INTEGRATED SCIENCE AND MATHEMATICS PROGRAM (ISMP) FOR SECONDARY SCHOOLS IN EASTERN VISAYAS: A MODEL

A Dissertation

Presented to

The Faculty of Graduate School

Samar State Polytechnic College

Catbalogan, Samar

In Partial Fulfillment

Of the Requirements for the Degree

Doctor of Philosophy

(Educational Management)

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March 2000

APPROVAL SHEET

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ACKNOWLEDGMENT

In our life time of continuing quest for knowledge and wisdom, it could not be denied that we cannot achieve our goals by the self alone. Our success can only come from cooperative efforts by which supports from all sectors in education are solicited. It is in sharing that we are successful. On the other hand, success is nothing when there is no one to share it with.

One of the most pleasant aspects of writing a dissertation is the opportunity to convey sincere thanks and profound gratitude to those who have contributed to its successful completion.

To Dr. Bonifacio S. Villanueva, SSPC President for his encouragement and support of the graduate and post-graduate programs;

To Dr. Jose S. Labro, Dean, College of Arts and Sciences and the researcher's adviser for sharing his expertise and guidance;

To the distinguished dissertation committee panel:

Dr. Eusebio T. Pacolor, Dean of Graduate School, for his encouragement and moral support as chairman;

Dr. Bernardo S. Oliva, retired Vice President for Academic Affairs, one of the finest professors for his critical and technical advices;

Dr. Simon P. Babalcon, Jr., Vice President for Academic Affairs, for the well taken valuable suggestions;

Dr. Marilyn D. Cardoso, Dean College of Education for her unquestionable statistical expertise;

Dr. Emilio C. Albos, Vice President for Administration, whose comments and constructive criticism is well appreciated;

To all my professors in the post-graduate program, especially, Dr. Rizalina M. Urbiztondo, Dr. Dominador Q. Cabanganan, Dr. Luisito M. Quitalig, for their excellent guidance, support and valuable advice,

To the Schools Division Superintendents of DECS - Region VIII, for their cooperation and immediate response to the questionnaire used in gathering the data and other information.

To the Education Supervisor of the Secondary Education Division of DECS Region VIII, for unselfishly sharing the RTAR data;

To the Samar National School, Science and Mathematics teachers for their help in the validation of the instrument;

To my colleagues and friends for their encouraging remarks, stimulating suggestions on the entire course of the study;

To Miss Florida B. Marco, SSPC mathematics professor for helping in preparing the final draft and her computer services, and

To the respondents of my study for sharing their valuable time and expertise.

Thank you very much.

Prudy

Dedication

To the Science and Mathematics Teachers

of Secondary Schools whose vision and

mission are for solidarity and

prosperity,

To the students for better performance

in their studies,

To my very supportive wife **LORETTA**

and children; **DEXTER** and **LOREN**

for their prayers, love and inspiration,

this humble work is dedicated.

F. D. B.

ABSTRACT

The study attempted to analyse the existing Science I and Mathematics I programs in the secondary curriculum of national high schools in Eastern Visayas with an end of developing a model for the integration of Science I and Mathematics I into one subject. The descriptive-developmental research design was used in this study. The study sample involved 23 science supervisors, head teachers and master teachers, 160 secondary school teachers in science, 19 mathematics supervisors, head teachers and master teachers, and 149 secondary school teachers in mathematics comprising a total of 341. As to the relationship of perceptions among science supervisors/classroom teachers and mathematics supervisors/classroom teachers, mathematics supervisors, while science teacher's perceived higher integration than their mathematics counterpart. The achievement level of secondary students in Science I is significantly related to their achievement level in Mathematics I for SY 1995-1996. Their achievement levels in the two subjects, however, are not significantly related for SY 1996-1997 and SY 1997-1998.

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Chapter 1

THE PROBLEM AND ITS SETTING

Introduction

If in unity there is strength, how can we unify instructional concepts and skills in science and mathematics to strengthen the teaching-learning processes in these areas and make them more effective and attuned to the desired learning competencies required of our students under the new Secondary Education Development Program (SEDP)?

The new secondary school curriculum emphasizes science as a process whereby a child learns to understand his environment and simultaneously develops scientific skills through personal experiences with materials and phenomena. Educators in science continuously endeavor to find means on how to teach science that will enable children to learn the fundamental concepts and help them realize that these concepts are products of human inventiveness and imagination which can repeatedly be tested by observations and experimentation.

The result of the Third International Mathematics and Science Study (1994), however, showed a "very poor

performance" of Filipino students in science and mathematics. In the 1988 International Educators Association (IEA) study of science achievement, the typical 14-year old Filipino student answered correctly an average score of 11.5 as against students from Hongkong (16.4), Singapore (16.5), Korea (18.1) and Japan (20.2). The same trend was observed in mathematics achievement when he correctly answered an average of 9.5 only as against students from United Kingdom (11.7), Hongkong (11.2), and Singapore (11.2). In both instances, the Filipinos ranked the lowest among 16 countries.

The level of performance of the Filipino students in international assessment studies creates deep concern among educational leaders resulting in an awareness and realization of the need to help our students perform better in science and mathematics.

Hidalgo (1984:188) notes that one trend in education is to focus students' abilities and interests by rationalizing what they ought to learn-whether it is useful or useless. This pragmatic approach requires a methodology that can cultivate the student's scientific abilities and skills on what he needs in daily life so that he can easily adjust to his environment. A key to understanding and

learning pragmatic science is through relevant mathematics.

One of the more widely used educational techniques to achieve unity is integration. The word "integrated" means a functioning of a unified whole. To ascribe integration to a program or a system is to maintain its unified totality.

The interrelated nature of intellectual development enables the infusion of science and mathematics concepts in the activities of the different year levels through the integrated processes. These processes include controlling variables, defining operationally, formulating hypotheses, interpreting data, and, as an ultimate form of such integration, experimenting.

Many think that unity or integration can be found in the inherent logical sequences of units or knowledge. Accordingly, although it is necessary to break down the total scope of knowledge into subject matter divisions such as mathematics, language, and the various sciences, many believe that there is an essential relatedness in all these fields of knowledge. Thus, chemistry and biology are related trough biochemistry, biology and psychology through psychobiology, psychology and sociology through social socio-psychology, or, as proposed by this study, science and mathematics as "scimath."

As an educator and mathematics and science teacher for more than twenty years, the researcher has observed that the difficulty in understanding science and mathematics is apparent not only in the elementary but more so in the high school level. Most secondary students find science and mathematics to demand longer amount of time and greater concentration to master. This experience discourages them to look at science and mathematics as effective tools for progress. Thus, a very small number of students pursue science courses in college.

In undertaking this study, the researcher believes that by providing meaning to mathematical concepts using science, and scientific concepts using mathematics through their integration into one subject, the students will eventually not miss the need for mathematics in science because they will be using mathematics in understanding science, and vice versa. Moreover, in combining interrelated key concepts in mathematics with those of science, the new subject, Scimath, attempts to strengthen the pragmatic value of mathematics in science and scientific concepts in mathematics.

Statement of the Problem

The study attempted to analyze the existing Science I and Mathematics I programs in the secondary curriculum of national high schools in Eastern Visayas with an end view of developing a model for the integration of Science I and Mathematics I into one subject.

Specifically it sought answers to the following questions:

1. What is the profile of science and mathematics supervisors and teachers in Eastern Visayas as regards

   1.1 age?

   1.2 sex?

   1.3 educational background?

   1.4 number of years of teaching science and/or mathematics?

   1.5 science and mathematics related seminars and training programs attended in the last five years.

2. What is the achievement level in Science I and Mathematics I of secondary school students based on the Regional Test-All Results (RTAR) in the last three years?

3. Is there a significant relationship between the students' achievement level in Science I and their achievement level in Mathematics I as reflected by the

Regional Test-All Results (RTAR) during the last three consecutive school years?

4. As perceived by science and mathematics supervisors/head teachers and secondary schools teachers, to what extent is the integration of Science and Mathematics instruction necessary to first year high school students?

5. Is there any significant relationship among the perceptions of supervisors/head teachers and classroom teachers on the extent of necessity of integrating science and mathematics key concepts in the first year level?

6. What model for an Integrated Science I and Mathematics I Program (ISMP) can be developed based on the findings of this study?

Hypotheses

Based on the foregoing specific questions, the following null hypotheses were drawn:

1. There exists no significant relationship between the students' achievement level in Science I and their achievement level in Mathematics I as reflected by the Regional Test-All Results for last three consecutive school years.

2. There exists no significant relationship in the perceptions of supervisors/head teachers and classroom teachers on the extent of necessity of integrating science and mathematics key concepts in the first year level.

Theoretical Framework

This study is anchored on the Gestalt philosophy of learning cited by Gregorio (1976) in his book Principles and Methods of Teaching. According to this philosophy, learning involves change in behavior which causes a person to face subsequent situations differently.

The German word "gestalt" means pattern, shape form, or configuration. It implies that a set of stimulating circumstances takes place according to the relative value of various stimuli acting at the same time. This point of view recognizes that the whole is more than the sum of its parts. The central theme of the philosophy rests on the view that the conception of experiences at any given moment is determined by the totality of its related phases which constitute an integrated pattern or configuration. These configurations of experiences serve as the important units of behavior and adjustment. Configuration depends upon relationship rather than upon minute details of structure.

The Gestalt philosophy puts emphasis upon immediate experience, interaction, and the whole child. It suggests that the body responds the stimuli as body than as mere brain and nervous system. Thus, differentiation within the perceptual field is the basis of learning. Differentiation is the process of classifying and making precise those significant aspects of a situation that are formerly vague, unclear as part of the ground.

Gestalt philosophy puts emphasis on insights, generalization, integration, and their related principles. It stresses relationship of component parts and maintains that all parts are intimately interrelated and interdependent. Such point of view require the teacher to see the whole as it is more concerned with the unitary.

Gregorio (1976:137) notes that the Gestalt view has extended considerable influence upon educational procedures. The many defects of our school work may be attributed to the neglect of the integrative phase of learning. This conception prevails today in many schools and is accepted by many psychologist and educators. The consequences of the Gestalt theory are serious and far reaching in their effect on educational practice since learning must also be thought of as a process of problem

solving, a way of thinking, creating, generalizing or integrating.

The Gestalt theory regards learning as a process of directing activities toward some end or goal. In this process, the essential feature is the combining or integrating the elements involved as they are important to total situations.

Related to the Gestalt philosophy is the basic principle of learning which states that "learning is a process of integration." (Gregorio, 1976: 138). Learning is best when integration occurs in the learning process. Integration is a process which operates in the unifying of separates items into a perceptual whole. Through integration related experiences are organized or tied together into bonds of greater meaningfulness. It includes the ability to perceive similarities and to organize dynamic system into a unified whole. Some learning products are themselves an integration of similar elements. However, it can be said that integration alone is not the whole of learning.

Analysis, as well as synthesis, is essential in learning. Integration takes place concurrently with differentiation. Integration and differentiation are not

independent processes that operate separately without regard to the process. Differentiation, as one part of learning, is a preparatory process during which the learner engages in the process of distinguishing meaning from parts or situations in order to promote understanding. On the other hand, discovering relationship between situations is an important aspect of the integrating process. The more effective the integration is, the more functional is the learning process. The teacher must select appropriate learning experiences of the students to associate learning into larger and greater whole. Learning tends to unify individual experiences because the learner acts as a unit in his learning. Past experiences help for furnishing organized materials concepts, meaning and relation through the process of integration.

The principle also views learning as a cooperative process among teachers and students. An individual learns best when he can share cooperatively in selection, organization, and management of the learning experiences with his classmates under the guidance of the teacher.

This study also utilizes the principle of flexibility in curriculum design and development. If the curriculum must be flexible in point of time, then there are others

who think that it must also be flexible enough to suit the individual differences of students. Since individuality is of the ultimate nature of reality, no educational authority can make a uniform curriculum for a multitude of youngsters.

Brubacher (1978:172) contends that a number of educators seek integration in different directions. Instead of finding learning as ready-made in the logic of its universe, they form it around specific problems or centers of interests. Each new problem demands its own unique organization or integration to ensure solution. The organization or integration becomes useful for the next problem, but as to the extent to which the integration meets the demands of the new problem depends on the unique features of the new problem. Thus, a new integration occurs. Whichever way integration is approached in the curriculum leads ultimately to the realization that unified integration is the heart of the philosophic view of education.

This process of integration and reintegration is most evident in science and mathematics. As professor emeritus of Chemistry Westheimer, as cited by Diola (1995:2), points out:

> We need to teach enough so that our students are able to cope with the books that have yet to be written, and the ones that exist but have not been read with the economic principles that have yet to be formulated and, of course, with the science that has yet to be discovered.

Westheimer further observes that science is "more highly vertical" than the other areas, which means that specific prior knowledge is necessary for learning in science to continue. Thus, there is a sequence that must be followed-algebra depends on arithmetic, calculus on algebra, biochemistry on organic chemistry, mechanics on calculus.

Educators now become facilitators instead of being mere tutors. As Lonergan (1999:2) observes, teachers cannot hope to just teach a student. The teacher set the venue of learning and, most importantly, teaches the students how to look for knowledge. To this end, Diola (1995:3) adds that teachers must take up the task to improve their teaching, to uphold high standards and inculcate among students a better understanding of science and technology.

To achieve a better understanding of science and technology by using the foregoing theory and principles of learning and curriculum development, the researcher undertook the development of a model for the integration of

Science I and Mathematics I into one subject.

The proposed model is envisioned not only to enable teachers and administrators improve science and mathematics instruction and facilitate learning in mathematics and science, but likewise to help students take active participation in achieving skills and competencies required of secondary students by employing a pragmatic approach to learning.

Moreover, as proposed and viewed by the researcher, integration is relevant since mathematics is the "handmaid of all sciences." By actually using mathematics as a stepping stone in the understanding of science, the student is able to realize the importance of mathematics in unifying his study of science. This view applies vice-versa.

Conceptual Framework

While the Gestalt philosophy served as the heart of this study, a structure in the form of a conceptual paradigm was necessary not only to contain the rationale of the undertaking but more importantly to serve as a procedural blueprint during the actual research endeavor.

The paradigm shown in Figure 1.1 manifests the

blueprint of the entire study using the concept of pedagogical integration as anchorage.

The first frame represents the need to assess the existing conditions of science and mathematics instruction. The study utilized documentary analysis on Science I and Mathematics I performance of all secondary schools in the nine (9) schools divisions in Eastern Visayas.

From the identified schools, as shown by the second frame, sampled respondents of mathematics and science supervisors/head teachers and classroom teachers were pooled for perceptions on the need for, problems on, and solutions to the integration of learning competencies and skills in science and mathematics based on the Philippine Secondary Schools Learning Competencies (PSSLC) for Science I and Mathematics I.

In the third frame, the responses were compared, similarities and differences were identified and noted, and the perceived major areas of concerns served as inputs to the development of a model for the integration of Science I and Mathematics I as one subject in the secondary education program.

The result shown by the fourth frame aims to improve the competencies and skills of Science I and Mathematics I

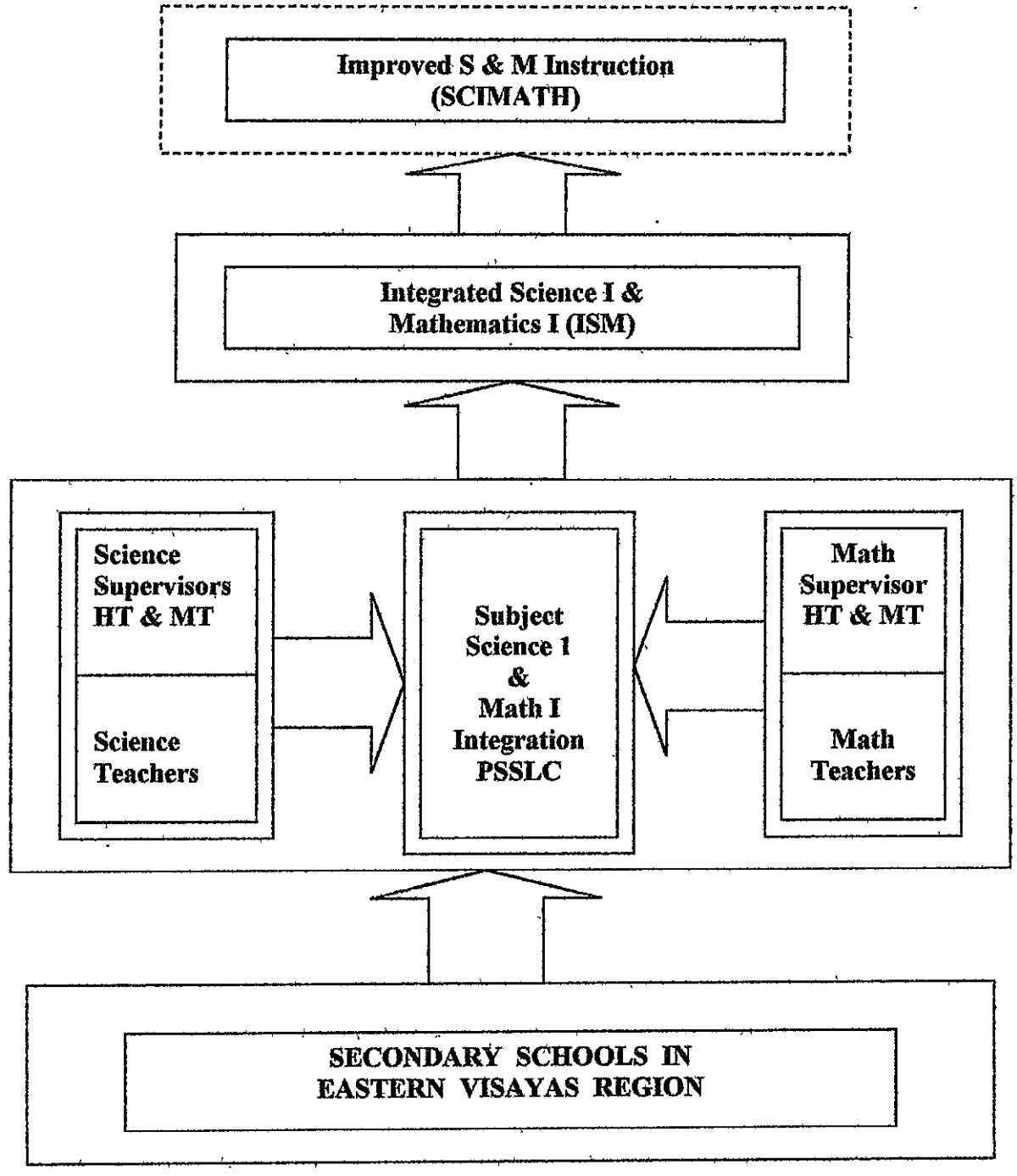

Figure 1. A Conceptual Paradigm of an Integrated Science I and Mathematics I Program

students through integrating Science I and Mathematics I key concepts. This will eventually lead to quality education.

Significance of the Study

This study was undertaken with the end view of benefiting high school students in Science I and Mathematics I. By proposing a model for an integrated one subject of instruction in lieu of the two subjects, the study targets the development of the instructional and manpower aspects in the teaching-learning process. The study responds to the challenge of raising the consistency of test results which indicate that high school students generally perform at twenty to thirty percent level of the required skills performance in science and mathematics among secondary schools of the four schools divisions in Samar island. By integrating key concepts in science and mathematics, in the first year level to say the least, performance level in the two areas becomes holistic.

On the part of school administrators and supervisors, the study is important because it is in the line with the education department's thrust to emphasize approaches that can improve the quality of instruction. As President

Estrada (1999) revealed his intentions in "modernizing science laboratories, improving science and mathematics education, and establishing regional centers of excellence in science and mathematics education," he likewise pointed out his immediate and preferential concern to allocate funds for these purposes. An improved performance in science and mathematics among students assures national attention and fund preference.

The present study also helps science and mathematics teachers discover integration as an important strategy to maximize learning in science and mathematics. The strategy affords them time to perform other educational functions since less time will be spent to teach the two interfacing disciplines. While the preparation appears tedious, once placed the proposed mechanism will provide the teachers opportunities for creative presentations and meaningful discussions in the classroom since a more pragmatic approach is employed.

The parents, on the other hand, will find the integration of the subjects more economical inasmuch as their children will be learning two skills in a single session. Less financial requirement for instructional materials and projects will be needed in the integrated

subjects.

As a whole, the results of the proposed study are viewed as addends to the repertoire of pedagogical knowledge for supervisors, principals, head teachers and subject teachers in science and mathematics to understand the integration of subjects in the teacher learning process. Societal benefits are likewise foreseen as interest in science and technology careers and boost the national manpower resource.

Scope and Delimitation of the Study

The study focused on the development of a model for the integration of Science I and Mathematics I as one subject. It entailed an analysis of the test-all performance results of schools in the nine (9) schools divisions in Eastern Visayas during the past three years, the demography and perceptions of the randomly selected supervisors/head teachers/classroom teachers on topics, problems, and solutions relative to the integration.

The study utilized the descriptive-developmental design since its concerns were to obtain information of the current status of phenomena, determine the nature of the situation as it existed at the same time of the study, and

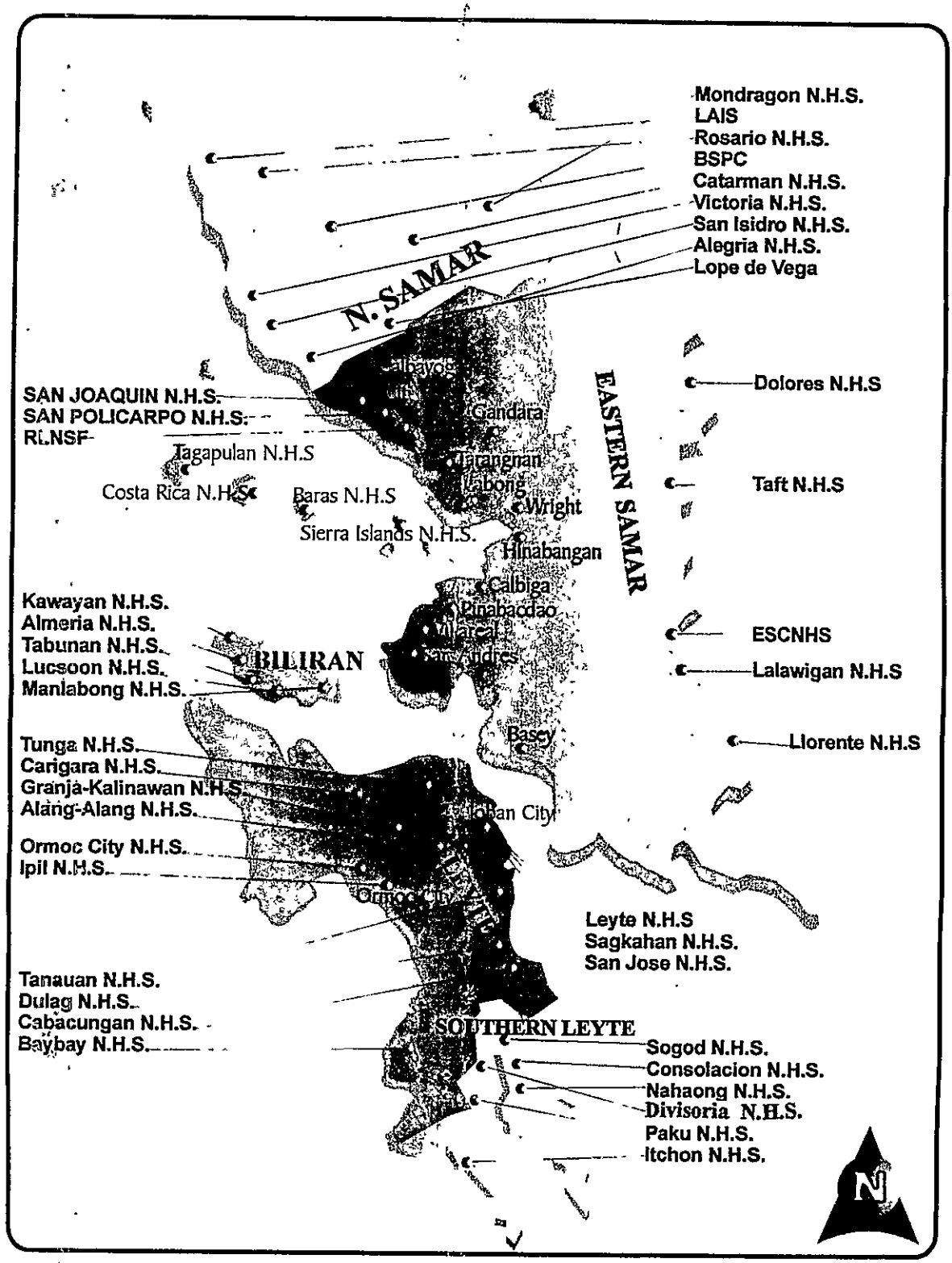

Figure 2. Map of Eastern Visayas Showing the Location of the Respondent Schools

develop a model based on the findings. Thus, in developing an integrated model for Science I and Mathematics I, the developmental design was employed.

A total of 351 respondents comprising 23 science supervisors, head teachers and master teachers, 160 secondary school teachers in science, 19 mathematics supervisors, head teachers and master teachers, and 149 secondary school teachers in mathematics served as sources of the data. They were randomly selected from the total population distribution of the nine (9) schools divisions of Eastern Visayas region.

In eliciting the needed data, a survey questionnaire was developed and validated using first year science and mathematics teachers of Samar National School in Catbalogan, Samar.

The data gathering procedures of the study included documentary analysis, personal interviews, and field survey.

The study was undertaken during the school year 1999-2000.

Definitions of Terms

For purposes of a common frame of reference, the

following terms are contextually and/or operationally defined:

Achievement test. The term refers to a test that measures present proficiency, mastery, and understanding of general and specific areas of knowledge (Kerlinger, 1986: 451). As used in this study, it is the summative evaluation conducted by the schools divisions to high school students for subjects under the SEDP program.

Division leader school. This refers to a secondary school whose area of specialization under the Secondary Education Development Program is (SEDP) focussed on Science and Mathematics.

Gestalt. According to Gregorio (1976: 127), the German word "gestalt" means pattern, shape form, or configuration.

Integration. According to Lardizabal (1995: 37), the term is pedagogically used to describe a teaching procedure, which relates varieties of subject matters to the units of study or to a problem solving situation. In this study, integration refers to the process by which Science I and Mathematics I are fused into a proposed subject in the first year of the secondary curriculum.

Integration program. As used in this study, it is the proposed model for the integrated Science I and Mathematics

I training program for teachers containing learning competencies common to both disciplines.

Learning competencies. These refer to the minimum learning competencies or skills to be developed in Science I and Mathematics I as contained in the Philippine Secondary Schools Learning Competencies Manual (1996).

Mathematics I. This refers to the first year mathematics subject contained in the New Secondary Education Curriculum (NSEC) with a total allotment per week of 200 minutes and an equivalent credit of one unit (Llagas, 1992).

Mathematical skills. These refer to the minimum learning competencies and skills in Mathematics I reflected in the PSSLC manual (1996).

Maximum cognitive performance. This refers to the knowledge gained by the integrating science and mathematics concepts.

Model. This refers to as an example of an integrated Science I and Mathematics I subject so called "Scimath", integrated topics through the PSSLC.

School capability. The term refers to human resource capabilities, fiscal capabilities, and physical resource capabilities of the learning institution.

Science I. This refers to the first year science and technology subject contained in the New Secondary Education Curriculum (NSEC) with a total allotment per week of 400 minutes and an equivalent credit of two units (Llagas, 1992).

Science skills. The skills which refer to the minimum learning competencies and skills in Science I reflected in the PSSLC manual (1996).

Test-all results. These are results of the evaluation by the DECS Division on secondary school students' achievement in all subject areas. In this study, the results cover the period 1997 - 2000.

Thinking skill development. As used in this study, thinking skill development refers to the thinking tools used by the teacher in integrating science and mathematics learning competencies.

Chapter 2

REVIEW OF RELATED LITERATURE AND STUDIES

With the end view of providing directions to the proposed study and enriching its content, the researcher reviewed relevant books, periodicals, magazines, official documents and reports, and other related researches on the subject of science and mathematics education and the process of integration.

Related Literature

Education Department Secretary Gonzales (DECS Post: 1999), as head of the Philippine delegation, pointed out during his presentation at the 34th SEAMEO Council Conference that he looked forward to enhance activities in the field of education, expanded language plans, tropical medicine, science and mathematics, history and cultural identity, and technical education in the next five years.

His concern for science and mathematics echoes the thrust of the Estrada Administration's Development Agenda (1999) contained in Memorandum Circular No. 7 which envisions to achieve "a more prosperous, equitable, and peaceful society through sustained growth, efficient and targeted programs to support the poor and vulnerable sectors

of society, and effective governance, particularly the pursuit of peace and order."

In pursuing this vision, science and technology play a cross cutting role in making the economic sector and social programs more effective and efficient. Science and technology increase productivity, provide economic opportunities, and help ease poverty. In fact, given the changing environment, science and technology offer a mode of wealth creation and distribution-the direct impact and benefits of scientific and technological capability.

The Master Plan for Basic Education (1995) covering the period 1996-2005 indicates that by the year 2005, Filipino students will be highly competitive in science and mathematics compared to students from other countries in terms of knowledge, skills and attitudes. Features of the strategies include a well thought-out and relevant curriculum in science and mathematics for secondary and elementary students; an effective program for recruiting, employing, training, and recognizing good mathematics and science teachers who can significantly contribute to the country's development. The plan likewise provides incentives to high performing secondary students in order to attract them to take mathematics, science and technology courses in college.

Santiago (1997) shares that the DECS envisions an education that nurtures, and articulates the best of today. Utilizing the fullest potentials of an individual is the only sure way of achieving such vision. Education, he adds, is at the forefront in utilizing the learner's fullest potentials by developing and enhancing his full social intelligence.

But how is the teaching-learning process made meaningful for basic quality education? Literature on the process classify three significant factors for an effective teaching-learning process: the teacher, the learner, and the teaching-learning situation. These factors are elucidated by Tating (1993), Afunggol (1996), and Navarro (1997).

Tating (1993), further adds that educational effectiveness depends to a great extent on teacher effectiveness. Since most teaching throughout the world, he asserts, takes place in classrooms, what the students learn from the predominantly group-oriented teaching is to a large extent as classroom management, the setting pattern, the type of diversity of the student population, and the availability of science equipment and materials, which instill scientific preparations in the classroom conditioned by the students. All these factors comprise the set of step-

by-step "frame factors" teachers has to strive if only to perform effectively in their craft.

Afunggol (1996), talking about his project, Rescue Initiatives for Science Education (RISE), admits that the level of performance of Filipino students in science and mathematics hardly improves despite the various educational interventions and reforms. He contends that science education has yet to reach a level of structure that is capable of improving student performance in science and mathematics. If present trend continues, he observes, the may not have the quantity and quality science technology human resources needed for its development efforts.

As to the curriculum , Navarro (1997) observes that the need for an alternative learning system for a large number of Filipinos who are deprived of useful scientific knowledge and information is evident. The country's level of scientific literacy leaves much to be desired and a visible science culture is lacking. She identifies low quality of science learning from schools as a major factor for the deplorable condition.

Navarro (1997) notes that the delivery system of the formal basic education focuses on equipment and facilities. Despite the emphasis, however, facilities, especially in small rural areas, are inadequate and sub-standard. Research

findings indicate that the condition is true in all levels-primary, secondary, and tertiary-and that inadequate facilities and instructional materials are related to unsatisfactorily student performance.

The review of the foregoing literature indicates the importance of science and mathematics to the country's development efforts. The literature likewise point out the sordid condition of science and mathematics education that persist today.

A greater part of improving the teaching-learning process in science and mathematics lies in the introduction of innovative strategies that would help students realize the importance of science and mathematics in everyday life. One such strategy, which is the subject of the present undertaking, is integration.

Integration is one of the more widely used educational techniques to achieve unity. The word "integrated" means a functioning of a unified whole (Lardizabal, 1995: 57). To ascribe integration to a program or a system is to maintain its unified totality.

According to Elevazo (1995: 84), the parts of an integrated program or system are so interrelated and coordinated that each is necessary and contributory to the unity of the whole system. He added that its product is also

an integrated human being for a unified effect on his personality.

Integration as a concept of organization is seen in different ways. Lardizabal (1995) in her book, Principles and Methods of Teaching, posits that educators appear to use the concept of integration in several contexts. She notes that psychologically, integration is the term employed to denote the educator's concern for the total personality of the learner; pedagogically, integration is used to described a teaching procedure which relates varieties of subject matter to units of study or to problem solving situations; and sociologically, it is utilized to designate the desired relationship between individuals as interacting personalities, an individual and the organized institution of society, or an organized institution (such as the school) and other institutions involved in the complex nature of culture.

The foregoing literature point out that integration as a technique is a means of achieving both the personal and social coherence of the individual. However, as Elevazo (1995: 87) opines, the technique can work effectively only in an integrative curriculum where learning opportunities are organized to promote integration or wholeness in the learner.

Integrative teaching is concerned with the development of a well-rounded personality that can adjust and respond to situations in a meaningful way (Lardizabal, 1995: 83). The integrative technique transform the classroom into a democratic workshop wherein the teacher and students work together in solving the problem. While the cooperation, it requires that the teacher must know the students' psychology. Success in the use of this technique depends on the teacher's thorough and complete understanding of the principles of the teaching and learning process.

Pleacer (1998) posits that students learn must effectively if they are able to apply inquiry and problem solving skills to problems that emphasize practical applications. As he observed, many experts stress connecting chemistry to other disciplines, such as mathematics, and modeling word problems to real - world situations. He makes a connection between mathematics and chemistry since knowledge of mathematics means more than just memorizing information or facts. It also requires the ability to use information to reason, think, and solve problems which is the realm of science.

On the other hand, Davidson (1994) in his book Mathematical Methods for Introductory Physics with Calculus integrates mathematics and physics. He notes that students

who enter in an introductory level course in physics frequently finds themselves unable to keep pace because of lack of familiarity with the necessary mathematical tool. Such students experience difficulty acquiring the requisite of mathematical background for physics because mathematics is not integrated in physics. His book integrates the appropriate calculus topics with the corresponding physics concepts to allow the students to familiarize and connect the mathematical methods required in the concepts.

Considering the foregoing literature and as the thesis of the present study, mathematics is best integrated in the sciences such as chemistry and physics since it is needed in the understanding of scientific concepts.

Related Studies

To give substance to the research undertaking, the researcher likewise reviewed several studies dealing with science and mathematics education.

In her study on the performance profile of grade school examiners in science and mathematics of the Center of Educational Measurement, Sampang (1997) found out that there is a downward trend in scores across grade levels as well as connective skills in both science and mathematics. The higher the grade, the lower is the mean score. She interprets this as a function of increasing difficulty and

complexity of the subject areas as they progress along the grade level from grades one to six.

Similarly, Rostubog's (1993) study on factors related to students ratings on teacher effectiveness in science and mathematics reveals that in teaching methodology with perceived strictness-leniency, students expected grades, level of interest, and perceived course difficulty are significantly correlated with student ratings. These factors emerged as significant predictors of students performance. Citing Peck and Tucker, Rostubog suggested that teachers should established a relaxed and conducive atmosphere in class characterized by fewer directions, less criticisms and authority, and negative feedback. He also added that teachers should possess warmth democratic attitude especially when enforcing rules and regulations in class.

Hamcheck, Travers and Rebore (1995) likewise suggested that it is essential for teachers to explain the rationale as well as the importance why such rules and regulations are being implemented. If done correctly and properly, students will most likely know the expectations of their teachers.

The studies of Sampang, Rostubog, Hamcheck, Travers and Rebore have bearing on the present study because they identify areas of students' difficulty in science and mathematics instruction afford the present study with the

parameters of an effective teaching-learning situation. These parameters provide directions in a curricular program for an integrated Science I and Mathematics I instruction.

The study of Balicot (1996) is similar to this study because it deals with the relationship of students' achievement in Science, Mathematics, and Technology and Home Economics (THE). Balicot's findings reveal that the teaching of science and mathematics based on the Desired Learning Competencies (DLCs) is directly related to the teaching of THE. Science and mathematics influence learning in THE as evidenced by the high degree of correlation that exist between science and THE, and between mathematics and THE. The study recommends that science and mathematics instruction based on DLCs should be taught intensively in order, for these two subjects are instrumental in learning THE. Moreover, teachers should simplify difficult concepts in science and mathematics in order to make abstract ideas concrete so that they are within the grasp of the regular student. Teachers teaching science, mathematics, and THE should sit together to identify the science and mathematics skills important and needed in learning THE so that strategies can be adopted to enhance the transfer of learning from science and mathematics to THE.

In a similar study on correlates of achievement, Nuñez (1993) reveals that there is no significant difference between the attitudes of the students from public and private schools toward chemistry with respect to course content, teaching methods, and instructional materials. On the other hand, there is a significant difference between the public school teachers perception of students expressed attitudes towards chemistry course content and teaching methods. The study recommends an in-service training for chemistry teachers to upgrade their competencies relative to the content and strategies of teaching. Furthermore, they are encouraged to used varied teaching strategies to make science learning more effective and meaningful.

The present study uses Nuñez's findings and recommendations as it developed a model program on the integration of content and strategies in science and mathematics.

In her study on students' mathematical abilities, Daca (1997) reveals that the mathematical reasoning abilities of freshmen students are unsatisfactorily below average, their computational abilities are average, while their mathematical abilities are high. The student with high achievement score in mathematical vocabulary likewise has a high achievement score in mathematical reasoning. As shown

by the study, mathematical reasoning is related to or is affected by the computational ability of the students. In general, those who obtained high achievement score in problem-solving also obtained high achievement score in mathematical vocabulary. Thus, mathematical vocabulary affects students' problem solving activities.

Daca's study provides a high evidence of significant relationship between achievement score in mathematical vocabulary and reasoning and in problem solving and computational skills which are required competencies in science.

Sharing the same concern, Labine (1996) found out that the mathematical abilities of SNS freshmen special class students fall under the category of average competency. They encountered learning difficulties addition dissimilar fractions, divisions of fractions, changing fraction to percent , finding rate of discount, quadrilateral angels, side of polygons, circumference of spheres, and volumes of given rectangular solids. The difficulty can be attributed to the highly abstract nature of the lesson that could be further illustrated by integrating them with concepts in science.

The teaching methods employed in the teaching learning process have also been the subject of several studies on the student achievement in science and mathematics.

Llarenas (1992) pointed out that elementary science instructional strategies employed by teachers of Calbayog City Division are limited and need improvement. She concludes that different techniques and approaches must maximally be utilized in teaching science.

Teachers, on the other hand, are significant factors in the mathematical achievement of students as shown by the following studies.

Bernales (1996) showed that there is significant relationship between the teacher's test performance and his undergraduate degree, undergraduate major, number of mathematics unit earned, teaching experience, in-service training, number of teaching preparations and attitude towards the present secondary mathematics program.

There is also a significant difference between the knowledge competencies possessed by mathematics teachers in relation to school location.

Oliva (1991), in her study on the competencies of chemistry teachers, reveals that in Eastern Visayas, there appears an acute shortage of chemistry teachers with appropriate educational qualification and training. The

chemistry teachers are not fully confident of their knowledge of chemistry concept and because of this, students find difficulty in learning chemical concepts. The study underscored the need to teach chemistry teachers teaching strategies, content and assessment techniques for concept and skills since the teachers claim they lack competency.

This leads to training teachers in their own field with science. Mathematics education rides a similar boat.

The study of Pacolor (1993) showed that some Mathematics IV teachers in Samar island have inadequate content knowledge in subject they are teaching. The same study noted that fourth year secondary students have inadequate mathematical skills. He then recommended for the training of mathematics teacher on content, teaching strategies and assessment techniques is highly imperative.

Pacolor (1993) reveals similar findings with Oliva (1991) when he concluded his dissertation on the determinants of achievement in mathematics of fourth year secondary students in Samar island. He found out that Samar lacks mathematics teacher with appropriate educational qualifications. Some mathematics teachers have inadequate content on the subject matter they are assigned to teach. They fall under the average achievement level. The fourth year secondary students have inadequate mathematical skills.

These are skills in the use of concepts, theorems, logarithms, rules, principles, relationship between students achievement in mathematics and teachers content knowledge and attitude.

Through the findings of these studies, the present study finds merit in developing a model for teacher training as component of an integrated science and mathematics program for first year high school students in the secondary schools of Eastern Visayas.

Moreover, the cited studies reveal a considerable student difficulty in specific subject areas either because the subject is too discipline-oriented that they cannot establish a functional value for the subject matter or the teaching strategies employed are inconsistent with the other learning factors predominantly existing in the teaching-learning situation.

Chapter 3

METHODOLOGY

This chapter discusses the methods and procedures employed by the researcher in the conduct of the present study. The discussions include research design, research instrument used and its validation, sampling procedure, data gathering procedures and statistical treatment of the gathered data.

Research Design

The descriptive-developmental research design was used in this study since descriptive research is designed to obtain information concerning current status of phenomena and is directed toward determining the nature of the situation as it exists at the same time of the study.

In adopting the design, the researcher was able to gather information regarding prevailing conditions, relationships that exist, practices that prevail, and trends that are developing vis-a-vis science and mathematics instruction in secondary schools.

The descriptive-developmental research design likewise allowed the generation of adequate data that were used in

proposing an integrated science and mathematics program for first year secondary students (ISMP).

In gathering the needed data the researcher used the validated survey questionnaire and the regional test- all results (RTAR) as the instruments. The data were gathered by division leader schools. The researcher personally administers the questionnaire to the four groups of respondents for facility in the retrieval. The correlation coefficient and the Fisher's t-test were computed in order to answer the problems raised in this study.

Instrumentation

The pertinent data and information needed in the study were gathered using the Regional Test-All Results (RTAR) and a validated survey questionnaire developed by the researcher. The following are brief descriptions of the instruments and, in the case of the questionnaire, the manner by which it was validated.

Regional Test-All Results (RTAR). As instrument to determine the achievement level in Science I and Mathematics I of secondary students in Eastern Visayas, the Regional Test-All Results were used. The means for the divisions were determined for each school year, from 1995-

1996 to 1997-1998. Data for school year 1998-1999 were not yet available at the time the study was conducted. The results were subjected to documentary analysis.

Survey Questionnaire. The questionnaire contained three parts, namely: Part I - General Information and Respondent's Profile; Part II - Perceptions of respondents on the extent to which learning competencies in Science I can be integrated with learning competencies in Mathematics I and vice-versa; and Part III - Other topics in Science I and/or Math I that can be integrated with the other.

A Likert-type five-point scale was used in the survey questionnaire to determine the ranges assigned to the respondents' perception for integration of Science I and Mathematics I PSSLC. The following mean ranges, numerical weights and corresponding descriptive interpretation were used to describe the data:

Mean Range	Numerical Weight	Interpretation
4.51 - above	5	To a Very Much Extent
3.51 - 4.50	4	To a Much Extent
2.51 - 3.50	3	To Some Extent
1.51 - 2.50	2	To A Little Extent
1.50 - below	1	Do Not Use Integration

Validation of the Instrument

The questionnaire, the main instrument in gathering the data was validated. The researcher in validating the questionnaire undertook the following steps. The initial draft of the instrument was submitted to the research adviser and three other experts for content validation. The questionnaire was revised incorporating the suggestions of the experts. It was then piloted at the Samar National School, using 24 Science and Math Teachers as respondents.

An evaluation sheet with ten criteria was accomplished by each of the 24 respondents. Using a rating scale of 1 to 5, with 1 as strongly disagree and 5 as strongly agree, an average weighted mean of 4.17 was obtained. Thus, the respondents collectively "agree" that the survey questionnaire conform to the criteria for validity.

The reliability of the questionnaire was determined using the Test-Retest Method by the respondents composed of 2 supervisors, 2 head teachers, 4 master teachers and 16 secondary school teachers. The respondents used in validating the questionnaire were not the selected respondents of the study.

In this method, the researcher computed the correlation coefficient between the two administration of

the test. If r were high the measurement would be consistent and the instrument would be reliable. The computed correlation coefficient of 0.72 was obtained. This reliability coefficient, according to Ebel's interpretation, is rather low, adequate for group measurement. Ebel's interpretation indicates that values below 0.70 is low, which is entirely inadequate for individual measurement, however, useful for group average and school survey.

Sampling Procedure

The study population encompasses 100 division supervisors, 200 head teachers, and 500 classroom teachers in science and mathematics in the entire Eastern Visayas region.

Four (4) groups of respondents were taken under the following categories: a) Mathematics Supervisors Group composed of Division Supervisors, Head Teachers and Master Teachers in Mathematics; b) Mathematics Classroom Teachers Group composed of Secondary School Teachers I, II, and III in Mathematics; (c) Science Supervisors Group composed of Division Science Supervisors, Head Teachers and Master Teachers in Science; and d) Science Classroom Teachers

Group composed Secondary School Teachers I, II, and III in Science.

The study sample involved 23 science supervisors, head teachers and master teachers, 160 secondary school teachers

Table 3.1 Sources of Data

Division	: National High Schools
Biliran	Lucsoon, Almeria, Tabunan, Kawayan, Caiberan
Calbayog City	San Policarpo, San Joaquin, RLMSF
Eastern Samar	ES Comprehensive School, Lalawigan, Llorente, Dolores
Leyte	Dulag, Alang-alang, Tanauan, Carigara, Tunga, Granja-Kalinawan, Baybay, Cabacungan
Northern Samar	Bobon Philippine School of Craftsmanship, Lavezares Agro-Industrial School, Catarman, Rosario, San Isidro, Victorias, Alegria, Lope de Vega
Ormoc City	Ormoc City, Ipil
Samar	Basey, Calbiga, Hinabangan, Wright, Jiabong, Gandara, Villareal, Pinabacdao, Costa Rica, Sierra Island, Tarangnan, Tagapul-an, San Andres, Baras
Southern Leyte	Itchon, Consolacion, Divisoria, Nahaong, Paku, Sugod
Tacloban City	Leyte, Sagkahan, San Jose

in science, 19 mathematics supervisors, head teachers and master teachers, and 149 secondary school teachers in mathematics comprising a total of 341. They were randomly selected from the total population distribution of the nine (9) schools divisions of Eastern Visayas region. The sample was determined from the Division Leader School and the most populated schools in each division.

Respondent distribution by division is as follows: 21 from Biliran, 15 from Calbayog City, 44 from Eastern Samar,77 from Leyte, 49 from Northern Samar, 20 from Ormoc City, 51 from Samar, 36 from Southern Leyte, and 38 from Tacloban City. The number of respondents for each division was determined using Sloven's formula for sample size. Table 3.1 details the sources of data.

Data Gathering Procedures

The researcher asked permission from the Regional Director of DECS, Region VIII to administer the survey questionnaire to the respondents of the study - division supervisors, head teachers and teachers in Science I and Mathematics I.

He again secured the permission to administer the said questionnaire from the division superintendents of the nine

divisions in the region. After permission was sought, the researcher distributed the questionnaire to the division supervisors by division.

Also, the researcher personally distributed the survey questionnaires to the head teachers by division in the different schools identified in Table 3.1.

For the science and mathematics teachers, the researcher visited the identified schools to distribute the questionnaire. Some questionnaires were given during the Sci-Damath and Damath competitions held at Maydolong Agricultural School and during the Regional Science Fair at Samar Regional School of Fisheries, because a group of science and mathematics teachers were present during the said activity.

The researcher retrieved the survey questionnaires by division. The Regional Test -All Results (RTAR) was secured from the DECS Regional Office.

Statistical Treatment

In trying to answer the problems raised in this study, the accomplished questionnaires were separately arranged according to the four groups of respondents. Responses to the items in the questionnaires for Part I were tallied and

frequency were taken on age, sex, educational background, teaching experience in teaching science and/or mathematics, and seminars and training programs attended. Percentages were used in analyzing the obtained data. Similarly, a tally of the responses in Part II for each group was made and the frequencies for the different indicators for each item in the questionnaire were also determined. This was done in order to compute for the weighted mean of each item. The weighted mean was used as the basis for determining the perceived degree of integrating science and mathematics. To measure the extent of necessity of integration of the learning competencies in Science I and Mathematics I, a ranking was made on the key concepts in the first year level. The following scale was used in interpreting the extent of integration of each item listed in the questionnaire.

Weighted Mean Range	Interpretation
4.51 - above	To a Very Much Extent
3.51 - 4.50	To Much Extent
2.51 - 3.50	To Some Extent
1.51 - 2.50	To A Little Extent
1.50 - below	Do Not Use Integration

To determine the relationship of Science I and Mathematics I as perceived by the respondents as to need for integration (hypothesis no. 2) the correlation was computed for each group. The formula for r is:

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{\Sigma X^2 - (\Sigma X)^2}\sqrt{\Sigma Y^2 - (\Sigma Y)^2}}$$

where:

N = total number of observations

ΣX = the sum of the data of the predictor or independent variable

ΣY = the sum of the data of the dependent variable

ΣX^2 = the sum of the squared values of the predictor or independent variable

ΣY^2 = the sum of the squared values of the dependent variable.

The significance of the computed coefficient of correlation was determined using the Fisher's t-test. The following formula for Fisher's t-test was used:

$$t = r \sqrt{\frac{N - 2}{1 - r^2}}$$

where:

t = test of significance

r = the computed correlation

N = number of respondents

To test hypothesis number 1 of the study; the test-all results for the last three consecutive school years were subjected to documentary analysis.

The mean and the mean percentile score (MPS) were computed for each of the nine divisions test-all results in Science I and Mathematics I for three consecutive school years starting school year 1995-1996 up to school year 1997-1998. Data for school year 1998-1999 was not yet available during the time of the study. The obtained mean in achievement in the RTAR is interpreted based on the following scale:

Mean Rating	Interpretation
80 - 100	Outstanding
60 - 79	Very Satisfactory
40 - 59	Satisfactory
20 - 39	Fair
0 - 19	Poor

To determine if there is significant relationship between the achievement level in Science I and the achievement level in Mathematics I as revealed by the RTAR the correlation and the Fisher's t-test were computed for each school year for three consecutive school years.

The degree of relationship can be determined by the size of the obtained r. Interpretations of the obtained r by Ebel is shown below:

Reliability		Degree of Reliability
0.95 - 0.99	-	Very high, rarely found among teacher's made tests.
0.90 - 0.94	-	Highly equaled by few test.
0.80 - 0.89	-	Fairly high, adequate for individual measurement.
0.70 - 0.79	-	Rather low, adequate for group measurement but not very satisfactory for individual measurements.
Below 0.70	-	Low, entirely inadequate for individual measurement although useful for group average and school survey.

Using MICROSTAT computer software for data analysis facilitated the computations.

Chapter 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter presents the collected data in tabular form for easy reference, together with the findings, analysis of results, and interpretation of the data.

To answer the specific questions raised in the study, data from the survey questionnaires were collated, tallied, subjected to statistical tests, and the results analyzed and interpreted.

The presentation of data follows the sequence of the specific problems posed in the study.

Profile of Respondents

Demographic data relative to the profile of the respondents were organized into five categories, namely, respondents as to age, sex, educational attainment, teaching experience, and seminars and training programs attended.

Respondents as to age. Table 4.1 shows the respondents' distribution by schools division as to age. Of the nine divisions, Eastern Samar has the highest number, 10

out of 44 of the respondents, belonging to the age bracket "greater than 50". Tacloban City and Leyte divisions followed close behind with 6 of 38 and 11 of 77, respectively. For age bracket "41 to 50," Calbayog City division has the most frequency at 9 out of 15 respondents, while Tacloban City, Northern Samar, and Eastern Samar tail behind with almost 30% of their respondents falling under this age bracket. The division of Southern Leyte, with 56% of its respondents, leads the "31 to 40" bracket followed by the divisions of Ormoc City at 44% and Leyte at 40%. The divisions with most respondents "under 30" consist of Biliran, Samar, and Northern Samar, with 38%, 37%, and 32% respectively, of respondents belonging to this age bracket.

Table 4.1 Distribution of Respondents by Age (in Years)

	Age in Years				
Divisions	> 50	41-50	31-40	< 30	Total
Biliran	2	4	7	8	21
Calbayog City	2	9	2	2	15
Eastern Samar	10	13	12	9	44
Leyte	11	17	31	18	77
Northern Samar	3	15	15	16	49
Ormoc City	3	4	11	2	20
Samar	3	15	14	19	51
Southern Leyte	2	6	20	8	36
Tacloban City	6	12	10	10	38
Total	42	95	122	92	351

As implied by the data on age distribution, Eastern Samar and Leyte have the "oldest" while Biliran, Samar, and Northern Samar possess the "youngest" science and mathematics teachers.

Collectively in Eastern Visayas as indicated by the data, most science and mathematics teachers have ages ranging from 31 to 40 years old, or roughly 35% of the respondents, indicating a workable age level which will require further training and seminars to upgrade their competencies.

Respondents as to Sex. As to gender distribution, 268 of the 351 respondents were females while 83 were males. This is reflective of the prevailing trend that a greater percentage of women are into education than men. Thus, the same observation can be said about science and mathematics teachers in Eastern Visayas.

Respondents as to Educational Attainment. As to the educational attainment of the respondents, Table 4.2 shows that the division of Calbayog City has the greatest percentage (20%) of MA graduates, followed by Ormoc City (15%), Samar (14%) and Tacloban City (13%). Most

respondents from Eastern Samar, Samar and Southern Leyte respondents have finished or acquired certificate of academic requirement (CAR). Respondents from Southern Leyte, Ormoc City and Eastern Samar divisions have the most number of MA units earned. On the other hand, the divisions of Calbayog City, Leyte and Biliran have the most teacher-respondents without graduate units.

Likewise Ormoc City had a great potential because of their high educational attainment and a low percentage of "No MA units." Leyte and Biliran respondents shows to need more training due to lack of MA units earned. Most of the respondents have MA units or earned more than 50%.

Table 4.2 Distribution of Respondents by Educational Attainment

Divisions	MA	CAR	MA Units	No MA Units	Total
Biliran	1	1	11	8	21
Calbayog City	3	0	6	6	15
Eastern Samar	4	8	26	6	44
Leyte	6	5	36	30	77
Northern Samar	5	6	28	10	49
Ormoc City	3	2	12	3	20
Samar	7	7	26	11	51
Southern Leyte	2	5	24	5	36
Tacloban City	5	4	22	7	38
Total	36	38	191	86	351

Respondents as to Teaching Experience. Table 4.3 shows the distribution of the respondents as to teaching experience. Most respondents from Eastern Samar, Ormoc City and Samar divisions have teaching experiences of 20 years and above. Most teachers in the divisions of Calbayog City, Southern Leyte and Ormoc City have teaching experiences ranging from 11 to 20 years. On the other hand, Biliran, Northern Samar, Southern Leyte, have more teachers whose experiences in teaching are less than or equal to 10 years.

Collectively taken, most of the respondents have less than ten years of teaching experiences or they are rather new in the job which implies that their knowledge in terms of strategies in teaching math and science are the recent one.

However, there is still a need to send them to seminars and training in teaching science/mathematics because the advancement in science and technology has brought about changes in the educational system just recently. The educational objectives and trust is toward global competitiveness which implies that young and old teachers should do their share in shaping and training the minds of our students. This would mean additional training and in-service seminars in the teaching of these subjects.

Table 4.3 Distribution of Respondents as to Teaching Experience (in Years)

Divisions	>20	11 to 20	< 10	Total
Biliran	2	6	13	21
Calbayog City	1	8	6	15
Eastern Samar	12	12	20	44
Leyte	15	29	33	77
Northern Samar	6	17	26	49
Ormoc City	5	8	7	20
Samar	10	19	22	51
Southern Leyte	2	16	18	36
Tacloban City	9	14	15	38
Total	38	191	86	351

Respondents as to Seminars and Training Attended.

Table 4.4 shows the distribution of respondents as to attendance in seminars and training during the last five years. Respondents from Samar division have attended more training and seminars. They are followed by those from Calbayog City, Southern Leyte and Eastern Samar in the "greater than 5 seminars/training attended" category. The data imply that the potential trainers may be found in these divisions. On the other hand, Leyte, Eastern Samar and Biliran divisions have the most respondents to have no training in science and mathematics during the last five years. Respondents from Calbayog City, Ormoc City, and

Southern Leyte have three (3) to five (5) training programs attended more than the other divisions in the last 5 years. Biliran, Northern Samar, Eastern Samar and Tacloban City respondents signified attendance in less than three training programs.

Analyzed collectively, most of the respondents, 28% of them, have attended from 3 to 5 training programs for the last 5 years; 27% of them have less than 3 training programs while the same number of them have had no training at all. Thus, more than 50% of the respondents require more training and seminars.

Table 4.4 Distribution of Respondents as to Number of Training Programs and Seminars Attended in the Last Five Years

Divisions	>5	3 to 5	< 3	No Training	Total
Biliran	2	3	10	6	21
Calbayog City	3	7	4	1	15
Eastern Samar	8	9	14	13	44
Leyte	13	22	17	25	77
Northern Samar	7	12	17	13	49
Ormoc City	3	8	4	5	20
Samar	15	15	11	10	51
Southern Leyte	7	11	9	9	36
Tacloban City	6	10	12	10	38
Total	64	97	95	95	351

Achievement Level of First Year Secondary Students

To determine the achievement levels in Science I and Mathematics I of secondary students for the last three consecutive school years, the results of the Regional Test-All were used.

Table 4.5 shows the mean scores in Science I and Mathematics I of first year students of the nine schools divisions in Eastern Visayas for the last three consecutive school years.

The RTAR in Science I for each of the nine divisions during the last three years reveal the following:

Table 4.5 RTAR Means for Science and Mathematics I
Source: DECS Regional Office VIII

Divisions	Science I			Mathematics I		
	1995-1996	1996-1997	1997-1998	1995-1996	1996-1997	1997-1998
Biliran	52.35	58.18	60.68	47.64	39.31	43.63
Calbayog City	47.39	53.59	61.15	48.89	41.80	51.75
Eastern Samar	54.28	63.14	67.91	50.19	49.66	53.74
Leyte	46.10	58.06	57.82	39.23	43.58	41.30
Northern Samar	58.49	56.80	59.72	59.14	50.09	48.79
Ormoc City	52.99	65.72	64.75	49.59	45.65	54.99
Samar	55.08	58.55	55.18	57.16	54.33	53.96
Southern Leyte	54.86	64.09	63.73	52.54	48.33	46.68
Tacloban City	51.96	64.19	68.36	50.14	46.81	50.50
Total	473.50	542.32	559.30	454.52	419.56	445.34

1. In 1996, Northern Samar division ranked first followed by the divisions of Samar and Southern Leyte. Ormoc City division ranked first in 1997, followed by the divisions of Tacloban City as second and Southern Leyte as third. In 1998 Tacloban City ranked first followed by Eastern Samar, then Ormoc City.

2. Ranking of the average performances of the nine divisions during the last three years ranked Eastern Samar as number one, followed by the Tacloban City division and Ormoc City division. Southern Lye and Northern Samara division performances were on the upward trend while the performances of the Billiard, Samar, Calbayog City and

Table 4.6 Division Ranking by RTAR Means in Science I

Divisions	Science I							
	1995-1996	Rank	1996-1997	Rank	1997-1998	Rank	Ave.	Rank
Biliran	52.35	5	60.68	4	39.31	4	43.49	8
Calbayog City	52.35	5	60.68	4	39.31	4	43.49	8
Eastern Samar	52.35	5	60.68	4	39.31	4	43.49	8
Leyte	52.35	5	60.68	4	39.31	4	43.49	8
Northern Samar	52.35	5	60.68	4	39.31	4	43.49	8
Ormoc City	52.35	5	60.68	4	39.31	4	43.49	8
Samar	52.35	5	60.68	4	39.31	4	43.49	8
Southern Leyte	52.35	5	60.68	4	39.31	4	43.49	8
Tacloban City	52.35	5	60.68	4	39.31	4	43.49	8
Total	52.35	5	60.68	4	39.31	4	43.49	8
MPS	52.35	5	60.68	4	39.31	4	43.49	8

Leyte divisions were on downward trend. There was a consistent performance in science by the divisions of Biliran, Southern Leyte, Eastern Samar and Leyte to low in performance.

3. The average achievement level for the last 3 years in Science I is 58.34. The RTAR in Mathematics I (Table 4.7) for each of the nine divisions during the last three consecutive school years reveal the following:

1. There is a decreasing trend from 1995 -1996 to 1996-1997. In 1996, Samar division ranked first followed by Northern Samar and Southern Leyte divisions. Though there

Table 4.7 Division Ranking by RTAR Means in Mathematics I

Divisions	Mathematics I							
	1995-1996	Rank	1996-1997	Rank	1997-1998	Rank	Ave.	Rank
Biliran	47.64	7	39.31	9	43.53	8	43.49	8
Calbayog City	44.89	8	41.80	8	51.75	4	46.15	7
Eastern Samar	50.19	4	49.66	3	53.74	3	51.20	3
Leyte	39.23	9	43.58	7	41.30	9	41.47	9
Northern Samar	59.14	2	50.09	2	48.79	6	52.67	2
Ormoc City	49.59	6	45.65	6	54.99	1	50.08	4
Samar	61.16	1	54.33	1	54.06	2	56.52	1
Southern Leyte	52.54	3	48.33	4	46.68	7	49.18	5
Tacloban City	50.14	5	46.81	5	50.50	5	49.15	6
Total	454.52		419.56		445.34		439.81	
MPS	50.50		46.62		49.48		48.87	

was a decrease in performance in 1997, Samar division still ranked first. Northern Samar division ranked second while Eastern Samar division was third. In 1998, Ormoc City division ranked first, Samar division was second while Eastern Samar division was third.

2. There was a decreasing trend from 1996 to 1997 in terms of division performance. In 1998, Ormoc City, Samar, Eastern Samar, Tacloban City and Calbayog City divisions obtained mean percentage scores (MPS) way above the average MPS. The divisions of Northern Samar, Southern Leyte, Biliran and Leyte were on downward trend. The low performance of the foregoing divisions in RTAR in Mathematics I may be attributed to factors that contribute to students' Mathematics achievement, which these divisions had failed to consider and strengthened.

3. The achievement level of Mathematics I for the last three consecutive years was 48.87. Samar was consistently on top in terms of the performance of students in Mathematics I. Following the Samar division were divisions of Northern Samar and Eastern Samar. Leyte and Biliran were also consistent as the last two divisions in Mathematics I performance.

Relationship Between RTAR in Science I and Mathematics I

Table 4.8 shows the means and standard deviations for Science I and Mathematics I RTAR respectively for each school year.

Comparison of the means and standard deviations in Science I for each school year shows an increasing trend. The average mean performance is improving while the standard deviation indicates an increasing dispersion of the scores from the central value or average score.

On the other hand, the means for each school year in Mathematics I show a decreasing trend. The means indicate that in 1997 it decreased yet in 1998 it increased. It, however, did not reach the base line performance in 1996. The standard deviations show that scores in Mathematics I are highly dispersed, that is, the scores are further from the mean than the Science I scores.

Table 4.8 Means and Standard Deviations of RTAR in Science I and Mathematics I

Year	Science I		Mathematics I	
	Mean	SD	Mean	SD
1995-1996	52.61	3.85	50.50	6.71
1996-1997	60.26	4.13	46.62	4.62
1997-1998	62.14	4.43	49.48	4.83

Table 4.9 shows the computed correlation r and the result of the Fisher's t test. The correlation (r) of 0.892 in 1995-1996 indicates a positive correlation and significant in Fisher's t test. This implies that Science I and Mathematics I RTAR performance are significant by correlated meaning. It further implies that if the child is good in mathematics, the child will likewise have a good score in science.

However, RTAR for 1996-1997 and 1997-1998 while showing positive correlation, 0.259 and 0.306 respectively, the relations are not significant as revealed by Fisher's t values of 0.80557 and 0.96474 respectively against the tabular t value of 2.365 at 0.05 level of significance. This means that if a child is good in science, he may not be good in mathematics.

Thus, there is significant relationship between the achievement levels of students in Science I and Mathematics

Table 4.9 Correlation r and Fisher's t-test of RTAR in Science I and Mathematics I

Year	Correlation r	Fisher's t	Evaluation/Interpretation
1995-1996	0.892	5.92	significant
1996-1997	0.259	0.81	not significant
1997-1998	0.306	0.96	not significant

I only for scores in school year 1995-1996 as evidenced by the computed Fisher's t value of 5.917643, as against the tabular t value of 2.365 at 0.05 level of significance.

Extent of Necessity to Integrate Science I and Mathematics I

Table 4.10 shows the perceptions by science supervisors/head teachers and science classroom teachers as regards the need to integrate science concepts and mathematics concepts in the first year.

As revealed by the average means of the ratings, the key concepts with high ratings are: Measurement (4.41), Studying Data (4.33), Force and Motion (4.19), Ratio and Proportion (4.04), and Introduction to Science (3.77). These concepts in science and mathematics are perceived by science supervisors/head teachers and classroom teachers as to be integrated to "a much extent."

On the other hand, the key concepts with low ratings are: Earth's Place in the Universe (3.33), Matter (3.35), Naturally Occurring Changes (3.36), Man Affects the Changes in the Environment (3.38), and Algebraic Expressions (3.49). These concepts in science and mathematics are perceived by science supervisors/head teachers and

classroom teachers as to be integrated to "to some extent." Science supervisors/head teachers and science classroom teachers disagree in terms of rating and perceptions as to key concepts with low integrative value.

Table 4.10 Perceptions of Science Supervisors/Head Teachers and Classroom Teachers

Key Topics	Science Supervisor Group	Science Teachers Group	Combined	Interpretation
A. Science				
Introduction	3.77	3.98	3.88	ME
Force & Motion	4.19	4.09	4.14	ME
Energy	3.59	3.86	3.72	ME
Matter	3.35	3.78	3.56	ME
Naturally Occurring Changes	3.36	3.71	3.54	ME
Earth's Place in the Universe	3.33	3.72	3.52	ME
Man Affects Changes in Environment	3.38	3.96	3.67	ME
B. Math				
Measurement	4.53	4.28	4.41	ME
Ratio, Proportion, Percent	4.04	3.79	3.92	ME
Signed Numbers & Square Roots	3.55	3.45	3.50	SE
Algebraic Expressions	3.49	3.65	3.57	ME
Mathematical Equation & Inequality	3.65	3.70	3.68	ME
Studying Data	4.33	4.06	4.20	ME
Geometry of Shape & Size	3.48	3.55	3.52	ME

Legend:
4.51 - above To a Very Much Extent (VME)
3.51 - 4.50 To Much Extent (ME)
2.51 - 3.50 To Some Extent (SE)
1.51 - 2.50 To a Little Extent (LE)
1.50 - below Do Not Use Integration (DUI)

As perceived by science supervisors/head teachers, the science concepts Matter, Naturally Occurring Changes, and Earth's Place in the Universe need integration "to some extent." The science classroom teachers perceived the integration of the following mathematics key concepts "to a low extent" - Signed Numbers and Square Roots, Geometry of Shape and Size, and Algebraic Expressions. This implies that science key concepts can be integrated with mathematics to a much extent. Science supervisors/head teachers agree that mathematics key concepts can be integrated with science to a much extent.

The combined group of science supervisors/head teachers and classroom teachers identified the following topics for integration "to a much extent": Measurement (4.41), Studying Data (4.20), Force and Motion (4.15), Ratio, Proportion and Percent (3.92), Introduction (3.87), Energy (3.72), Mathematical Equation and Inequalities (3.68). The least topic that can be integrated is Signed Numbers and Square Roots (3.50).

Table 4.11 shows the perceptions by mathematics supervisors/head teachers and mathematics classroom teachers as regards the need to integrate science concepts and mathematics concepts in the first year.

Table 4.11 Perceptions of Mathematics Supervisors/Head Teachers and Classroom Teachers

Key Topics	Math Supervisor Group	Math Teachers Group	Combined	Interpretation
A. Science				
1. Introduction	4.02	3.84	3.93	ME
2. Force & Motion	4.30	4.04	4.17	ME
3. Energy	3.77	3.67	3.72	ME
4. Matter	3.57	3.48	3.52	ME
5. Naturally Occurring Changes	3.58	3.36	3.47	SE
6. Earth's Place in the Universe	3.60	3.50	3.55	ME
7. Man Affects Changes in Environment	3.61	3.57	3.59	ME
B. Math				
Measurement	4.49	4.30	4.40	ME
Ratio, Proportion, Percent	4.38	4.09	4.24	ME
Signed Numbers & Square Roots	4.14	3.89	4.02	SE
Algebraic Expressions	4.21	3.93	4.07	ME
Mathematical Equation & Inequality	3.97	3.92	3.95	ME
Studying Data	4.50	4.22	4.36	ME
Geometry of Shape & Size	4.04	3.93	3.99	ME

Legend:
4.51 - above To a Very Much Extent (VME)
3.51 - 4.50 To Much Extent (ME)
2.51 - 3.50 To Some Extent (SE)
1.51 - 2.50 To a Little Extent (LE)
1.50 - below Do Not Use Integration (NI)

As perceived by mathematics supervisors/head teachers, the following key topics have high ratings for integration; Studying Data (4.50), Measurement (4.49), Ratio, Proportion

and Percent (4.38), Force and Motion (4.30), and Algebraic Expressions (4.21). Key topics with low ratings are: Matter (3.57), Naturally Occurring Changes (3.58) and Earth's Place in the Universe (3.60).

On the other hand, as perceived by mathematics classroom teachers, the following key topics have high ratings for integration: Measurement (4.30), Studying Data (4.22), Ratio, Proportion and Percent (4.09), Force and Motion (4.04), and Algebraic Expressions (4.07). Topics with low ratings for integration are; Naturally Occurring Changes (3.36), Matter (3.48), and Earth's Place in the Universe (3.50).

The average means of the perceptions of mathematics supervisors/head teachers and classroom teachers indicate agreement on the degree of integration of each topic.
The combined means of mathematics supervisors/head teachers and classroom teachers identified the following topics as needing integration "to a much extent": Measurement (4.40), Studying Data (4.36), Ratio, Proportion and Percent (4,24), Force and Motion (4.17), Algebraic Expressions(4.07), and Signed Numbers and Square Roots (4.02). Topics least to be integrated is Naturally Occurring Changes (3.47), Matter (3.52), and Earth's Place in the Universe (3.55).

Table 4.12 shows the average means of the two groups of respondents as to the extent of integration of key concepts in Science I and Mathematics I. The following topics are ranked according to the perceptions of science supervisors/head teachers and classroom teachers, and mathematics supervisors/head teachers and classroom teachers as needing integration to "a much extent":

1. Measurement
2. Studying Data
3. Force and Motion
4. Ratio, Proportion and Percent
5. Introduction to Science
6. Algebraic Expressions
7. Mathematical Equation and Inequalities
8. Signed Numbers and Square Roots
9. Geometry of Shape and Size
10. Energy
11. Man Affects the Changes in the Environment
12. Matter
13. Earth's Place in the Universe
15. Naturally Occurring Changes

Table 4.12 Weighted Means of Perceptions of Science and Mathematics Respondents

Key Topics	Ave. Weighted Mean Science T/S	Ave. Weighted Mean Math T/S	Combined Average	Interpretation
A. Science				
1. Introduction	3.94	3.87	3.905	ME
2. Force & Motion	4.17	4.15	4.160	ME
3. Energy	3.72	3.72	3.720	ME
4. Matter	3.52	3.56	3.540	ME
5. Naturally Occurring Changes	3.47	3.54	3.500	SE
6. Earth's Place in the Universe	3.55	3.53	3.540	ME
7. Man Affects Changes in Environment	3.96	3.67	3.633	ME
B. Math				
1. Measurement	4.40	4.41	4.405	ME
2. Ratio, Proportion, Percent	4.24	3.92	4.080	ME
3. Signed Numbers & Square Roots	4.02	3.50	3.760	SE
4. Algebraic Expressions	4.02	3.50	3.760	ME
5. Mathematical Equation & Inequality	3.95	3.68	3.815	ME
6. Studying Data	3.99	3.52	3.755	ME
7. Geometry of Shape & Size	4.04	3.93	3.990	ME

Legend:
4.51 - above To a Very Much Extent (VME)
3.51 - 4.50 To Much Extent (ME)
2.51 - 3.50 To Some Extent (SE)
1.51 - 2.50 To a Little Extent (LE)
1.50 - below Do Not Use Integration (DUI)

Relationships Between Perceptions of Science and Mathematics Respondents as to Need for Integration

To determine relationships between the perceptions of science supervisors/head teachers and classroom teachers, and mathematics supervisors/head teachers and classroom teachers, means, standard deviations, correlation coefficient (r), and Fisher's t test were used.

Table 4.13 shows the means and standard deviations of the different group respondents.

In comparing the means and standard deviations of the four groups of respondents, the following observations are made:

1. Mathematics supervisors group perceived higher integration than the Science supervisors group, while science teachers group perceived higher integration than mathematics teacher group.

Table 4.13 Means and Standard Deviations of Responses by Groups

Group Concerned	Mean	SD	Interpretation (Degree of Integration)
Math Supervisors	3.85	0.34	Higher Integration
Math Teachers	3.70	0.29	Higher Integration
Math Supervisors and Teachers Combined	3.77	0.31	Higher Integration
Science Supervisors	3.60	0.36	Higher Integration
Science Teachers	3.83	0.19	Higher Integration
Science Supervisors and Teachers Combined	3.72	0.26	Higher Integration

2. The combined group of science supervisor and teachers perceived a higher degree of integration of the key topics.

3. Science supervisors and teachers group are closer to the mean, which implies that they are more compact or solidly bound in their perception of integration than the mathematics supervisors and teachers group.

The Teacher Group registered an r-value of 0.57, which is moderately correlated. The Supervisors Group had a very high correlation of 0.91, and the correlation value of 0.84 for the Combined Group indicates a high correlation. This means that the Supervisors Group had a very high perception for the necessity of integrating science and mathematics key concepts. The supervisors and teachers combined had a high perception of the necessity for integration of the science and mathematics key concepts. The teachers group perceived the integration of science and mathematics key concepts "moderately" only as compared to the supervisors and the supervisors and teachers combined. This implies that the teachers teaching mathematics and science do not place more emphasis on the integration of the key topics of the two subjects because maybe they have been integrating the key concepts of the two subjects when they teach these

subjects. Supervisors perceived higher the necessity for integration of the key concepts because management wise this will create savings in terms of teaching manpower and resources. Also, since transfer of learning from one subject to another is possible as cited by researches in the review, this will mean better performance in the subject Scimath.

The Fisher's t test on Table 4.14 shows a significant relation among the perception of the teachers, the supervisors and the supervisors & teachers combined.

In the light of the Fisher's t test there is a significant relationship in the perception of the two groups as regards to the extent of necessity to integrate key topics in Science I and Mathematics I and vice versa.

Table 4.14 Correlation r and Fisher's t-test of Perceptions of Respondent Groups

Groups	Correlation r	Fisher's t	Evaluation/ Interpretation
Teachers	0.57	4.13	significant
Supervisors	0.91	12.83	significant
Combined	0.84	9.06	significant

Chapter 5

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter presents the findings, conclusion and recommendations of the study.

Summary of Findings

This study aimed to analyze the achievement levels in Science I and Mathematics I of secondary students in Eastern Visayas, gather and compare perceptions of science and mathematics supervisors/head teachers and classroom teachers on the extent of necessity to integrate instruction of the two aforesaid subjects, and propose a model for an Integrated Science I and Mathematics I Program (ISMP) in the first year level of the secondary curriculum.

The following were the findings of the study:

1. In Eastern Visayas, most science and mathematics teachers have ages ranging from 31 to 40 years old, or roughly 35% of the respondents, indicating a workable age level. Two hundred sixty eight (268) of the 351 respondents were females while 83 were males. The division of Calbayog City has the greatest percentage (20%) of MA graduates, followed by Ormoc City (15%), Samar (14%) and Tacloban City (13%). Most respondents from Eastern Samar, Samar and

Southern Leyte have finished or acquired certificate of academic requirements (CAR). Respondents from Southern Leyte, Ormoc City and Eastern Samar divisions have the most number of MA units earned. On the other hand, the divisions of Calbayog City, Leyte and Biliran have the most teacher-respondents without graduate units. Most respondents from Eastern Samar, Ormoc City and Samar divisions have teaching experiences of 20 years and above. Most teachers in the divisions of Calbayog City, Southern Leyte and Ormoc City have teaching experiences ranging from 11 to 20 years. On the other hand, Biliran, Northern Samar, Southern Leyte, has more teachers whose experiences in teaching are less than or equal to 10 years.

2. The average achievement level in Science I for the three (3) consecutive school years in review was 58.34. Rankings of the average performance of the nine divisions during the last three years indicated Eastern Samar division as number one, followed by Tacloban City division and Ormoc City division. Southern Leyte and Northern Samar divisions' performances were on the upward trend while the performances of the divisions of Biliran, Samar, Calbayog City and Leyte were on downward trend. There was a consistent performance in science by the divisions of Biliran, Southern Leyte, Eastern Samar and Leyte to low in performance,

3. The achievement level of students in Mathematics I for the school years in review was 48.87. Samar division was consistently on top, followed by the divisions of Northern Samar and Eastern Samar. Leyte and Biliran divisions were also consistent as the last two divisions in Mathematics I performance.

4. As to relationship of RTAR in Science I and Mathematics I, the correlation coefficient r of 0.892 and Fisher's t of 5.92 for SY 1995-1996 indicate a positive and significant correlation. However, RTAR for SY 1996-1997 and 1997-1998, while showing positive correlation, 0.259 and 0.306 respectively, indicate that the relations are not significant as revealed by Fisher's t values of 0.80557 and 0.96474 respectively, against the tabular t value of 2.365 at 0.05 level of significance.

5. The combined group of science supervisors/head teachers and classroom teachers identified the following topics for integration "to a much extent": *Measurement* (4.41); *Studying Data* (4.20); *Force and Motion* (4.15); *Ratio, Proportion, and Percent* (3.92); Introduction [to Science] (3.87); *Energy* (3.72); and *Mathematical Equation and Inequalities* (3.68). The topic least to be integrated was *Signed Numbers and Square Roots* (3.50).

6. The combined group of mathematics supervisors/head teachers and classroom teachers identified the following topics for integration "to a much extent": *Measurement* (4.40); *Studying Data* (4.36); *Ratio, Proportion and Percent* (4.24); *Force and Motion* (4.17); *Algebraic Expressions* (4.07) and *Signed Numbers and Square Roots* (4.02). Topics least to be integrated was *Naturally Occurring Changes* (3.47), *Matter* (3.52), and *Earth's Place in the Universe* (3.55).

7. As to relationship of perceptions among science supervisors/classroom teachers and mathematics supervisors/ classroom teachers, mathematics supervisors perceived higher integration than science supervisors, while science teachers perceived higher integration than their mathematics counterpart.

8. Fisher's $\underline{t}$ test showed significant relationship among the perceptions of teachers' (4.13), supervisors' (12.83) and supervisors and teachers combined (0.06). In all cases, the $\underline{t}$ values were higher than the critical value of 2.365 at 0.05 level of significance.

Conclusion

The following conclusions were drawn relative to the specific questions posed and on the basis of the foregoing findings of the study:

1. The science/mathematics supervisor/teacher in Eastern Visayas is in her 30s, has earned MA units, and with less than 10 years of teaching experience. She has, during the last five years, attended from three to five relevant training programs and seminars in her field of specialization.

2. The average achievement level in terms of Mean Percentile Score (MPS) of secondary students in Science I is 58.34 while in Mathematics I is 48.87.

3. The achievement level of secondary students in Science I is significantly related to their achievement level in Mathematics I for SY 1995-1996. Their achievement levels in the two subjects, however, are not significantly related for SY 1996-1997 and SY 1997-1998.

4. Collectively, science and mathematics supervisors, head teachers, and classroom teachers indicate a significant agreement on the degree of integration of key topics in Science I and Mathematics I.

5. The following first ten (10) topics were perceived by science and mathematics supervisors, head teachers, and

classroom teachers as needing integration "to a much extent": Measurement, Studying Data, Force and Motion, Ratio, Proportion and Percent, Introduction [to Science], Algebraic Expressions, Mathematical Equations and Inequalities, Signed Numbers and Square Roots, Geometry of Shape and Size, and Energy.

6. The integration of key topics in Science I with key topics in Mathematics I, and vice versa, is necessary to a much extent as perceived by science and mathematics supervisors and teachers. A model program can therefore be developed based on the list of key topics in Science I and Mathematics I prioritized by science and mathematics supervisors and teachers.

Recommendations

In the light of the foregoing findings and conclusions, the researcher recommends the following:

1. A pilot teacher-training course for the Integrated Science I and Mathematics I Program (ISMP) be conducted;

2. A pool of experts be selected region-wide who will serve as trainers in the pilot training program;

3. Fiscal resources be allocated for the pilot program;

4. A pilot test of the subject (Integrated Science I and Mathematics I) through team teaching be conducted;

5. A curriculum study committee composed of selected science and mathematics teachers should be formed to prepare a detailed course of instruction in Scimath I program for pilot testing.

6. Based on the results of the pilot test, further studies be conducted for the integration of science and mathematics in the other levels of the secondary curriculum.

Chapter 6

SCIMATH: INTEGRATED SCIENCE I AND MATHEMATICS I SUBJECT

The integration of Science I and Mathematics I learning competencies had come up with one subject called "SCIMATH" as a first year high school subject.

This subject aims to develop "scimathic" students equipped with values and attitudes, scientific skills in mathematical computations and analyses.

The subject includes key topics or content to be taken up, the learning competencies to be developed, the strategies to be made, the time allotment covered and the budgetary allocation that is intended for the program.

Key Topics	Time Allotment (in hours)
The content or key topics are the following:	
1. Measurement	10
2. Studying data	10
3. Force and motion	20
4. Ratio, proportion and percent	15
5. Introduction on how Science and Technology affect man's belief's, practices, and ways of thinking	10
6. Algebraic expressions	20

7. Mathematical equations and inequalities	20
8. Signed numbers and square roots	20
9. Geometry of shape and size	15
10. Energy	30
11. Man affects the changes in the environment	20
12. Matter	20
13. Earth's place in the universe	35
14. Naturally occurring changes	25

Skills/Learning Competencies

A. Measurement

- Demonstrate knowledge and understanding of measurement and the use of measuring devices, and skills in applying their knowledge involving real-life problems.

B. Studying Data

- Demonstrate understanding and skills in the effective use of tables, graphs and averages in analyzing and interpreting data for problem solving.

C. Force and Motion

- Show skills in measuring distances traveled and speed;
- Show skills in measuring forces
- Demonstrate understanding of force and work

D. Ratio, Proportion, and Percent

- Demonstrate knowledge and understanding of ratio, proportion, percent and related concepts and skills in applying them in solving real life problems.

E. Introduction [to Science and Technology]

- Relate how science and technology affect man's beliefs, practices and ways of thinking
- Appreciate the contributions of science and technology of outstanding Filipino and Foreign scientists
- Recognize the role of scientific investigation in gathering scientific knowledge
- Apply the process of science in solving problems in daily life

F. Algebraic Expressions

- Evaluate mathematical phrases for given values of the variables
- Apply mathematical knowledge and problem-solving skills in solving industrial and real life problems
- Demonstrate ability to identify/illustrate and perform operations on monomial perform operations on polynomials

G. Mathematical Equations and Inequalities

- Demonstrate understanding and skills in transforming and solving mathematical sentences with one variable.

H. Signed Numbers and Square Roots

- Demonstrate knowledge, understanding and skills related to signed rational numbers and square roots, and skills in applying this knowledge and skills in solving real life problems

I. Geometry of Shapes and Size

- Demonstrate knowledge and understanding of certain concepts used to describe shapes of triangles convex, quadrilaterals, circles, and certain solid figures, and related measures

J. Energy

- Show awareness and understanding of energy problems
- Demonstrate understanding of energy sources in the community and in the country
- Demonstrate understanding of energy, its forms and transformations
- Appreciate the importance of using energy wisely

K. Man Affects the Changes in the Environment

- Manifest scientific thinking by which disturbs the relationships between organisms
- Manifest scientific thinking to restore and maintain a balanced ecosystem
- Understand the interaction between living and non-living things

L. Matter

- Demonstrate understanding of the properties, classification, and composition of matter.
- Demonstrate awareness and understanding of physical and chemical change
- Understand some natural phenomena in terms of properties of matter

M. Earth's Place in the Universe

- Demonstrate knowledge of the physical features of planet earth
- Understand the effects of earth's motion
- Develop awareness and understanding of the different phenomena related to the movement of the earth's system

- Show understanding of what lies beyond the solar system

N. Naturally Occurring Changes

- Show preparedness in case of natural disaster and suggest ways to mitigate occurrences
- Demonstrate understanding of the atmosphere, hydrosphere and lithosphere
- Understand the resources of the earth.

Strategies

The developmental concept of "SCIMATH" in response to this study of Integrated Science I and Mathematics I Program (ISMP) through the PSSLC, aims to increase the performance level of students in Science and Mathematics.

"SCIMATH" calls for curriculum development by which staff or teacher training is demanded for the fusion of some concepts in Science and Mathematics through the PSSLC to come up with a better achievement.

1. In Measurement - the use of instruments in science must be properly taught.

2. Studying Data - The teacher should make use of the data gathered through the experiment conducted either in tabular or graphical form for student analyses and

interpretation.

3. Force and Motion - It is focused with measurement.

4. Ratio, Proportion and Percent - It could be associated with matter and energy topics and skills or competencies to be acquired.

5. Introduction [to Science] has something to do with algebraic expression topics.

6. Mathematical Equations and Inequalities has something to do with the transformation of matter and energy.

7. Signed Numbers and Square Roots can be fused with topics on Man Affects the Changes in the Environment.

8. Geometry of Shape and Size is associated with topics on Earth's Place in the Universe and the Naturally Occurring Changes.

The fusion of these concepts and skills or learning competencies require tedious training for staff development. The poll of experts or trainers from the school level may start the implementation of the program.

Evaluation

Feedback on the implementation and monitoring would create a good foundation for a successful endeavor. This

could be a part of the training program for teachers as well as supervisors.

Performance/Success Indicators

1. Fusion of Science I and Mathematics I "SCIMATH" I.
2. Reduction of the number of hours to one hour and a half (90 minutes) from two hours (80 minutes for Science I and 40 minutes for Mathematics I).
3. Improvement in teaching instruction and increased achievement of student performance.

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A P P E N D I C E S

APPENDIX A

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar
SCHOOL OF GRADUATE STUDIES

APPLICATION FOR ASSIGNMENT OF ADVISER

NAME: BAYSA, FLORENCIO DACUNOS
(Surname) (First Name) (Middle Name)

CANDIDATE FOR DEGREE: Doctor of Philosophy

AREA OF SPECIALIZATION: Educational Management

TITLE OF PROPOSED THESIS/DISSERTATION: Science and Mathematics Integration Program (SMIP) for Secondary Schools In The Island of Samar : A Model

FLORENCIO D. BAYSA
Applicant

JOSE S. LABRO, Ph.D.
Name of Designated Adviser

APPROVED:

RIZALINA M. URBIZTONDO, Ed.D.
Dean, Graduate Studies

CONFORME:

JOSE S. LABRO, Ph.D.
Adviser

In 3 copies: 1st copy - for the Dean
2nd copy - for the Adviser
3rd copy - for the Applican

APPENDIX B

Application for Pre-Oral Defense

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar
GRADUATE & POST-GRADUATE STUDIES

November 26, 1999

The Dean
Graduate School
Samar State Polytechnic College
Catbalogan, Samar

Madam:

I have the honor to apply for Pre/Final Oral Defense of my Thesis/Dissertation entitled Science and Mathematics Integration Program (SMIP) for Secondary Schools in the Island of Samar : A Model

on the date convenient for your Office.

Very truly yours,

FLORENCIO D. BAYSA
Graduate Student

Recommending Approval:

JOSE S. LABRO, Ph. D.
Adviser

APPROVED: EUSEBIO T. PACOLOR, Ph. D.
Dean, Graduate & Post-Graduate Studies

Date: Dec. 5 1999 Sunday

Time: 8:00 AM 8:10 AM

APPENDIX C

Letter to the Regional Director Requesting to Administer Survey Questionnaire to Division Supervisors, Head Teachers and Teachers

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

December 9, 1999

The Regional Director
DECS, Region VIII
Govt. Center, Candahug
Palo, Leyte

Madam:

Warmest greetings!

In connection with the research which I am intending to conduct entitled " Integrated Science I and Mathematics I Program (ISMP) for Secondary Schools in Eastern Visayas Region:" A Model, I am, respectfully requesting permission from your good office to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I to some schools in our region.

This research endeavor will serve as teachers knowledge and skills in the integrative technique for quality instruction through the PSSLC.

Your favorable action on this request is earnestly sought.

Thank you very much and more power.

Very truly yours,

FLORENCIO B. MAYSA
Researcher

Recommending Approval:

EUSEBIO T. PACOLOR, Ph. D.
Dean Graduate/Post Graduate Studies

Approved:

CIRILA V. VILLEGAS, C.E.S.O. III
Director IV

APPENDIX D

Letter to the Schools Division Superintendent Requesting to Administer Survey Questionnaire to Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

January 22,2000

The Schools Division Superintendent
Division of Eastern Samar
Borongan, E. Samar

Sir:

Warmest greetings !

In connection with the research which I am conducting entitled "Integrated Science I and Mathematics I Program (ISMP) for Secondary Schools in Eastern Visayas" A Model:, I amm respectfully requesting permission to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I to some schools in your division.

This research endeavor will serve as teachers' knowledge and skills in the integrative technique for quality instruction through the PSSLC.

Your favorable action on this request is earnestly s ought.

Thank you very much and more power!

Very truly yours,

FLORENCIO D. BAYSA
Researcher

Recommending Approval :

EUSEBIO T. PACOLOR, Ph.D.
Dean Graduate/Post-Graduate Studies

Approved:

LEONCIO C. MACATIMPAG, C. E. S. O. IV
Schools Division Superintendent

APPENDIX D (Continued)

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

January 22, 2000

The Schools Division Superintendent
Division of Northern Samar
Catarman, Northern Samar

Sir/Madam:

Warmest greetings!

In connection with the research which I am conducting entitled "Integrated Science I and Mathematics I Program (ISMP) for Secondary Schools in Eastern Visayas" A Model:, I am, respectfully requesting permission to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I to some schools in your division.

This research endeavor will serve as teachers' knowledge and skills in the integrative technique for quality instruction through the PSSLC.

Your favorable action on this request is earnestly sought.

Thank you very much and more power!

Very truly yours,

FLORENCIO D. BAYSA
Researcher

Recommending Approval:

EUSEBIO T. BACOLOR, Ph. D.
Dean Graduate / PosttGraduate Studies

Approved:

ROGELIO A. GUARDIANO SR.
Administrative Officer III and
Officer-In-Charge
Schools Division Superintende

APPENDIX D (Continued)

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

January 22, 2000

The Schools Division Superintendent
Calbayog City Division
Calbayog City

Madam:

Warmest greetings!

In connection with the research which I am conducting entiled " Integrated Science I and MathematicsI Program (ISMP) for SecondaryySchools in Eastern Visayas" A Model:, I am, respectfully requesting permission to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I to some schools in your division.

This research endeavor will serve as teachers' knowledge and skills in the integrative technique for quality instruction through the PSTLC.

Your favorable action on this request is earnestly sought.

Thank you very much and more power!

Very truly yours,

FLORENCIO D. BAYSA
Researcher

Recommending Approval:

EUSEBIO T. PACOLOR, Ph. D.
Dean Graduate/Post Graduate Studies

Approved:

2-11-2000

Schools Division Superintendent

APPENDIX D (Continued)

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

January 22, 2000

The Schools Division Superintendent
Leyte Division
Palo, Leyte

Sir/Madam:

Warmest greetings!

In connection with the research which I am conducting entitled "Integrated Science I and Mathematics I Program (ISMP) for Secondary Schools in Eastern Visayas" A Model:, I am, respectfully requesting permission to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I to some schools in your division.

This research endeavor will serve as teachers' knowledge and skills in the integrative technique for quality instruction through the PSSLP.

Your favorable action on this request is earnestly sought.

Thank you very much and more power!

Very truly yours,

FLORENCIO D. BAYSA
Researcher

Recommending Approval:

EUSEBIO T. PACOLOR, Ph. D.
Dean Graduate/Post Graduate Studies

Approved:

Schools Division Superintendent

APPENDIX D (Continued)

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

January 22, 2000

The Schools Division Superintendent
Tacloban City Division
Tacloban City

Sir:

Warmest Greetings!

In connection with the research which I am conducting entitled "Integrated Science I and Mathematics I Program (ISMP) for Secondary Schools in Eastern Visayas" A Model:, I am, respectfully requesting from your good office, a permission to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I to some schools in your division.

This research endeavor will serve as teachers' knowledge and skills in the integrative technique for quality instruction through the PSSLC.

Your favorable action on this request is earnestly sought.

Thank you very much and more power!

Very truly yours,

FLORENCIO D. BAYSA
Researcher

Recommending Approval:

EUSEBIO T. PACOLOR, Ph.D.
Dean Graduate/Post Graduate Studies

Approved:

Schools Division Superintendent

Appendix D (Continued)

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

December 9, 1999

Dr. Jesusita L. Arteche
Schools Division Superintendent
Division of Samar
Catbalogan, Samar

Madam:

Warmest greetings!

In connection with the research which I am intending to conduct entitled "Integrated Science I and Mathematics I Program (ISMP) for Secondary Schools in Eastern Visayas Region:" A Model, I am, respectfully requesting permission from your good office to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and MathematicsI to some schools in your division.

This research endeavor will serve as teachers knowledge and skills in the integrative technique for quality instruction through the PSSLC.

Your favorable action on this request is earnestly sought.

Thank you very much and more power!

Very truly yours,

FLORENCIO D. BAYSA
Researcher

Recommending Approval:

EUSEBIO T. PACOLOR, Ph. D.
Dean Graduate / Post Graduate Studies

Approved:

JESUSITA L. ARTECHE, Ed.D.
Schools Division Superintendent

Appendix D (Continued)

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

January 22, 2000

The Schools Division Superintendent
Ormoc City Division
Ormoc City

~~Sir~~/Madam:

Warmest greetings!

In connection with the research which I am conducting entitled "Integrated Science I and Mathematics I Program (ISMP) for Secondary Schools in Eastern Visayas" A Model:, I am, respectfully requesting permission to administer my survey questionnaire to the Division Supervisors, Head Teachers and Teachers in Science I and Mathematics I to some schools in your division.

This research endeavor will serve as teachers' knowledge and skills in the integrative technique for quality instruction through the PSSLC.

Your favorable action on this request is earnestly sought.

Thank you very much and more power!

Very truly yours,

ELORENCIO D. RAYSA
Researcher

Recommending Approval:

EUSEBIO T. PACOLOR, Ph.D.
Dean Graduate/Post Graduate Studies

Approved:

VIOLETA M. ALOCILJA, Ph.D., CESO VI
Schools Division Superintendent

APPENDIX D-1

1st Indorsement
DECS, ORMOC CITY DIVISION
Ormoc City

Respectfully returned to Mr. Florencio D. Baysa, researcher, the herein approved letter request to administer survey questionnaire to Division supervisor, principal and teachers in Science I and Math I in Ormoc City High School, Ormoc City.

It is requested that a copy of the result of the survey be furnished this office.

VIOLETA M. ALOCILJA, Ph. D., CESO VI
Schools Division Superintendent

Republic of the Philippines
Department of Education, Culture and Sports
Region No. VIII
Ormoc City Division
Ormoc City

Date Feb. 1, 2008

To: J. Perozo

[✓] For action/coordination
[ ] For immediate action/ preferential attention
[ ] For dissemination/press release
[ ] For your initial/signature if okay
[ ] Please confer with me _____
[ ] For your approval
[ ] For you comments/ recommendation
[ ] For your referral to
[ ] For you reply/indorsement
[ ] For typing/encoding
[ ] Please prepare _____

Note: Please recommend and see to it that we get a copy of the final results of this study.

Thanks,

DR. VIOLETA M. ALOCILJA, CESO VI
Schools Division Superintendent

APPENDIX E

The Questionnaire

Republic of the Philippenes
SAMAR STATE POLYTECHNIC COLLEGE
COLLEGE OF GRADUATE STUDIES
Catbalogan

December 9, 1999

Dear Fellow Mathematics and Science Teachers,

Enclosed is a questionnaire designed to gather information pertinent to the doctoral dissertation, "**Integrated Mathematics I and Science I Program (IMSP) for Secondary Schools in Eastern Visayas: A Model**" which the undersigned is currently undertaking.

Kindly indicate your honest and sincere responses either by supplying the needed information or encircling the numbers representing your answers. Rest assured that whatever information you give will be kept confidential and utilized for research purposes only.

Thank you for your wholehearted cooperation.

Very truly yours,

FLORENCIO D. BAYSA
General Secondary School Principal
Researcher

PART I - GENERAL INFORMATION

Name (Optional) _____

Station _____

Position/Designation _____ Sex : ( ) M ( ) F Age _____

Educational Qualification: (Please Indicate Advance Units Earned)

_____

_____

No. of Years in the Teaching Profession : _____

No. of Years of Teaching Science and/or Mathematics _____

No. of Science and Mathematics-related Training in the Last Five Years : _____

APPENDIX E (Continued)

PART II - INTEGRATING SCIENCE I CONCEPTS WITH MATHEMATICS I CONCEPTS IN INSTRUCTION

Directions: Please rate the given Science I Learning Competencies on the degree of the need to integrate them in Mathematics I instruction using the following rating scale. Encircle the appropriate number.

To a Very Much Extent	5
To a Much Extent	4
To Some Extent	3
To a Little Extent	2
Do Not Need Integration	1

==========

A. SCIENCE I (Science and Technology)
General and Specific Learning Competencies

I. Introduction

1. Relate how science and technology affect man's beliefs, practices and ways of thinking	5	4	3	2	1
1.1 Cite local superstitions, beliefs and practices/ ways of thinking that are related to S & T	5	4	3	2	1
1.2 Cite how S & T influence our lives	5	4	3	2	1
1.3 Discuss the importance of scientific values in decision- making and problem-solving in our daily life	5	4	3	2	1
2. Recognize the role of scientific investigations in gathering scientific knowledge	5	4	3	2	1
2.1 Discuss recent scientific investigations that have enriched our scientific knowledge	5	4	3	2	1
3. Apply the processes of science in solving problems in daily life	5	4	3	2	1
3.1 Discuss the steps in scientific method	5	4	3	2	1
3.2 Identify experimental and control variables from the given examples	5	4	3	2	1
3.3 Enumerate some apparatus, their uses and safety precautions in the laboratory	5	4	3	2	1
4. Appreciate the contributions to S & T of outstanding Filipino and foreign scientists	5	4	3	2	1
4.1 Compare the contributions made by outstanding Filipino and foreign scientists	5	4	3	2	1
4.2 Identify the desirable qualities of scientists	5	4	3	2	1

APPENDIX E (Continued)

II Force and Motion

1. Show skills in measuring forces	5	4	3	2	1
1.1 Use and compare spring balance and improvise force measurer	5	4	3	2	1
1.2 Use standard unit of force	5	4	3	2	1
1.3 Report measurement honestly	5	4	3	2	1
1.4 Determine how force affects motion	5	4	3	2	1
2. Show skills in measuring distance traveled and speed	5	4	3	2	1
2.1 Determine distance covered by a moving object at a given time	5	4	3	2	1
2.2 Compare distance covered of two moving bodies with different speed	5	4	3	2	1
2.3 Relate how an object moving at different speed affects distance covered at a given time	5	4	3	2	1
3. Demonstrate understanding of force and work	5	4	3	2	1
3.1 Distinguish between contact and non-contact force	5	4	3	2	1
3.2 Identify the effects of forces	5	4	3	2	1
3.3 Compute work done on different situations	5	4	3	2	1
3.4 Compute work done using simple machine	5	4	3	2	1
3.5 Explain ways of increasing and decreasing friction	5	4	3	2	1

III. Energy

1. Demonstrate understanding of energy, its forms and transformations	5	4	3	2	1
1.1 Differentiate the forms of energy	5	4	3	2	1
1.2 Illustrate the transformation of energy from one form to another	5	4	3	2	1
1.3 Analyze how energy is transferred from one system to another	5	4	3	2	1
2. Demonstrate understanding of the energy sources in the community and in the country	5	4	3	2	1
2.1 Identify sources of energy in the Philippines	5	4	3	2	1
2.2 Compare the significance of using conventional and non-conventional sources of energy	5	4	3	2	1
3. Show awareness and understanding of energy problems	5	4	3	2	1
3.1 Discuss the current energy problems	5	4	3	2	1
3.2 Present possible solutions to energy problems	5	4	3	2	1

APPENDIX E (Continued)

3.3 Investigate some local resources that may be a substitute energy source	5	4	3	2	1
3.4 Evaluate the energy technology appropriate in a community given some criteria	5	4	3	2	1
4. Appreciate the importance of using energy wisely	5	4	3	2	1
4.1 Discuss/practice wise use of energy	5	4	3	2	1

IV Matter

1. Demonstrate understanding of the properties, classification, and composition of matter	5	4	3	2	1
1.1 Differentiate substances from mixtures	5	4	3	2	1
1.2 Identify matter in the environment in terms of its properties (e.g., density)	5	4	3	2	1
1.3 Illustrate the law of conservation of mass in different situations	5	4	3	2	1
1.4 Infer that matter is made up of atoms and molecules	5	4	3	2	1
1.5 Use models to describe atoms and molecules	5	4	3	2	1
2. Understand some natural phenomena in terms of properties of matter	5	4	3	2	1
2.1 Illustrate by examples the following: diffusion of gases, *capillarity*, and surface tension	5	4	3	2	1
3. Demonstrate awareness and understanding of physical and chemical changes	5	4	3	2	1
3.1 Give examples of how physical and chemical changes are used in daily life	5	4	3	2	1
3.2 Investigate how energy is involved in changes that matter undergoes	5	4	3	2	1

V. Naturally Occurring Changes

1. Understand the resources of the earth (land, air and water)	5	4	3	2	1
1.1 Enumerate raw materials obtained from land, air and water	5	4	3	2	1
1.2 Discuss some processes on how raw materials become finished products	5	4	3	2	1
2. Demonstrate understanding of the changes in the lithosphere	5	4	3	2	1
2.1 Cite evidences supporting the theory of continental drift, sea floor spreading and plate tectonics	5	4	3	2	1

APPENDIX E (Continued)

2.2 Discuss how folding and faulting of rocks from the mountains occur	5	4	3	2	1
2.3 Infer the origin of a place, given the present geological structure	5	4	3	2	1
2.4 Discuss rock formation	5	4	3	2	1
2.5 Collect and identify types of rocks and the minerals found in them	5	4	3	2	1
2.6 Give examples of minerals found in the locality and in the country	5	4	3	2	1
2.7 Trace soil formation from rocks (weathering)	5	4	3	2	1
2.8 Discuss how soil is transferred to other places by different means	5	4	3	2	1
3. Demonstrate understanding of the hydrosphere	5	4	3	2	1
3.1 Differentiate density currents and upward movements of nutrients	5	4	3	2	1
3.2 Discuss the stages in river formation and its effects on the environment	5	4	3	2	1
3.3 Cite evidences of natural pollution in bodies of water	5	4	3	2	1
4. Demonstrate understanding of the atmosphere	5	4	3	2	1
4.1 Infer that weather changes and climate are affected by changes in the environment	5	4	3	2	1
4.2 Keep a record of weather changes and determine periodic patterns	5	4	3	2	1
4.3 Apply the principle of convention current to explain monsoon winds	5	4	3	2	1
4.4 Predict the weather based on some data patterns	5	4	3	2	1
5. Show preparedness in case of natural disaster and suggest ways to mitigate occurrences	5	4	3	2	1
5.1 Suggest precautionary measures in cases of earthquakes, volcanic eruptions, floods, typhoons, landslides, and sea surges	5	4	3	2	1
VI. Earth's Place in the Universe					
1. Demonstrate knowledge on the physical features of the planet earth	5	4	3	2	1
1.1 Discuss the distance of the earth from the sun, its size, shape, age, inclination, density and other properties	5	4	3	2	1
2. Understand the effects of earth's motion	5	4	3	2	1
2.1 Demonstrate the different motions of the earth using a model	5	4	3	2	1
2.2 Discuss the phenomena that result from the					

APPENDIX E (Continued)

different motions of the earth (e.g. day, night, seasonal changes)	5	4	3	2	1
3. Develop awareness and understanding of the different phenomena related to the moon-earth system	5	4	3	2	1
3.1 Discuss how tides and eclipses occur	5	4	3	2	1
3.2 Cite situations how these affect people's lives	5	4	3	2	1
3.3 Discuss safety precautions in observing partial eclipses	5	4	3	2	1
4. Demonstrate understanding of the other members of the solar system	5	4	3	2	1
4.1 Describe the composition of the solar system	5	4	3	2	1
4.2 Compare the planets as to size, distance from the sun and other characteristics	5	4	3	2	1
4.3 Describe the minor members of the solar system (comets and meteors)	5	4	3	2	1
5. Show understanding of what lies beyond the solar system	5	4	3	2	1
5.1 Construct a simple star map and *constellarium* for finding directions	5	4	3	2	1
5.2 Discuss how scientists study the characteristics of stars and other heavenly bodies	5	4	3	2	1
5.3 Trace the changes that happen from birth to death of a star and how they will affect the earth	5	4	3	2	1
5.4 Distinguish star clusters, galaxies, and other celestial formations and discuss their implications	5	4	3	2	1
6. Appreciate the importance of using standard measuring instruments and units of measure	5	4	3	2	1
6.1 Trace the history of space exploration	5	4	3	2	1
6.2 Recognize the significance of space explorations	5	4	3	2	1
6.3.Report the latest update on space explorations	5	4	3	2	1
VII. Man Affects the Changes in the Environment					
1. Understand the interactions between living and non-living things	5	4	3	2	1
1.1 Explain what makes an ecological system	5	4	3	2	1
1.2 Differentiate between food chain and food web	5	4	3	2	1
1.3 Illustrate the flow of matter and energy in an ecosystem	5	4	3	2	1
2. Manifest scientific thinking by which man disturbs					

APPENDIX E (Continued)

the relationships between organizations	5	4	3	2	1
2.1 Extrapolate the effect of population size/density on food, space, and relationships between organisms	5	4	3	2	1
3. Manifest scientific thinking to restore/maintain a balanced ecosystem	5	4	3	2	1
3.1 Discuss how natural resources can be used wisely	5	4	3	2	1
3.2 Explain conservation of soil forest, wild life, water and air	5	4	3	2	1

==========

PART III - NECESSITY OF INTEGRATING MATHEMATICS I CONCEPTS WITH SCIENCE I CONCEPTS IN INSTRUCTION

Directions: Please rate the given Mathematics I Learning Competencies on the degree of the need to integrate them in Science I instruction using the following rating scale. Encircle the appropriate number.

To a Very Much Extent	5
To a Much Extent	4
To Some Extent	3
To a Little Extent	2
Do Not Need Integration	1

==========

B. MATHEMATICS I
General and Specific Learning Competencies (SSPLC)

I. Measurement

1. Demonstrate knowledge and understanding of measurement and the use of measuring devices, and skill in applying this knowledge in solving real-life problems	5	4	3	2	1
1.1 Appreciate the development of measurement from the primitive to the present international system	5	4	3	2	1
1,2 Use instruments to measure length, weight, mass, volume, time, angle, etc.	5	4	3	2	1
1.3 Calculate to obtain measurements involving ratios	5	4	3	2	1
1.4 Convert measurement from one unit to another	5	4	3	2	1
1.5 Give examples in real life when one rounds up or rounds down	5	4	3	2	1
1.6 Round off numbers to a given decimal place	5	4	3	2	1
1.7 Apply knowledge of measurements and problem solving strategies in solving routine and non-routine word problems from real life (e.g., home					

APPENDIX E (Continued)

management, science, work)	5	4	3	2	1
II. Ratio, Proportion, and Percent					
1. Demonstrate knowledge and understanding of ratio proportion, percent and related concepts and skill in applying them in solving real life problems.	5	4	3	2	1
1.1 Express certain relationships in real life situations from verbal form to ratios and proportions, and vice-versa	5	4	3	2	1
1.2 Express percent in fraction or decimal form, and vice versa	5	4	3	2	1
1.3 Identify the base, rate, percentage in the statement:	5	4	3	2	1
1.4 Solve for the missing number in the statement A of B - C when two of the numbers A, B, or C are given	5	4	3	2	1
1.5 Solve for the missing number of the proportion a/b = c/d where three of the numbers (a, b, c. d).	5	4	3	2	1
1.6 Apply knowledge and skills related to ratio, proportion and percent, as well as problem solving skills to solve routine and non-routine problems from real life,	5	4	3	2	1
III. Signed Numbers and Square Roots					
1. Demonstrate knowledge, understanding, and skills related to signed rational numbers and square roots and skill applying this knowledge and skills in solving real life problems.	5	4	3	2	1
1.1 Demonstrate understanding ability with signed rational number	5	4	3	2	1
1.2 Demonstrate understanding and abilities with square roots of positive rational numbers	5	4	3	2	1
IV. Algebraic Expressions					
1. Demonstrate understanding and skills related to simplifying and performing operations of polynomials	5	4	3	2	1
1.1 Given a mathematical expression, identify constants, variables, mathematical terms	5	4	3	2	1
1.2 Evaluate numerical expressions including those with whole number exponents	5	4	3	2	1
1.3 Translate verbal phrases to mathematical phrases and vice-versa	5	4	3	2	1
1.4 Evaluate mathematical phrases for given values of the variables	5	4	3	2	1
1.5 Demonstrate ability to identify/illustrate and perform operations on monomials	5	4	3	2	1

APPENDIX E (Continued)

1.6 Perform operations on polynomials	5	4	3	2	1
1.7 Apply mathematical knowledge and problem solving skills in solving mathematical and real life problems.	5	4	3	2	1

V. Mathematical Equations and Inequalities

1. Demonstrate understanding and skill in transforming and solving mathematical sentences with one variable.	5	4	3	2	1
1.1 Translate verbal statements involving general or unknown quantities to mathematical statements and vice versa	5	4	3	2	1
1.2 Given a simple mathematical sentence involving one variable, determine the solution	5	4	3	2	1
1.3 Determine solutions of simple mathematical equations by algebraic procedures	5	4	3	2	1
1.4 Visualize solution of simple mathematical inequalities as intervals or rays on a number line	5	4	3	2	1
1.5 Apply knowledge and skills with equations and inequalities to solve problems (e. g relations among numbers, geometry, business, science and other fields)	5	4	3	2	1

VI. Studying Data

1. Demonstrate understanding and skill in the effective use of tables and graphs and averages in analyzing and interpreting data for problem solving	5	4	3	2	1
1.1 Demonstrate understanding and skill in the use of graphs and tables of statistical data	5	4	3	2	1
1.2 Demonstrate understanding and skill in the calculating and use of mean, median, and mode of a collection of statistical data	5	4	3	2	1

VII Geometry of Shape and Size

1. Demonstrate knowledge and understanding of certain concepts used to describe shapes of triangles and convex quadrilaterals, circles and certain solid figures, and related measures.	5	4	3	2	1
1.1 Illustrate, name and identify different kinds of angles (e.g. acute, right, obtuse)	5	4	3	2	1
1.2 Illustrate, name and identify different kinds of triangles, quadrilaterals, and their parts	5	4	3	2	1
1.3 Illustrate, name and identify parts of a circle	5	4	3	2	1
1.4 Demonstrate understanding of properties of certain figures arrived at by investigative procedures	5	4	3	2	1
1.5 Identify/Give examples of certain space					

APPENDIX E (Continued)

figures	5	4	3	2	1
1.6 Give and apply rules (formulas) for finding plane or surface area, perimeter, volumes, and other dimensional properties of certain plane and solid figures	5	4	3	2	1
1.7 Apply knowledge and skills to solve problems involving plane and solid figures and their measures	5	4	3	2	1
1.8 Apply problem solving skills in investigating patterns in polynomial numbers	5	4	3	2	1

OTHER CONCEPTS OR TOPICS YOU MAY WISH TO INCLUDE IN AN INTEGRATED SCIENCE AND MATHEMATICS INSTRUCTION FOR FIRST YEAR HIGH SCHOOL STUDENTS

_____

_____

_____

_____

_____

THANK YOU FOR YOUR USUAL COOPERATION!

APPENDIX F

Evaluation Sheet

Name of Evaluator: _____
Position/Station: _____
Educational Attainment: _____

Direction: Please evaluate the enclosed instrument on the basis of the enumerated criteria using the following numerical weights and descriptive interpretations:

Strongly Agree	5
Agree	4
Uncertain	3
Disagree	2
Strongly Disagree	1

CRITERIA	Rating Scale 5	4	3	2	1
1. Are the items related to the research problems and objectives?	5	4	3	2	1
2. Are the directions clear and unambiguous?	5	4	3	2	1
3. Is the language used in each item clear and understandable?	5	4	3	2	1
4. Is the language used in each item simple and unambiguous?	5	4	3	2	1
5. Are the items leading items?	5	4	3	2	1
6. Do the items demand personal or delicate material that the respondent may resist?	5	4	3	2	1
7. Do the items demand knowledge and information that the respondent may not have?	5	4	3	2	1
8. Are the items loaded with social desirability?	5	4	3	2	1
9. Are the descriptive and numerical scales used appropriate for the items?	5	4	3	2	1
10. Is the length of the instrument adequate for the purpose?	5	4	3	2	1

Other comments/suggestions?

_____
_____
_____

THANK YOU VERY MUCH FOR YOUR ASSISTANCE!

APPENDIX G

Letter to the Principal of SNS Requesting
to Administer the Try-out of the
Research Instruments

Republic of the Philippines
SAMAR STATE POLYTECHNIC COLLEGE
Catbalogan, Samar

December 9, 1999

The Principal
Samar National School
Catbalogan, Samar

Sir:

In connection with the research which I am intending to conduct entitled "Integrated Science I and Mathematics I Program (ISMP) for secondary schools in Eastern Visayas Region: A Model", may I respectfully request permission from that office to administer the try-out of my research instruments utilizing your head teachers and teachers in science I and Mathematics I for the purpose.

The results of the try-out will enable the undersigne to make the necessary revisions on his instruments and subsequently administer them to his target respondents.

Your favorable action on this request is earnestly sought.

Thank you very much and more power.

Very truly yours,

FLORENCIO D. BAYSA
Researcher

Approved:

LEOVEGILDO N. MANTE
Principal III

APPENDIX H

Computation of the Questionnaire's Reliability Coefficient (Test -Retest Correlation)

	X	Y	X^2	Y^2	XY
1.	714	663	509796	439569	473382
2.	447	395	199809	156025	176565
3.	553	548	305809	300304	303044
4.	652	457	425104	208849	297964
5.	556	567	309136	321489	315252
6.	577	557	332929	310249	321389
7.	527	560	277729	313600	295120
8.	616	567	379456	321489	349272
9.	459	421	210681	177241	193239
10.	523	523	273529	273529	273529
11.	506	506	256036	256036	256036
12.	602	461	362404	212521	277522
13.	524	437	274576	190969	228988
14.	260	264	67600	69696	68640
15.	681	672	463761	451584	457632
16.	412	484	169744	234256	199408
17.	475	595	225625	354025	282625
18.	669	500	447561	250000	334500
19.	681	363	463761	131769	247203
20.	682	715	465124	511225	487630
21.	326	305	106276	93025	99430
22.	418	418	174724	174724	174724
23.	281	273	78961	74529	76713
24.	506	506	256036	256036	256036
	12647	11757	7036167	6082739	6445843

Pearson r

$$r_{xy} = \frac{N \ EXY - (EX)(EY)}{\sqrt{[N \ EX^2 - (EX)^2][N \ EY^2 - (EY)^2]}}$$

APPENDIX H (Continued)

$$r_{xy} = \frac{24\,(6445843) - (12,647)\,(11,757)}{\sqrt{[24(7036167) - (12647)^2][24(6082739) - (11757)^2]}}$$

$$= \frac{154700232 - 148690779}{\sqrt{(168868008-159946609)\,(145985736-138227049)}}$$

$$= \frac{6009453}{\sqrt{(8921399)(7758687)}}$$

$$= \frac{6009453}{8319756}$$

$$= 0.72$$

APPENDIX I

Interpretation of F.V. and I.D. According to ESPINA

Facility Value	**Interpretation**
0.76 - 1.00	Easy
0.25 - 0.75	Average
0 - 0.24	Difficult

Discrimination Index	**Intepretation**
0.40 and above	high discrimination
0.30 to 0.39	satisfactory discrimination
0.20 to 0.29	marginal discrimination
0.19 and below	poor discrimination

APPENDIX J

Comparative Means of RTAR Achievement Levels in Science and Mathematics of Secondary Freshmen

	1995-96		1996-97		1997-98	
	Science	**Math**	**Science**	**Math**	**Science**	**Math**
	52.35	47.64	58.18	39.31	60.68	43.53
	47.39	44.89	53.59	41.80	61.15	51.75
	54.28	50.19	63.14	49.66	67.91	53.74
	46.10	39.23	58.06	43.58	57.82	41.30
	58.49	59.14	56.80	50.09	59.72	48.79
	52.99	49.59	65.72	45.65	64.75	54.99
	55.08	61.16	58.55	54.33	55.18	54.06
	54.86	52.54	64.09	48.33	63.73	46.68
	51.96	50.14	64.19	46.81	68.36	50.50
Total	473.50	454.52	542.32	419.56	559.30	445.34
Mean	52.61111	50.50222	60.25778	46.61778	62.14444	49.48222
SD	3.853403	6.709743	4.134773	4.617057	4.435558	4.825821

	r	Fisher's t	
1995-96	0.892	5.917643	Significant
1996-97	0.259	0.80557	Not Significant
1997-98	0.306	0.96474	Not Significant

APPENDIX K

Computation of Correlation and Fisher's t-test and Evaluation

	Math			Science		
	Supervisors	Teachers	Combined	Supervisors	Teachers	Combined
	3.83	3.74	3.79	3.63	3.83	3.73
	4.10	3.96	4.03	3.85	4.07	3.96
	4.24	4.00	4.12	3.91	4.13	4.02
	3.91	3.68	3.80	3.70	3.90	3.80
	4.38	4.09	4.24	4.23	4.14	4.19
	4.47	4.13	4.30	4.34	4.10	4.22
	4.05	3.89	3.97	4.01	4.04	4.03
	3.68	3.54	3.61	3.62	3.90	3.76
	3.77	3.63	3.70	3.49	3.77	3.63
	3.75	3.61	3.68	3.48	3.77	3.63
	3.87	3.89	3.88	3.76	4.02	3.89
	3.64	3.58	3.61	3.47	3.77	3.62
	3.50	3.38	3.44	3.24	3.76	3.50
	3.56	3.47	3.52	3.33	3.80	3.57
	3.65	3.49	3.57	3.36	3.75	3.56
	3.40	3.18	3.29	3.23	3.61	3.42
	3.45	3.25	3.35	3.32	3.60	3.46
	3 57	3.32	3.45	3.44	3.69	3.57
	3.84	3.54	3.69	3.44	3.90	3.67
	3.92	3.68	3.80	3.68	3.86	3.77
	3.73	3.50	3.62	3.39	3.73	3.56
	3.54	3.36	3.45	3.26	3.70	3.48
	3.54	3.44	3.49	3.26	3.75	3.51
	3.31	3.42	3.37	3.13	3.56	3.35
	3.54	3.58	3.56	3.27	3.70	3.49
	3.47	3.47	3.47	3.27	3.90	3.59
	3.76	3.61	3.69	3.57	3.93	3.75
	3.61	3.65	3.63	3.30	4.05	3.68
	4.49	4.30	4.40	4.53	4.28	4.41
	4.38	4.09	4.24	4.04	3.79	3.92
	4.14	3.89	4.02	3.55	3.45	3.50
	4.21	3.93	4.07	3.49	3.65	3.57
	3.97	3.92	3.95	3.65	3.70	3.68
	4.50	4.22	4.36	4.33	4.06	4.20
	4.04	3.93	3.99	3.48	3.55	3.52
Total	**134.81**	**129.36**	**132.09**	**126.05**	**134.21**	**130.13**
Mean	**3.85**	**3.70**	**3.77**	**3.60**	**3.83**	**3.72**
SD	**0.33814795**	**0.287803037**	**0.309130863**	**0.356132352**	**0.19335038**	**0.257326**

APPENDIX K (Continued)

Correlation	r	Fisher's t	Evaluation
Teachers	0.57248653	4.130769168	Significant
Supervisors	0.90813204	12.88287116	Significant
Combined	0.83741162	9.064106863	Significant

CURRICULUM VITAE

CURRICULUM VITAE

PERSONAL DATA

NAME	: FLORENCIO D. BAYSA
ADDRESS	: San Francisco Street, Brgy. 2, Salug Catbalogan, Samar
DATE OF BIRTH	: January 23, 1949
PLACE OF BIRTH	: Calbiga, Samar
CIVIL STATUS	: Married
WIFE	: Loretta Tapia Baysa
CHILDREN	: Dexter T. Baysa Loren T. Baysa

EDUCATIONAL BACKGROUND

Elementary	: Catbalogan II Elementary School Catbalogan, Samar (1960)
Secondary	: Samar High School Catbalogan, Samar (1965)
College	: University of Negros Occ. - Recoletos Bacolod City (1970) Major - Mathematics Minor - General Science
Graduate	: Samar College Catbalogan, Samar (March 1997) Master of Arts in Educational Management
Thesis	: Effect of Magnetic Field on the Germination of Mungbean: Input to Instructional Material (IM) Development

Post Graduate : Samar State Polytechnic College
Catbalogan, Samar (2001)
Doctor of Philosophy in Educational Management

Dissertation : Integrated Science and Mathematics Program (ISMP) for Secondary Schools in Eastern Visayas: A Model

CIVIL SERVICE ELIGIBILITY

Career Service Professional
Teachers Board Examination (PBET)

PRESENT POSITION

Secondary School Principal I
Tarangnan National High School

Scout Commissioner for Advancement and Training
BSP, Samar Council, Board Member

Member: K of C, Council 3342
Member: Couples for Christ

STATUS OF EMPLOYMENT

PERMANENT STATUS	:	Classroom Teacher	- 13 years
		Master Teacher I	- 6 years
		Head Teacher	- 4 years
		OIC, Principal (SNS)	- 1 year
		Principal I (TNHS)	- 7 years
YEARS IN THE SERVICE	:	31 years	

CERTIFICATES OF APPRECIATION/COMMENDATION/RECOGNITION

1. Demonstration Teacher in Mathematics IV (April 8, 1980)

2. Resource Person, Seminar-Workshop on Science Fairs and Quizzes (August 7, 1981)

3. Regional Seminar-Workshop Science Fair -Project Winner, Seminar-Workshop on Science Fair and Quizzes (March 20, 1981)

4. Trainor Science IV, Regional Echo-IPSED, Seminar_Workshop on Math II, Science III and Science IV for Secondary Curriculum (Jan. 17, 1981)

5. 1982 Division Science Fair and Quiz (Oct. 20, 1982)

6. Facilitator, Regional In-service Education Program in Communication and Instructional Competencies for Science and Mathematics Teachers (Aug. 27, 1982)

7. 1983 Division Science Fair and Quiz (Oct. 11, 1983)

8. Chairman, working Committee, 1986 Division/Provincial Science Fair and Quiz (Oct. 21, 1986)

9. Science Club Month Celebration (Sept. 30, 1986)

10. Coordinator, lecturer, facilitator, Re-echo Seminar Workshop on Research and Research Management for Science and Math Teachers (Sept. 26, 1986)

11. 1987 Division Science Fair & Quiz (Nov. 18, 1987)

12. 1988 Division Science Fair & Quiz (Nov. 14, 1988)

13. Executive Committee Member of the Regional Leader School (RLS) SEDP Training Lecturer in Mathematics II (June 2, 1990)

14. 1990 Division Science Fair & Quiz (Oct. 11, 1990)

15. Co-organizer, Evaluation Seminar on the New Secondary Mathematics Program (Feb. 18, 1991)

16. Conducted Out-of-School Youth Integrated Leadership Training (June 21, 1991)

17. Discussant, Re-echo Seminar -Workshop on SEDP School Location Planning and Administrative Conference for Secondary School Heads (August 2, 1991)

18. Regional Echo-seminar on Team Building and Sports Management (Oct. 11, 1991)

19. Regional Echo-seminar Workshop on the Promotion of Philippine Culture through PESS (Nov. 22, 1991)

20. Resource Speaker, Division Seminar-Workshop on Research in Teaching Learning Mathematics Education (Dec. 6, 1991)

21. Consultant, Division Seminar-Workshop on Curriculum Writing in Math I and Math II (Aug. 28, 1992)

22. Co-chairman, 1992 EVRAA, Samar Delegation

23. Outstanding performance as Facilitator, Division Implementation of Supervisory Enhancement Program (SSEP) Nov. 27, 1992

24. Cooperating Mathematics Department Head of Student Teachers of Sacred Heart College (March 2, 1992)

25. Regional Echo-seminar of Coaching and Officiating in Sports (Dec. 11, 1992)

26. Council-wide Woodbadge Conference and Reunion

27. Student Teacher Coordinator for Student Teachers of Samar College (SY 1992-1993)

28. Cooperating Department Head in Mathematics of Sacred Heart College, Student teachers (Jan. 6-Feb. 26, 1993)

29. Coordinator, Seminar-Workshop in Secondary Mathematics (June 30, 1993)

30. School Administrator as the Host School during the Seminar-Workshop in Guidance held at Samar National School (Sept 17, 1993)

31. Support to the 8th Infantry Division Philippine Army "Up-up Samar Island 1993 Movement" (Oct. 31, 1993)

32. Bronze Medal of Merit, BSP, National Court of Honor No. 3585 (Oct. 31, 1993)

33. DLS-Based Conference Workshop of Academic Department Heads and Social Studies Teacher in Region VIII (Nov. 5, 1993)

34. Three-day In-service Training for Science and Mathematics Secondary School Teachers (Nov. 27, 1993)

35. Second Regional Convention of Student Leaders and Teachers Advisers in Region VIII (Nov. 5, 1993)

36. Basic Training Course for Unit-Leaders (June 19, 1994)

37. Leadership and coordinative roles played to the Councils Activities and Operation during the years 1992-1994, resulting in every significant gain for the Scouting Movement in Samar (July 14, 1994)

38. Resource Speaker and Facilitator in the In-service Orientation on Mathematics Teaching for Secondary Schools Administrators (Oct. 7, 1994)

39. Basic Training Course in Scouting, Trainor (Oct. 30, 1994)

40. Lecturer/Facilitator, Seminar-Workshop on Teaching Resource Materials (TRM) Utilization in Secondary Mathematics (July 15, 1995)

41. Resource Speaker, Seminar-Workshop on Teaching Strategies in Elementary Mathematics (Aug. 18, 1995)

42. Associate Fellow, National Educators Academy of the Of the Philippines, NEAP Fellow (March 13, 1995)

43. DAMATH Integer, Facilitator (Oct. 6, 1995)

44. Valuable service rendered "Test All" Project (Oct. 11, 1995

45. Valuable support, cooperation and assistance rendered SPAA Meet 1995 (Nov. 15, 1995)

46. Outstanding Unit Manager (Unit I, SPAA) Dec. 18. 1995

47. Seminar-Workshop on Enhancing Teacher's Competencies in Teaching Values Education/GMRC (Feb. 10, 1996)

48. Outstanding Support in the Implementation of the "Paligsahan sa Kasaysayan" (March 1, 1996)

49. Guest Speaker during the Recognition Day of Sierra Island National High School (March 23, 1996)

50. Resource Speaker, Seminar-Workshop on Upgrading Teaching Competencies of Mathematics Teachers (Sept. 6, 1996)

51. Facilitator, DAMATH Counting Numbers (Oct. 2, 1996)

52. Discussant, BSP Advancement Seminar (Sept. 6, 1996)

53. Meritorious and Outstanding Services rendered to the BSP organization (March 22, 1997)

54. Basic Training Course for Unit Leaders in Scouting, Meritorious services as Course Leader (July 20, 1997)

55. Active and Cooperative Principal, PTCA, TNHS (Aug. 2, 1997)

56. Silver Medal of Merit (Oct. 31, 1997)

57. Commission as Deputy Council Scout Commissioner for Training of Samar Council, BSP (Feb. 9, 1998)

58. Plaque of Recognition, Meritorious and Outstanding Services rendered to the BSP, Scouting Movement of Samar Council (Jan. 29, 1998)

59. Outstanding performance as Process Observer, Division Seminar-Workshop on Mathematics Instruction Management (July 16, 1999)

60. Facilitator, Echo-Seminar-Workshop on the Refinement and Finalization of RHGP (Sept. 17, 1999)

61. Meritorious and Outstanding services rendered, 5th Samar Council KAB Olympics (Oct. 17, 1999)

62. Gold Medal of Merit -Meritorious and Outstanding Services rendered of the BSP organization (Oct. 31, 2000)

63. Outstanding award, selfless dedication to the scouting movement significant contribution for the advancement of Boy Scouts for the year 2000 (March 23, 2001)

64. Involvement and conduct of the study: Teaching Effectiveness of Mathematics and Science Teachers in Public Elementary and Secondary Schools, DECS, NETRC (Nov. 6, 2000)

STUDY/SCHOLARSHIP GRANTS

1. Summer Institute (Physics) April 17 to May 27, 1978 DWU, Tacloban City

2. 2. Summer Institute (Mathematics IV) April 18 to May 29, 1979 DWU, Tacloban City

3. Leadership Course in Communication and Instructional Competencies for Science and Mathematics Teachers, May 3 to 29, 1982, BVNS, Baguio City

4. Research and Research Management Training May 5 to 23, 1986, UPLB College, Laguna

5. Values Development Orientation Workshop, April 4-10, 1988, Teachers Camp, Baguio City

6. PASMEF Workshop on Teacher Supervision and Development for Mathematics Secondary School Head Teacher Feb. 18 to March 15, 1991 UP College of Education, UP-ISMED, PASMEP, DECS

AWARDS

1. Bronze Service Awards (BSP)
   May 18, 1974 No. 339

2. Pilak na Gawad sa Paglilingkod (BSP)
   Oct. 31, 1981 No. 546

3. Outstanding Teacher (CPPSTEA -SNS)
   Dec. 7, 1988

4. Bronze Medal of Merit
   Oct. 31, 1993 No. 3583

5. Silver Medal of Merit
   Oct. 31, 1997 No. 5629

6. Plaque of Recognition
   Boy Scouts of the Philippines
   National Office Manila
   January 29, 1998

7. Gold Medal of Merit
   Oct. 31, 2000 No. 4163

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