjects abstract concepts are taught.

This low interest in Physics can also be related to the common beliefs of students that Physics is not an easy subject which requires a high degree of dedication. This could also be attributed to some of the students' beliefs regarding Physics. "Physics is boring"; "Physics is difficult"; "Physics is for boys"; "Physics is only for intelligent students"; "Physics is irrelevant, not like Biology which can be related to my body"; "Physics is strange and only crazy people like Newton, do it" (Jordan,1994). Knowing this mindset among students, teachers can use better strategies in diverting the student's thinking to a more favorable outlook.

Research Question # 3: Are there significant differences in the grades in Physics and NAT science scores of the students when they are categorized according to their level of interest?

To determine the significant differences in the grades in Physics and NAT science scores of the students when categorized according to their level of interest, ANOVA-1 was used.

Table 14 shows the comparison of science grades with respect to the level of interest by discipline.

Table 14
Comparison among Grades in Physics by Level of Interest

Discipline	Level	f	%	X_L	X_H	Mean	SD	Remark[a]	df	F-value	p-level	Interpretation
Integrated science	HI	16	14.0	75.09	91.98	81.91	5.850	AP	**3,110**	**0.053**	**0.984**	**Not Significant**
	MI	77	67.5	75.10	93.66	81.83	5.590	AP				
	SI	20	17.5	75.11	90.45	81.66	5.079	AP				
	NI	1	0.9	79.76	79.76	79.76	0.000	D				
Biology	HI	11	9.6	75.17	91.57	81.79	5.378	AP	**3,110**	**0.090**	**0.966**	**Not Significant**
	MI	77	67.5	75.09	93.66	81.93	5.771	AP				
	SI	25	21.9	75.11	91.22	81.47	4.808	AP				
	NI	1	0.9	79.76	79.76	79.76	0.000	AP				
Chemistry	HI	5	4.4	75.17	90.36	83.94	5.972	AP	**3,110**	**0.557**	**0.645**	**Not Significant**
	MI	53	46.5	75.09	93.66	81.24	5.463	AP				
	SI	45	39.5	75.10	93.11	81.98	5.427	AP				
	NI	11	9.6	75.89	92.56	83.94	5.972	AP				
Physics	HI	10	8.8	75.17	93.11	84.82	6.197	AP	**3,110**	**1.721**	**0.167**	**Not Significant**
	MI	50	43.9	75.10	93.66	82.23	5.814	AP				
	SI	47	41.2	75.09	92.56	80.83	4.880	AP				
	NI	7	6.1	75.89	89.09	80.86	4.732	AP				

a. based on Mean
Legend: AP- Approaching Proficiency D- Developing

ICPS is a non-stock-nonprofit Catholic institution which has a total population of 1,129 students for SY 2013-2014. The said population is composed of preschool 76, grade school 459 and High school 594 from which the 114 fourth year respondents of the study were purposively sampled. The answers of the students to the SIIS were tallied according to their level of interest

per discipline. After which ANOVA –I was applied to find the significant differences in grades in Physics when grouped accordingly.

Table 14 shows one major analysis result and that is, the Physics final grades of the student do not show significant differences when they were categorized according to their level of interest. The mean scores fall on the range of 79.76- 84.82 reflecting a general proficiency level of Approaching Proficiency (AP). However, when these mean scores were examined, vis-à-vis their level of interest, the latter varied in spite similar performances. The differences in the means of the sample population are a result of the causal chance of sampling. This result implies that for this sample population alone, students 'interest does not presuppose good performance. The same findings were noted by Onah and Ugwu (2010). They found that school location and interest of students had no significant effects on performance in physics. Instead, performance in physics depends on sex (gender), teacher qualification and laboratory facilities.

Within disciplines it is notable that most of the students, who are all approaching proficiency, are either falling under Somewhat Interested (SI) or Moderately interested (MI) level and a very few signifies disinterest. This implies that ICPS students have a liking for science. Therefore, teachers, administrators and parents should capitalize on this opportunity and think of creative ways of nurturing this liking and exert best efforts to develop it more.

The differences of the NAT science scores were also assessed with respect to the students 'level of interest. Table 15 shows the statistical analysis of data.

Table 15
Comparison among NAT Science Scores by Discipline by Level

Discipline	Level	f	%	X_L	X_H	Mean	SD	Remark[a]	df	F-value	p-level	Interpretation
Integrated Science	HI	16	14.0	13.00	34.00	21.06	6.245	Average	3,110	1.031	0.382	Not Significant
	MI	77	67.5	10.00	40.00	21.87	6.923	Average				
	SI	20	17.5	9.00	28.00	19.00	5.140	Low				
	NI	1	0.9	20.00	20.00	20.00	0.000	Low				
Biology	HI	11	9.6	13.00	34.00	21.45	6.654	Average	3,110	0.187	0.905	Not Significant
	MI	77	67.5	9.00	40.00	21.49	7.025	Average				
	SI	25	21.9	12.00	31.00	20.40	4.330	Low				
	NI	1	0.9	20.00	20.00	20.00	0.000	Low				
Chemistry	HI	5	4.4	13.00	30.00	23.00	7.517	Average	3,110	0.513	0.674	Not Significant
	MI	53	46.5	9.00	40.00	21.00	7.460	Average				
	SI	45	39.5	11.00	38.00	20.84	5.973	Average				
	NI	11	9.6	20.00	30.00	23.18	3.250	Average				
Physics	HI	10	8.8	13.00	32.00	21.50	6.485	Average	3,110	0.621	0.603	Not Significant
	MI	50	43.9	9.00	40.00	21.70	7.838	Average				
	SI	47	41.2	10.00	34.00	20.36	5.297	Low				
	NI	7	6.1	20.00	30.00	23.43	4.117	Average				

a based on Mean
legend: HI-Highly Interested MI- Moderately Interested SI-Somewhat Interested NI-Not Interested

Generally, the interest level of the students in science does not affect NAT Science Scores as observed in Table 15. However, comparing the p-values obtained from the data analysis, Integrated Science has the lowest value which to a certain degree suggests that interest affects NAT Science performance. This is because Integrated Science covers varied concepts from the four disciplines of science which cater to the different interest of students as far as science topics are concerned. Therefore, considering the fact that NAT items for science includes questions that reflect the competencies, knowledge and skills in all of the four disciplines, then student interest matters and could somehow affect the NAT performance. This

interpretation can be supported by the study done by Adodo and Gbore (2012) which shows that Science interest possess the strength for predicting performance among the students in their different ability level group.

Research Question # 4: Is there a significant relationship between the students' interest in science and their grades in Physics?

The test of correlation was done to determine if the students' level of interest in science is related to their science performance. Table 16 gives the details.

Table 16
Correlation between Grades and Interest by Discipline

Discipline	r	df	t-value	p-level	Remark
Integrated Science	0.058	112	0.616	0.539	negligible positive rectilinear correlation; not significant
Biology	-0.016	112	-0.171	0.865	negligible negative rectilinear correlation; not significant
Chemistry	-0.023	112	-0.249	0.805	negligible negative rectilinear correlation; not significant
Physics	0.147	112	1.569	0.120	negligible positive rectilinear correlation; not significant

Table 16 shows that there is a negligible positive rectilinear correlation between the interest level in Physics and Integrated Science in relation to the Physics grades of the students. However, between the two, interest in Physics is more related to the students 'Physics performance considering a lower p-value of 0.120 than 0.539 of Integrated Science. This may be explained by the fact that since the data involved in the correlational analysis both pertains to the same discipline which is Physics; therefore parallel constructs are being considered.

The over-all negative correlation revealed in this analysis is the very opposite of the different studies reviewed in this study. Apparently, the researcher was not able to find any specific study or review that will support negative correlations between interest and Physics performance in particular. This finding therefore is an isolated case representing the sample population from ICPS and does not necessary reflect the universal population.

Table 17 shows the results of the correlation analysis between the NAT scores and the students' level of interest. The interpretation of correlational values is found in Table 9 page 52.

Table 17
Correlation between NAT and Interest by Discipline

Discipline	r	df	t-value	p-level	Remark
Integrated Science	0.082	112	0.871	0.388	negligible positive rectilinear correlation; not significant
Biology	-0.014	112	-0.148	0.881	negligible negative rectilinear correlation; not significant
Chemistry	-0.052	112	-0.551	0.580	negligible negative rectilinear correlation; not significant
Physics	0.006	112	0.063	0.949	negligible positive rectilinear correlation; not significant

Table 17 shows a negligible positive rectilinear correlation for integrated science, (r=0.082, p = 0.388) and Physics, (r=0.006, p= 0.949). These results are consistent with the obtained results in Table 16 where both Integrated Science (r= 0.058, p= 0.539) and Physics (r=0.147, p=0.120) are not correlated in terms of academic performance and interest level in science. This means that both grades in Physics and NAT science scores do not show strong evidence that interest level has an effect on the science performance of the students.

However, among the four computed correlations, the r value of Integrated Science shows the highest positive correlation (negligible). This may be explained by the fact that since NAT includes questions that practically cover concepts discussed in Integrated Science (which includes basics of the four disciplines) therefore, the students will have a good grasp of the topics especially if they are interested. In view of the said interpretation, the researcher proposed an intervention program specifically to enhance the interest of the Grade 7 students in science. This hopes that as early as the time they are exposed to Integrated Science, interest in Physics may be developed and consequently improve their performance in the said subject.

5. **What intervention program may be proposed based on the results of the study?**

Although the result of the study shows that interest has no strong evidence on the science performance of students and that literature reviewed presented otherwise, still this study deemed it necessary to come up with an intervention program in response to the alarming low performance of students in Physics and their apparent and relatively low interest in the same.

The proposed intervention program is to be implemented by the science teachers for the Grade 7 students. Since, the Philippines is already observing the Enhanced Basic Education Curriculum or the commonly known K to 12 Program, Grade 7 students are expected to take up science concepts that are combinations of the four disciplines of including Physics. A longitudinal study showed that at the end of the primary education, children have a positive attitude towards science but however tends to decrease during the secondary education (Walper, et.al, 2013). Likewise, consistent with previous research, intrinsic motivation showed a significant linear decrease from 3rd grade through 8th grade and proved positively correlated with children's grade and standardized test score at all grade levels (Lepper, Corpus and Iyengar

2005). Therefore, the interest of the students in science should be enhanced at the onset of Grade 7 to sustain interest especially during the transition period.

The next important basis for the proposed intervention program was the findings of the study which summarizes that ICPS students have low Physics grade and low NAT science scores both reflecting poor science performance in addition to their low interest in Physics. With this in mind, specific activities were incorporated to address the two main concerns of the results.

For the poor science performance, a quarterly science quiz bee based on the topics in the K -12 will transpire. This will allow the development of in-depth knowledge in science concepts and improve competitiveness among students as they vie for the championship at the end of the school year. This event will not solely develop interest and enthusiasm for Physics but as well as Integrated Science, Biology and Chemistry as scheduled in the spiral implementation of the Grade 7 science curriculum.

Secondly, for the condition of low interest in Physics, an annual project making contest will be implemented. This will allow students to creatively and originally represent their knowledge and understanding of Physics concepts through model making for example to represent free falling body, projectile, centrifugal / centripetal force and the like. In addition, a week- long science fair will be held to give students the idea that science is an important and interesting discipline such that days of celebration were allotted to see to it that they will have the chance to enjoy it. The beauty of Physics and its relevance to the society and one's life were considered in the preparation of the activities in the fair. As Hulleman and Harackiewicz (2009) put it, course materials when found to be relevant to their lives, increase interest in science and course grades. The study of Swarat (2008) suggests that in order for a topic to be interesting, it

should consider its activeness, importance, familiarity, coolness, and challengingness.

Within the science fair days, activities like Physics Magic Show will be done. This includes "demonstrations of day to day realities that can be explained by Physics concepts (i.e. optical illusions, mirage formation, etc.). Perkins, et.al (2005) found out that there is a correlation between belief and self-rated interest. The reason for the increased interest was the connection between physics and the real world. Employing activities that are part of everyday life may enrich the interest of the students. Field trips to the likes of Mind Museum can also make connections of Physics to the real world. Finally, play / dramatization of the Physicist life and contributions will be held as a contest per section for the students to appreciate the experiences of the scientists and emulate them (See Appendix F for the actual intervention program).

CHAPTER 5

SUMMARY, CONCLUSIONS, RECOMMENDATIONS

This chapter presents the summary of findings, conclusions and recommendations based on the results of the study.

The study focused on the students' interest as it affects science performance. To determine the interest level of the 114 fourth year high school students in the four disciplines of science namely Integrated Science Biology, Chemistry and Physics, a researcher-made survey form, SIIS, was developed. The SIIS is composed of specific topics and general questions on the four disciplines of science which consists of 10 items for Integrated Science, 10 for Biology, 10 for Chemistry and 10 for Physics. The researcher-made survey form was presented to a science teacher, and science coordinator for initial validation with emphasis on content, construct and face validation. Several suggestions and recommendations were taken into consideration and were applied to enhance the survey tool, SIIS. After revising the tool, the researcher again presented it to another set of evaluators composed of Science professors and psychologists, for final validation.

After having done the validation, the researcher administrated the SIIS to 39 fourth year students of La Naval Academy for try-out. The comments and remarks given by the students were also considered during the revision of the survey tool. After trying-out the revised survey tool, the final draft was prepared.

The SIIS was administered to the fourth year students of ICPS to determine their interest level in the four disciplines of science. The SIIS results were correlated with their science performance.

Summary of Findings

Based on data gathered, analyzed and interpreted, the following are the findings of the study.

1. The Physics grades reflected that the ICPS students have "approaching proficiency performance" with a mean score of 81.80 (AP) while in terms of NAT Science scores results showed that students' performance is low with respect to the national standards.
2. In terms of level of interest in the four disciplines of science, namely: Integrated Science, Biology, Chemistry and Physics, most of the students are moderately interested both in Integrated Science and Biology and somewhat interested in Chemistry and Physics.
3. With respect to the differences between the science performances of students when categorized in their level of interest, there were no significant differences observed.
4. There was no significant relationship observed between the students' level of interest and their science academic performance.
5. Based on the findings of low Physics grade and low NAT Science scores of the ICPS students, an intervention program for Grade 7 students was proposed.

Conclusions:

Based on the significant findings of the study, the researcher derived the following conclusions:

1. ICPS students have poor performance in Physics. Low grades and low NAT scores indicate that students have a low mastery of the subject and competencies were not fully developed in the duration of their stay in high school. This situation may be looked into as a product of

compounding extrinsic and intrinsic factors that need to be identified and addressed for the improvement of the next graduating class.

2. Biology is a more preferred subject among the four disciplines of science. Since students can easily relate to the many topics of Biology in their day to day existence such as eating, breathing, and other physiological cycles not to mention the tangible examples that living things can provide, understanding and concretizing scientific concepts is not that complicated as compared to Chemistry and Physics. This reality radically suggests that Physics teachers must employ their best efforts in designing lessons which will concretize and bring Physics concepts close to reality so students can experience it.
3. Considering the ICPS sampled population in this study, student interest in Science is not a predictor of their academic performance. One major possible reason as to why the results of this study contradicts the findings reflected in the review of literature and studies could be that the sampled population was too small to capture a general scenario. Nevertheless, the negative findings of this study being an isolated case does not necessarily mean as a general rule that interest is not correlated to student performance. Therefore, it could still be considered in designing curriculum, lessons and intervention programs for that matter. After all, this study has established a relatively low overall interest in science and so something must be done to enhance it.
4. The Grade 7 students are the appropriate recipients of the proposed program since they will be the ones to experience transition K-12 curriculum where they may lose their focus and interest in science because of the spiral approach of lesson delivery. This is because

in spiraling, concepts are taught in bits and pieces and not in continuum and so topics are not dealt with depth.

Recommendations

With the given findings and conclusions, these recommendations are offered:

1. ICPS administration may consider the findings of this study to evaluate the science program and identify the factors that are contributory to the poor performance of the students. From there, remedial interventions may be designed to improve student performance particularly in Physics.
2. Equip Physics teachers and all science teachers with content and pedagogy and update them through seminars so that teaching and learning process in the classroom will take place with the use of interesting enhancement activities that will lead to a better performance on the part of the students.
3. Perform the same study using a much bigger sample population to determine the validity of the results of this study.
4. Create a science intervention program that will address the varying interests of the students, and consequently improve their level of interest. Use the said program, implement and evaluate to assess its feasibility and viability for future enhancements and extension to the different grade levels.

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APPENDIX A

PERMISSION LETTER TO CONDUCT DATA GATHERING

A.1. Permit to Conduct Data Gathering- ICPS School Director

A.2. Permit to Conduct Data Gathering- ICPS Principal

A.3 Permit to Conduct Data Gathering- La Naval Academy Principal

A.4. Request Letter to NETRC for NAT Results

A.5 Letter of Approval from NETRC

A.1
PERMIT TO CONDUCT DATA GATHERING
ICPS SCHOOL DIRECTOR

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Pedro Orata Hall, Room 201, Taft Avenue, Manila

March 12, 2014

Rev. Fr. REY O. AMANTE
School Director/ Human Resource Manager
Immaculate Conception Parochial School
Malabon City

Dear Father Rey:

Greetings!

I am a student of the Philippine Normal University, Taft, Manila, pursuing graduate studies in Science Education. I am now on the process of conducting a research entitled Student's Interest Affecting Science Performance of Secondary Students in Immaculate Conception Parochial School in Malabon City.

In this regard Father, may I request your permission to allow me administer the questionnaires among the fourth year students, this school year 2013-2014. Please allow me also Father to use their science final grades and the NAT results which will be released by August of 2015 as the data to be utilized in the proposed study.

Father I am looking forward for your favorable response. Thank you very much.

Sincerely,

MARIVIC S. BASILIO
Researcher

Approved By:

Rev. Fr. REY O. AMANTE
School Director

the coordinator of the program
a D.O.

A.2
PERMIT TO CONDUCT DATA GATHERING
ICPS SCHOOL PRINCIPAL

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Pedro Orata Hall, Room 201, Taft Avenue, Manila

March 12, 2014

Mr. RAFAEL B. LIMBAUAN
School Principal
Immaculate Conception Parochial School
Concepcion, Malabon City

Dear Sir:

Greetings!

I am a student of the Philippine Normal University, Taft, Manila, pursuing graduate studies in Science Education, and as part of my requirement, I am required to complete a study in my own field. I am now on the process of conducting a research entitled "Students Interest Affecting Science Performance of Secondary Students in Immaculate Conception Parochial School in Malabon City.

The study seeks to discover the relationship between the students' interest, and the science academic performance of the students. I hope that this research work be of help in improving the science education in the school.

In this regard, may I request your permission in facilitating the conduct of my study and given the access to the NAT result and science final grades of the fourth year students this school year 2013-2014. May I also request for the administration of the research –made instrument.

I am looking forward for your favorable response and the support you can extend to me for the completion of my proposed study. Thank you very much. May God bless you!

Sincerely,

MARIVIC S. BASILIO
Researcher

Approved by:

Mr. RAFAEL B. LIMBAUAN
School Principal

A.3
PERMIT TO CONDUCT DATA GATHERING
LA NAVAL ACADEMY SCHOOL PRINCIPAL

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research

March 24, 2014

Dr. HAZEL M. ANGELES
Principal
La Naval Academy
Navotas City

Dear Dr. Angeles,

Greetings!

I am a student of the Philippine Normal University, Taft, Manila, pursuing graduate studies in Science Education. I am now in the process of conducting a research study entitled Student's Interest Affecting Science Academic Performance of Secondary Students in Immaculate Conception Parochial School in Malabon City.

In this study, a researcher- made instrument will be used to measure the level of interest of the students. In line with this, may I request your permission to allow me pilot test the said instrument to your fourth year students.

I am looking for your favorable response. Thank you very much.

Sincerely yours,
MARIVIC S. BASILIO
Graduate Student

Approved by:

Dr. HAZEL M. ANGELES
School Principal
03-24-14

APPENDIX A.4
LETTER OF REQUEST TO NETRC

To: depednetrc@yahoo.com

Dec 5, 2014

Dear Sir/Madam,

The Immaculate Conception Parochial School - Malabon City is requesting for a copy of the results of all the examinees (NAT Y4 2013-2014). This will be used in my research and some academic purposes of the said school.

I am hoping for your favorable response. Thank You and God bless!

Respectfully,

Mrs. Marivic Basilio
School Registrar/Researcher

A.5
PERMIT TO CONDUCT DATA GATHERING
LETTER OF APPROVAL FROM NETRC

Republika ng Pilipinas
Kagawaran ng Edukasyon, Kultura at Isports
Pambansang Sentro ng Pagsusulit at Pananaliksik
(National Educational Testing and Research Center)
12th Floor, Mabini Bldg., DECS Complex, Pasig City

December 9, 2014

MARIVIC BASILIO
School Registrar
Immaculate Conception Parochial School
Malabon City

Dear Ms. Basilio:

In response to your request for the National Achievement Test (NAT) results of the fourth year high school students of Immaculate Conception Parochial School for SY 2013-2014, attached herewith is the said request by subtest per examinee. They were identified through their Examinee Numbers.

Please be informed that the NAT is a system-based assessment specifically designed to gauge the learning outcomes across target levels in identified periods of basic education. Specifically, the NAT for Fourth Year serves as exit assessment of the secondary level of basic education (pursuant to DepEd Order No. 5, s. 2005).

Likewise, this Office cannot provide test results by names pursuant to Republic Act No. 10173 otherwise known as the "Data Privacy Act of 2012". Specifically, Section 12 of the said Act states that;

> *"Sec. 12. Criteria for Lawful Processing of Personal Information - The processing of personal information shall be permitted only if not otherwise prohibited by law, and when at least one of the following condition exist:*
>
> *(a) The data subject has given his or her consent."*

We hope that the data we have furnished will assist you in whatever legal purpose it may deem necessary.

Very truly yours,

NELIA V. BENITO, Ph. D., CESO IV
Director III

APPENDIX B

7 POINT SCALE ACHIEVEMENT LEVEL DESCRIPTIVE EQUIVALENTS OF NAT SCORES

Table 1.
7-point scale Achievement Level Descriptive Equivalent of NAT scores

Percentile Rank	Descriptive Equivalent
96%-100%	Mastered
86%-95%	Closely Approximating Mastery
66%-85%	Moving Towards Mastery
35%-65%	Average Mastery
16%-34&	Low Mastery
5%-15%	Very Low Mastery
0%-4%	Absolutely No Mastery

Source: Lifted from Benito (2010). National Achievement Test: An Overview

APPENDIX C
SCIENCE INTEREST INVENTORY SURVEY –EXPERTS'VALIDATION

Score

4 Very Good (no modifications needed

3 Good (some modifications needed)

2 Satisfactory (no modifications needed but could be improved with minor changes)

1 Needs Improvement (major modifications needed)

Content Validity	E 1	E2	E3	E4	E5
1. Statements are correct.	3	2	2	3	2
2. Statements identify the interests of the students.	3	3	3	0	3
3. Statements are presented properly.	2	2	2	1	3
4. Statements are independent from the others.	3	2	2	2	3
5. Statements are relevant to the study.	3	0	1	2	3
Language Validity					
1. Language used is proper.	2	3	2	3	3
2. Language used is consistent.	2	3	1	2	3
3. Terms used are easily understood.	3	3	3	3	3
4. Statements are properly constructed.	2	2	2	3	3
5. Statements are grammatically correct.	3	2	1	2	3
Format Validity					
1. Appropriate text size.	3	3	3	3	3
2. Print-out is clear.	3	3	3	3	3
3. Readable font style.	3	3	3	3	3
4. Quality of paper is acceptable.	3	3	3	3	3
5. Text is not crowded.	3	3	3	3	1

APPENDIX D
SCIENCE INTEREST INVENTORY SURVEY

SCIENCE INTEREST INVENTORY SURVEY (SIIS)

Dear Students,

The researcher would like to determine your level of interest in science subjects. Your responses will help researchers to better understand students and improve science education, and make you become better and highly achieving students. The researcher assures you the confidentiality of your identity and the exclusive use of your answers for research purposes only. Thank you.

Part I. Demographic Profile

Print Name (First & Last): _____ Date: _____
(Optional)

Year Level: _____ Age: _____ Gender: _____

Part II. Student's Interest

This will help you explore your interests in science. Carefully read each statement below and tick (√) the number that shows to what extent you are interested in science.

Scale	Descriptive Rating	Qualitative Rating
3	Highly Interested	If the student is having full attention, involvement and enjoyment.
2	Moderately Interested	If the students is having a more attention, participation and enjoyment.
1	Somewhat interested	If the student is having little attention, participation, and enjoyment.
0	Not Interested	If the student is having no attention, participation and enjoyment.

		3	**2**	**1**	**0**
1	I am interested in learning Science.				
2	I love solving science problems.				
3	I like to carry out investigatory projects.				
4	I enjoy discussing the importance of science.				
5	I am concerned with the results of environmental problems.				

6	I am interested in joining science field trip.				
7	I find laboratory activities interesting.				
8	I enjoy reading the lives and works of scientists.				
9	I am interested in the inventions and discoveries in science.				
10	I am interested watching science-related movies or series.				
11	I enjoy biology subject.				
12	I enjoy working in a biology laboratory.				
13	I am interested in knowing how traits are transferred from parents to offspring.				
14	I am interested in studying about animals and other forms of life.				
15	I am interested in knowing how the human body works and the function of each part.				
16	I like finding answers on how mutation occurs.				
17	I am interested in learning the origin and evolution of life on earth.				
18	I am interested in how babies grow and mature.				
19	I enjoy playing computer games related to how the body works.				
20	I enjoy exploring at botanical garden.				
21	Chemistry is useful in my everyday life.				
22	I like doing chemistry experiments.				
23	I am interested in learning different chemicals and their effects on human life.				
24	I am excited in learning about atoms and molecules.				
25	I am interested in studying about chemicals, their properties and how they react.				
26	I am interested to know how radiation affects the human body.				
27	I enjoy balancing chemical equations.				
28	I am excited during chemistry classes.				

29	I am challenged to think when asked difficult chemistry questions.				
30	I am interested to know how elements are discovered.				
31	I am interested in studying how nuclear power plant works.				
32	I am interested in studying about lights, their properties and application.				
33	I have fun working with physics experiments.				
34	I look forward to attending my physics classes.				
35	I am interested in studying about the application of physics in radio broadcasting and communications.				
36	I am attentive during my physics classes.				
37	I am interested in explaining how gadgets work.				
38	I am interested in studying how force affects motion.				
39	I find Physics problems challenging to solve.				
40	I love participating in physics discussion even outside the physics class.				

APPENDIX E
SUMMARY OF TOPICS OF INTEREST PER INDICATOR
(1- Being the highest)

		rank
1	I am interested in learning Science.	3
2	I love solving science problems.	25
3	I like to carry out investigatory projects.	16
4	I enjoy discussing the importance of science.	13
5	I am concerned with the results of environmental problems.	4
6	I am interested in joining science field trip.	2
7	I find laboratory activities interesting.	5
8	I enjoy reading the lives and works of scientists.	31
9	I am interested in the inventions and discoveries in science.	1
10	I am interested watching science-related movies or series.	9
11	I enjoy biology subject.	5
12	I enjoy working in a biology laboratory.	8
13	I am interested in knowing how traits are transferred from parents to offspring.	19
14	I am interested in studying about animals and other forms of life.	15
15	I am interested in knowing how the human body works and the function of each part.	10
16	I like finding answers on how mutation occurs.	28
17	I am interested in learning the origin and evolution of life on earth.	12
18	I am interested in how babies grow and mature.	13
19	I enjoy playing computer games related to how the body works.	11
20	I enjoy exploring at botanical garden.	28

21	Chemistry is useful in my everyday life.	22
22	I like doing chemistry experiments.	17
23	I am interested in learning different chemicals and their effects on human life.	18
24	I am excited in learning about atoms and molecules.	34
25	I am interested in studying about chemicals, their properties and how they react.	33
26	I am interested to know how radiation affects the human body.	20
27	I enjoy balancing chemical equations.	40
28	I am excited during chemistry classes.	39
29	I am challenged to think when asked difficult chemistry questions.	35
30	I am interested to know how elements are discovered.	31
31	I am interested in studying how nuclear power plant works.	38
32	I am interested in studying about lights, their properties and application.	22
33	I have fun working with physics experiments.	24
34	I look forward to attending my physics classes.	30
35	I am interested in studying about the application of physics in radio broadcasting and communications.	35
36	I am attentive during my physics classes.	26
37	I am interested in explaining how gadgets work.	7
38	I am interested in studying how force affects motion.	27
39	I find Physics problems challenging to solve.	21
40	I love participating in physics discussion even outside the physics class.	35

APPENDIX F
PROPOSED INTERVENTION PROGRAM

PROPOSED INTERVENTION PROGRAM

IMMACULATE CONCEPTION PAROCHIAL SCHOOL INTERVENTION PROGRAM

PROGRAM GOAL: To develop the interest in Physics of the students for a better understanding of science concepts.

Condition (Identified Weakness)	Intervention (activity)	Interventionist/Time (Who is responsible)	Measurement of Student Progress (How to measure progress)	Progress Monitoring Results from assessment (Is it working, Is there a need for revision
1. Low Proficiency level in Physics.	✓ **Quarterly Quiz Bee covering Physics topics of the K to 12 Curriculum**	✓ **Science Coordinator** ✓ **August, 2015** ✓ **Once per Quarter**	✓ Develops in depth knowledge in science concepts as motivational behavior.	Comments:
	✓ **Project-Making**	✓ Physics Teacher ✓ November, 2016 ✓ Once a year	✓ Applies the concept learned in Physics though the creating concrete and unique models.	
2. Low Interest in Physics.	✓ **Science Fair** ▪ **Field Trip** ▪ **Exhibit** ▪ **Physics Magic Show** ▪ **Investigatory Project**	✓ **School Principal** **Finance Officer** **Logistics Head** **Science Coordinator** ✓ **January, 2016 ((4 day long event)**	✓ Showcase concepts learned in Physics by coming up with concrete and unique models such as parallel and series circuit, projectile, pendulum, nuclear power plant….	Comments

Science Intervention Program

Rationale: Students are known to dislike Physics because of the level of difficulty students perceived in dealing with this subject. The challenge to educators especially in the science education is to redirect the minds of the students that Physics is enjoyable, relevant and essential for development. The proposed Intervention Program is a response to the existing condition that ICPS students are going through.

Goal: To develop a community of students pooled with activities to enhance interest in Physics that may further improve their Physics performance.

Objectives:

1. Provide programs that cater the needs and interest of the students.
2. Inculcate in the minds of the students that Physics is an enjoyable subject.
3. Develop among students appreciation of the contribution of Physics to one's life, and to the society.

Specific Objective:

1. Let the students explore the world of science through Field trip.
2. Apply the concepts of Physics to project-making.
3. Appreciate the wonders of Physics to Magical Show.
4. Develop deeper appreciation to Physics through CosPlAy.
5. Design an investigatory project of their interest in applying the concepts learned in Physics.

Time Frame:

Thee intervention program starts as early as the First quarter (August, 2015) and is composed of a year round activity, per quarter.

Persons Involved:

Science Coordinator
Science Teacher (Physics)
Students

Resources and Materials:

Sound System
School Supplies
Tokens

Procedures:

1. Coordinate with the science department for the details of the program.
2. Form working groups.
3. The detailed flow of the program will be provided a week before the scheduled activity.

Outcomes:

1. Showcase concepts learned in Physics by coming up with concrete and unique models (parallel series, pendulum, etc). Anything that is related to Physics will be accepted such as games (Physics Bingo, Angry Bird, etc…)
2. Be able to relate Physics to everyday existence through the Physics Magic.

Evaluation:

Comments of the students, teachers, administration and parents after each activity.

INTERVENTION ACTIVITY

PhysicsBingo

Force and Motion

I. Rationale

The Immaculate Conception Parochial School in its capability to provide activities that enhance science performance is making use of a very popular game among Filipinos, enjoyed by young and old people alike. This program was designed to increase students' knowledge and understanding of basic concepts in science, particularly in physics, in a more enjoyable and effective manner.

II. Objectives

1. Generate bingo games to enhance learning in science where your students will welcome a change of pace.
2. Provide a fun follow-up and review activity to support the lesson objectives
3. Improve student learning.

III. Materials

- ✓ BINGO cards
- ✓ BINGO marker
- ✓ Container for definitions

IV. Procedures:

1. Give each student a BINGO card. Instruct the students to refer to the list of terms at the bottom of the bingo card to write the terms to fill in each square using one word or term per square.
2. Do not put anything in the free space.
3. Note that each word can only be used once since there are more terms than the squares. This allows for more diversity in each of the bingo cards.
4. The students should not clear their cards when someone calls bingo until it has been verified. This saves some upsets if a student has marked the wrong definition on his card and the game is resumed.
5. Have bottle caps as bingo markers.
6. Students should be instructed that the definitions of the terms will be read and if they have the term that matches the definition on the card they should mark that square.

7. Definitions are pulled from the container and read one at a time until someone calls bingo. (Five squares in a row either horizontally, vertically, diagonally; four corner bingo and blackout bingo.

V. Rewards:

The first two set winners will receive five chips equivalent to one recitation grade and the blackout winner will receive ten chips equivalent to 2 recitation grades.

VI. Evaluation.

Pick one word and make an acronym on how you experience or feel about the activity.

VII. References:

http://www.schoolhousetech.com/Bingo/

www.womeninmining.org/activities/Environmental_**Bingo**.pdf

http://quizlet.com/1663127/forces-and-motion-vocabulary-flash-cards/original

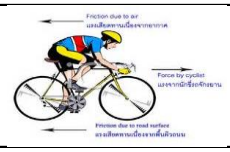
http://idahoptv.org/dialogue4kids/season9/forcesmotion/glossary.cfm

FORCE and MOTION BINGO
Terms and Definitions

Terms	Definition
Acceleration	A change in velocity
Action	the force one object applies to a second object as in Newton's third law of motion
action and reaction	Forces always come in pairs - equal and opposite.
air resistance	Also known as drag - it pushes against things that are moving.
Attracts	To cause to draw nearby physical force (like a magnet.)
balanced forces	Forces that cancel each other out when acting together on a single object
constant speed	object that is moving at the same rate because of equally applied forces
deceleration	decrease in the speed of an object
density	mass of a standard volume of a substance
directly related	one variable increases as the other also increases
Distance	The amount of space between two things, points, lines, etc.
external force	Forces acting between the body and environment.
Force	A push or pull that acts on an object
Friction	Opposes the motion of one object moving past another
Gravity	A force that pulls objects towards the earth's center.
Inertia	The tendency of an object to resist a change in its state of motion
inversely related	one variable decreases as the other increases
Joule	A unit of energy which is equal to the work done when a force of one Newton acts through a distance of one meter.
Magnet	An object that pulls metal or steel towards it.
Mass	A measure of quantity of matter in an object.
Momentum	A measure of the motion of a body which is equal to the product of its mass and velocity.
Motion	The action or process of moving or of changing place or position; movement.

Newton	English philosopher and mathematician: formulator of the law of gravitation.
Newton's 1st law of motion	An object in motion will stay in motion unless acted upon by an outside force or things will keep on doing what they are doing until something stops them. This is also known as **inertia.**
Newton's 2nd law of motion	Force = Mass x acceleration, which translates to this: the more mass an object has, the more you have to push it. The harder you push an object, the farther it will go.
Newton's 3rd law of motion	When you push on an object, it pushes back, and is often referred to as action and reaction.
Physics	The science of studying the concept of matter and its motion, as well as space and time. Physics is the science that deals with concepts such as force, energy, and mass.
Push	Something that moves things away from you.
Reaction	the force with which an object responds to an action as in Newton's third law of motion
Simple Machines	devices with few moving parts that make work easier to do
Speed	How fast an object's position is changing with time at any moment
Unbalanced Forces	forces that do not cancel each other out when acting together on a single object
Velocity	The speed and direction of a moving object
Weight	Equals the amount of gravitational pull on an object.
Work	using force to move an object

FORCE and MOTION BINGO

B	I	N	G	O
				

Terms to write on the squares

Acceleration	**directly related**	**Magnet**	**push**
Action	**Distance**	**Mass**	**Reaction**
action and reaction	**external force**	**Momentum**	**simple machines**
air resistance	**Force**	**Motion**	**Speed**
Attracts	**Friction**	**Newton**	**unbalanced forces**
balanced forces	**Gravity**	**Newton's 1st law of motion**	**Velocity**
constant speed	**Inertia**	**Newton's 2nd law of motion**	**Weight**
deceleration	**inversely related**	**Newton's 3rd law of motion**	**Work**
Density	**Joule**	**Physics**	

APPENDIX G
CERTIFICATION (LANGUAGE EDITOR)

Philippine Normal University
Taft Ave., Manila

February 2, 2015

CERTIFICATION

This is to certify that I edited the thesis entitled **"The Science Academic Performance and Interests of the Students in Immaculate Conception Parochial School"**, of Ms. **MARIVIC S. BASILIO,** Science Education specialization, prior to the thesis oral examination.

This certification is issued to Ms. Basilio for her to comply with the editing requirement for pre-oral thesis examination.

LUCILLA R. FETALVERO
Professor on part-time

APPENDIX H
CERTIFICATION (AUTHENTICITY TEST)

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Taft Avenue, Manila, 1000, Philippines
Tel. No. 3171768, Loc. 530

CERTIFICATION

This is to certify that the thesis of MS. MARIVIC S. BASILIO entitled "Physics Performance and Science Interest: a Basis for Proposing an Intervention Program" **passed** the authenticity test performed by the office on March 14, 2015 using the Anti-Plagiarism software of the university.

ANTRIMAN V. ORLEANS, Ph.D.
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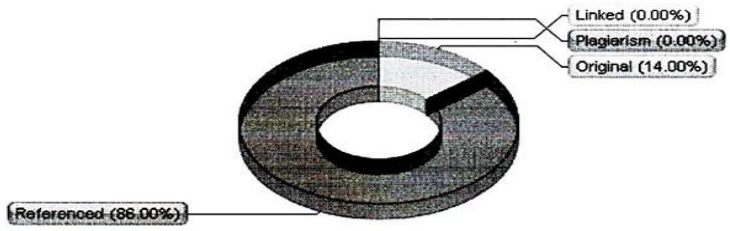

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CURRICULUM VITAE

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No. of Children:	2

Educational attainment

Graduated the Elementary course at Zamboanga Elementary School, City of Laoag
March, 1984

Graduated the Secondary course at Ilocos Norte College of Arts and Trades, City of Laoag
March, 1989

Graduated with a degree in Bachelor of Secondary Education at University of the East, City of Manila
March, 1994

Graduated with a Degree in Master of Arts in Education with specialization in Science Education at Philippine Normal University, Manila
March, 2015

Job Experience

1994-2003	Science Faculty/ Science Coordinator
2003-2007	Academic Coordinator
2008 up to the present	School Registrar