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The Mathematics Performance of Students in the National Achievement Test: Basis for the Development of Materials for Remedial Instruction

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Philippine Normal University
National Center for Teacher Education

THE MATHEMATICS PERFORMANCE OF STUDENTS IN THE NATIONAL ACHIEVEMENT TEST: BASIS FOR THE DEVELOPMENT OF MATERIALS FOR REMEDIAL INSTRUCTION

A Special Project
Presented to the College of Graduate Studies
and Teacher Education Research
Philippine Normal University
Taft Avenue, Manila

In Partial Fulfillment of the Requirements
for the Degree Master of Education
with Specialization in Mathematics

by
Walner A. Saturno
October 2013

ABSTRACT

Title: The Mathematics Performance of Students in the National Achievement Test: Basis for the Development of Materials for Remedial Instruction

Researcher: Walner A. Saturno

Degree: Master of Education

Specialization: Mathematics

Key Concepts: Constructivism, Instructional Module, Individualized Instruction, Mathematics Performance, National Achievement Test, Remedial Learning, Remedial Teaching,

Adviser: Dr. Rene R. Belecina

The study analyzed the mathematics performance of the second year high school students as basis for the development of instructional materials for remediation. The weaknesses and difficulties of the second year high school students in Mathematics were identified based on the results of the National Achievement Test. The descriptive-development research design was employed in this study. The development of the instructional material followed a four-stage process namely: Needs Analysis and Planning, Development, Validation, Revision and Finalization. In the first stage, the weaknesses of the second the second year students were identified based on their National Achievement Test results. The competencies tested in the National Achievement Test were clustered into six topics

namely Linear equations and Inequalities, Quadratic Equations, Rational Expressions, Exponents and Radicals, Variations, Sequence and Series. It was found out that the weaknesses of the high school students are in Quadratic Equations, Rational Expressions and Exponents and Radicals. The development stage involved the preparation of the instructional material based on the identified weaknesses. The validation stage dealt with the evaluation of the instructional materials by the experts. The main instrument used was the evaluation checklist used by Magdalaga (2013). The instructional material developed was evaluated in terms of functionality, objectives, usability and efficiency, format and appearance, language and clarity and overall rating. The criteria were rated using a five-point scale. The degree of acceptability of the instructional material was determined using the computed mean. The final stage involved the preparation of the final draft of the instructional materials based on the evaluation of the experts. The overall rating of the instructional materials proved that it has passed the standards and acceptability test for an instructional material for remediation.

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CHAPTER I

The Problem and Its Background

Introduction

In the Philippines, “the improvement of the curriculum is a continuing process, and the challenge to the school is to experiment with ways of delivering the program in the most effective and efficient manner as possible. The culture of innovation must be developed and nurtured in every school. The schools shall be capacitated to develop and manage curriculum innovations.” (DepEd Order No. 35 s.2005)

In line with curricular revisions, the Basic Education Curriculum was piloted in the school year 2002-2003. The desired learner or graduate of this curriculum is a functionally literate, a creative and critical thinker, an independent problem solver and a work-oriented lifelong learner who is *Makadiyos, Makabayan, Makatao and Makakalikasan*.

However, the case studies conducted by the Bureau of Secondary Education aimed at monitoring and evaluating the implementation of the Basic Education Curriculum in twenty public, private, technical-vocational and science high schools revealed that “there are gross inconsistencies between the kind of learner/graduate that the schools desire to produce and the strategies they employ. For example, instruction is still predominantly authoritative and textbook-based; learning is usually recipient and commonly prescriptive and directive; and assessment is focused more

on judging rather than improving performance."(DepEd Order No. 35 s.2005)

The findings from these case studies also showed that teachers have limited knowledge on constructivism as a learning theory. Among the basic concepts of the BEC is "Learning as a construction and the learner as a constructor of meaning." The concept underlies the integrated approaches in the BEC. Application of the concept, however, was limited. School documents like the yearly reports, school development and improvement plans, instructional and remedial programs, lesson plans, course syllabi and teachers' reports made little mention of how the concept was applied to the teaching-learning process.

Through a thorough analysis of the themes and patterns of school practices that emerged from the implementation of the BEC, it was recommended that "Schools should consider the use of alternative assessment tools and techniques that would provide opportunities for students to experience learning as an enjoyable, delighting process of inquiry, discovery, construction and creation of new knowledge rather than as tedious process of cramming to pass the examinations. While schools should double their efforts for students mastery of the basic competencies, they should never lose sight of the fact that their ultimate goal should be the development of functionally literate citizens of a democratic community."(DepEd Order No. 35 s.2005)

Achievement Tests conducted by the Department of Education serve as a major tool in planning for effective instruction. These tests not only determine the level of mastery of students in each competency in the subject areas in each year

level but also point what particular skills need attention for effective instruction. In the second year level, the National Achievement Test (NAT) was administered in 2006. From then on, the NAT is conducted yearly. National Education Testing and Research Center (NETRC) administers the NAT to students to determine what the students know, understand and can do at their level.

The NAT results guide decision makers in formulating policies relative to progression and promotion of students, especially in public school system. These will also determine the deficiencies of students that need further intervention. Results of this indicator will help teachers formulate appropriate interventions aimed at improving the educational system. By measuring the students' strengths, weaknesses and achievement levels, teachers and school administrators can derive ways on how the present educational system can be further improved.

Learning takes place from simple to complex. If for some reason the student has not learned the basics, it is futile to teach him the advanced topics. It is at this stage therefore where remedial teaching comes in. Careful analysis of the students' performance in the examination and diagnosing the areas of difficulty are key aspects in remedial teaching. Once the difficult areas are identified, the next task is to plan the learning experiences to teach the basics to understand the given topic. Experience shows that once the basics are taught, the learning process is accelerated and the slow learners comprehend and grasp the given topics of the class, since they have already attained the mental age.

The capacity to learn different subjects varies from student to student. For instance, learning mathematics is a knack for some learners. All students do not do well in mathematics just as they do in other subjects. While other subjects can be learned at any stage, it is very difficult for students to learn mathematics without the basics. Generally, students show interest in the subjects they like and neglect other subjects if not taken care of.

Remedial Teaching is identifying slow learners and giving them the necessary guidance to help them overcome their problems, after identifying their areas of difficulty. Contrary to what is said, remedial teaching is done perfunctorily without identifying their areas of difficulty and underlying cause for lagging behind.

The findings of the researches on the results of the National Achievement Test imply the need to study achievement test results as baseline information for conducting remedial programs to ensure learning of essential concepts and competencies. It was a guide in making instructional materials which will aid students in mastering the necessary skills and competencies. The findings on the mathematics performance in the National Achievement Test were used as a benchmark in the conceptualization of instructional materials for remedial program. The competencies which were least mastered were considered for the topics covered in the instructional material.

Conceptual Framework

This study was anchored on the theories of constructivism, individualized

instruction, active learning, and essential components of remedial instruction.

According to Tam (2000), the constructivist model emphasizes the importance of active involvement of learners in constructing knowledge for themselves by drawing on prior knowledge and personal experience. Students learn how to integrate disciplines in order to solve complex problems. The constructivist teacher acts as a designer of learning environment for students in order to achieve these learning goals. Learning environments emphasizes course delivery through active learning, assignments and problem-based learning

Constructivism is often referred to as learner-centered teaching philosophy. The teaching goal of the constructivist is for the student to learn an array of core learning objectives, such as communication and information literacy skills. Aspects of constructivism can be found in self-directed learning, transformational learning and experiential learning. It is necessary to benchmark on this philosophy to meet the challenges of the educational system (Bhojwani, 2009)

Glassersfeld (2009) describes constructivism as “a theory of knowledge with roots in philosophy and psychology”. According to Glassersfeld, sustaining motivation to learn is strongly dependent on the learner’s confidence in his or her potential for learning. These feelings of competence and belief in their potential to solve new problems, are derived from first-hand experience of mastery of problems in the past and are much more powerful than any external acknowledgment and motivation. According to Prawat and Floden (2004), constructivism’s implications for

the theory of instruction include personal, hands-on, experiential, collaborative, project-based, and task-based learning.

Schargel & Smink (2001) points out that individualized instruction programs are developed as a collaborative effort of students, teachers, and school administrators. Many schools are using individualized instruction with students who score below grade level on standardized tests. The most effective way to learn something for remedial instruction is to connect it to prior knowledge. In order for the teacher to know each child's knowledge level pre-testing, questioning, and observation are used. The educational philosophy of constructivism has as its basis at the ability of learners to give meaning to new learning based on their prior knowledge.

Caine & Caine, (2010) further suggests that active, experiential learning is vital to the construction of new knowledge. Some of the instructional strategies that encourage knowledge building according to this study are problem-based learning and reciprocal teaching, peer tutoring, cooperative learning, hands-on learning and journaling. Switzer, (2004) stresses the importance of inquiry during individualized instruction. According to him, motivation is particularly important when working with at-risk students. The three elements of motivation are positive value, clear connection between behavior and consequences, and a belief that success can be achieved with the available skill and resources.

Stainback & Stainback, (2012) puts emphasis on the recognition of the unique

learning needs of students in individualized instruction as a means of providing students with opportunities to achieve their potentials. This is affirmed by Pugach & Warger, (1996). According to their study, no child will be left behind if the individual learning needs of the child are met. Each child is unique and individualized programs can increase students' success.

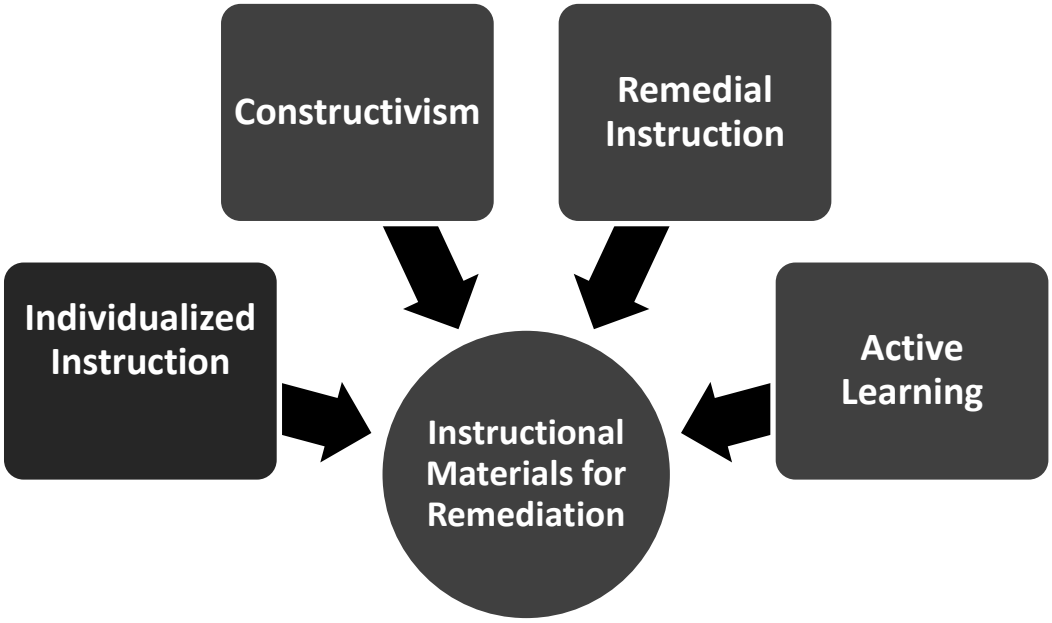
According to Swerling (2005), studies in math reveal that essential components of remedial instruction include drill, concept recall, diagnosis of difficulties, presentation of illustrative examples and journaling. He emphasizes that there is no single "best" program for teaching remedial mathematics. Rather, certain key abilities involved in learning math need to be addressed in remedial instruction, with the importance of different abilities shifting somewhat across the secondary grades. He further points out that because students have different strengths and weaknesses even within the domain of math, knowing the pattern of strengths and weaknesses is central to instructional planning. For instance, a student who has good conceptual abilities but whose difficulties center on automatic recall and computation will need a different kind of instructional program than a student whose main difficulties are conceptual in nature. Instructional materials should therefore address the weaknesses of the learners during remedial instruction.

The development of the instructional material considered the theories of constructivism, individualized instruction and essential components of remedial instruction to ensure that the presentation of lessons are anchored on the least mastered skills of the high school students. Cognizant of the learner centered

approach for remedial instruction, the method of introducing each lesson includes previous experiences to the learners in order for them to build their own constructs in each topic. The situations presented which are in the context of Philippine scenario are based on social constructivists' belief that the teacher does not regard the child as a vessel to be filled with information but a person who has his own schema. The material can help the teacher engage the students to build new knowledge using his or her stored knowledge. Experiences of Filipino learners serve as benchmarks on the acquisition of knowledge of those who will undergo remedial instruction.

The theory of individualized instruction is taken into account since the material is responsive to the student's least mastered skills in the National Achievement Test. The material developed is consistent with activities like problem-based learning, cooperative learning and journaling. These activities are recommended for effective individualized instruction. The problems given in the modules also include real life situations to build concepts on students existing knowledge and beliefs. The interdisciplinary approaches facilitate the acquisition of knowledge, skills and values.

Figure 2 presents the conceptual framework from which the study was anchored upon.



Conceptual Paradigm
Figure 1

Statement of Purpose

This study analyzed the mathematics performance of the second year high school students of Holy Rosary Colleges Foundation in the National Achievement Test (NAT) School Years 2009-2010 and 2010-2011. The results of the analysis were used as basis for the development of instructional materials for remediation.

Specifically, this study aimed to do the following:

1. Identify the weaknesses and difficulties of the second year high school students in Mathematics based on the results of the National Achievement Test.

2. Design and develop instructional materials for remediation based on the identified weaknesses.
3. Evaluate the instructional materials in terms of
   3.1 Functionality
   3.2 Objectives
   3.3 Usability and Efficiency
   3.4 Format and Appearance
   3.5 Language and Clarity
   3.6 Overall Rating
4. Prepare the final draft of the instructional materials based on the results of the evaluation.

Significance of the Study

This study will serve as a tool for improving the students' level of achievement of the objectives in Mathematics and for the acquisition of knowledge and skills necessary for a remedial learning.

To the ***teachers***, the study on the mathematics performance of the students in the National Achievement Test will make them aware of the competencies which need more time for discussion to achieve the students' mastery level. It will also give the teachers an idea for planning remediation and enhancement programs relevant to the needs of the students. Likewise, the instructional material developed will motivate them to come up with innovations which can enhance the teaching-learning

process. Moreover, it will make them prepared to make the curriculum tailored fit to the needs of the students.

To the ***school administrators***, the study will help them undertake some measures in addressing the students' learning needs. The results of the National Achievement Test reflected what competencies need to be strengthened and monitored in the implementation of the curriculum. In addition to this, it will also make them cognizant of the topics in Mathematics which need immediate attention and improvement in terms of the level of mastery.

To the ***students***, the results of this study will make them aware of the novel approaches that would spark their interest in studying mathematics. The instructional material which was developed will also help them in their learning efficiency, retention of concepts and transferability of skills to real life situations.

To the ***curriculum planners and designers***, this research will give them alternative designs for instruction which may help break the barriers and boundaries to effective and efficient learning. The instructional material developed was perceived to be a rich source of vicarious learning experiences which will give way to the development of learners who are functionally literate, a creative and critical thinker, an independent problem solver and a work-oriented lifelong learner.

Scope and Delimitations of the Study

The study was limited to the analysis of the mathematics performance in the National Achievement Test of 245 second year high school students of Holy Rosary

Colleges Foundation, Calaba, San Isidro, Nueva Ecija in the school years 2010-2011 and 2011-2012. An instructional material was developed to be responsive to the needs of the students in this school so only the mathematics performance of all the second year students in the National Achievement Test for school years 2010-2011 and 2011-2012 were studied. Analysis of the actual questions found in the test was not considered. Only the competencies together with the number of students on each level of mastery were studied.

The choice of topics included was based on the analysis of the National Achievement Test. The competencies tested in the National Achievement Test were clustered into six topics namely, topics namely; Systems of Linear Equations and Inequalities, Quadratic Equations, Rational Expressions, Exponents and Radicals, Variations, Sequence and Series. The topics covered in the instructional material developed only include lessons where the students have low mastery. These are Quadratic Equations, Rational Expressions and Exponents and Radicals. Validation of the material by experts was only restricted to functionality, objectives, usability and efficiency, format and appearance, language and clarity and overall rating. The criteria were rated using a five-point scale.

Definition of Terms

The following terms were defined conceptually and operationally for clarity and better understanding of their meaning and use in this study.

- **Instructional Material.** An instructional material is a tool which can help a

teacher effectively carry out his tasks in the teaching-learning process (Mertz, 2005). As used in this study, instructional material refers to the modules designed for remediation in Mathematics.

- **Level of Mastery.** It is a measure whether or not a student has mastered a specific competency. Whether or not a student has mastered the area of study is dependent upon pre-specified qualifications. Unlike other grading system, students who do not meet the mastery level have other chances to achieve the mastery level (Nichols, 2011).In this study, this refers to the level of achievement in each specific competency as determined by DepEd standards. On the test items, the list of scores will be converted into verbal equivalents namely: mastered, closely approximating mastery, moving towards mastery, average mastery, low mastery, very low mastery or absolutely no mastery. A score of 75% and up indicates mastery of the subject and 50% to less than 75%, near mastery; while a score of below 50% indicates low mastery.

- **Mathematics Performance.** It is the ability of a student to perform in mathematics based on skill and attributes (Gatto, 2009). As used in the study, this refers to the overall achievement of the students as reflected in their mean percentage score (MPS) in the National Achievement Test.

- **National Achievement Test (NAT).** This is an examination given annually in March to assess the competency of both public and private school students.

The students' knowledge and skills are tested in the subjects of Mathematics, English, Science, Filipino, and HEKASI for grade school and Mathematics, English, Science, Filipino, and Araling Panlipunan for high school. The test is administered by the Department of Education's National Education Testing and Research Center (NETRC). The results are intended to guide the Department of Education in its efforts towards the improvement of the quality of education in public schools and to provide appropriate intervention for the students.

- **Validation.** It is the process of confirming that a product or service meets the needs of its users. It is documenting that a products meets the standards of its users (Rock, 2007). As used in this study, it is the process of determining the usefulness of the proposed instructional material in terms of the following criterion: functionality, usability and efficiency, objectives, content, format and appearance, language and clarity.

CHAPTER II

Review of Related Literature

This chapter contains a review of related literature which are vital in the development of the present study.

The Monitoring and Evaluation of the Implementation of the 2002 Basic Education Curriculum: Findings and Recommendations

Hopkins (2000) defines evaluation as "a continuous inspection of available information concerning the students, teachers, educational programs and teaching learning process to ascertain the degree of change in the students and form valid judgment about the students and effectiveness of school programs.

In DepEd Order No. 35 s.2005 released by DepEd, one of the significant findings states

"**Teachers teach to the test, students study to the test."**

The use of traditional assessment tools like the multiple-response, simple recall, recognition and application tests is predominant. Rubrics, portfolios, and other forms of authentic assessment are not widely used. Teachers are aware of the limitations of traditional tests and the need for alternative forms to measure higher order thinking skills. However, they tend to resort to the traditional forms for several compelling reasons:

- These are the types used in periodic and achievement examinations.
- They are easier to score. (Teachers teach as many as 300 to 400 students a day and scoring non-traditional measures like rubrics could be an ordeal.)
- They are easier to prepare than the non-traditional forms like portfolios, rubrics, and other authentic measures.
- These are what everybody else is using.
- Teachers have inadequate knowledge of authentic learning and authentic assessment.

Documentary analysis showed that schools in general lack an institutionalized system of utilizing test results for diagnostic and remedial purposes.

This culture is reinforced by supervisors who specify units to be taught and tested for each grading period and use test results more for judging rather than improving teacher and student performance."

In the study, the Bureau of Secondary Schools recommended that schools should review their present assessment practices and that they should also consider the use of alternative assessment tools and techniques that would provide opportunities for students to experience learning as an enjoyable, delighting process of inquiry, discovery, to pass examinations.

National Achievement Test

In analyzing test performance, Mayo and Shotts(2004) found out that an important benefit of testing is the improvement of students' achievement. If test results are used by principals and schools to guide instruction, they can provide a road map for reaching and exceeding the standards. The more detailed the map, the more timely and successful the journey. Using test data requires analysis and care. Test results must not be used to document or even imply teacher's incompetence. Documenting excellent or poor teaching requires more than class-level test analysis. When test results are used effectively, teachers will come to value them as major tool in planning for effective instruction. The importance of test results as a road map to student performance becomes clearer. Educational decisions made by teachers, school administrators and other professionals have important consequences for students and the society.

The National Achievement Test (NAT) is an examination given annually in March to assess the competency of both public and private school students. The students' knowledge and skills are tested in the subjects of Mathematics, English, Science, Filipino, and HEKASI for grade school and Mathematics, English, Science, Filipino, and Araling Panlipunan for high school. The test is administered by the Department of Education's National Education Testing and Research Center (NETRC). The results are intended to guide the Department of Education in its efforts towards

efforts towards the improvement of the quality of education in public schools and to provide appropriate intervention for the students.

The National Achievement Test (NAT) was used to be called the National Elementary Achievement Test (NEAT) for grade school level and the National Secondary Achievement Test (NSAT) for the high school level. Both the NEAT and NSAT were precursors of the National College Entrance Examination (NCEE), an examination administered to gauge the competency of students entering college. The NCEE was abolished in 1994 through the Executive Order no.632 by the Education Secretary Raul Roco who stated that all high school students should be able to enter college and be given a chance of a better career in the future. It was replaced by NEAT and NSAT.

When the Department of Education Culture and Sports (DECS) was officially converted into the Department of Education (DepED), NEAT and NSAT were also abolished and replaced by the National Achievement Test (NAT). Both the public and private elementary and secondary schools take this exam. Many years back NAT result was part in the final grade of the second year test takers but it was also eliminated. In 2010-2011, there are schools, through sampling, where the second year test takers do composition writing in English and Filipino.

Features that Characterize the National Achievement Test

- A multiple-choice test

- A sampling of competencies intended for the whole year coverage
- A standardized test with mostly moderately difficult items
- Anchored on Bloom's Taxonomy of Cognitive Objectives/Dimensions
- High-Ordered Thinking Skills (HOTS)
- The performance of an examinee is compared to the performance of a national populace
- The rating is expressed in percentage score or percent of correct responses

Rationale of DepED in Administering the National Achievement Test

The NAT, which is a system-based assessment, was specifically designed to gauge learning outcomes across target levels in identified periods of basic education. In particular, it spans from mid assessment of elementary education which falls on the third grade, and then to a terminal exit assessment which falls on the sixth grade. On the other hand, the NAT for Second Year High School serves as mid assessment of the secondary level.

Is There A Passing Score in the NAT?

The NAT has no passing grade or score. It uses the Mean Percentage Score (MPS) to indicate the percentage of correctly answered items in a test. For instance, a 50 MPS would mean that an examinee correctly answered 20 of a

40-item subject area test. The computation of grades in school, however, is done very differently from NAT (DepED Order No. 70, s. 2003, “Revised Grading System for Elementary and Secondary Schools; www,deped.gov.ph).

How the NAT Scores Are Reported and Interpreted To Each Examinee

The score comprises the Percentage of Correct Responses (PCR) per learning competency by subject area.

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

Does an MPS below 75 Mean that the Examinee Failed the Test?

An MPS below 75 does not mean that pupils/students who took the test failed it. For instance, a 66 MPS in the total test would mean that the examinees were “moving towards mastery.” The NAT uses a seven-descriptive equivalent of Achievement Level based on the normal curve wherein an MPS of 75 and above is the national target.

The schools of Eastern Visayas and CARAGA made it to the top 2 for school years 2004-2005 and 2005-2006 while the schools of ARMM, NCR and Western Visayas were in the bottom 3. Science was found to be the lowest competence for both elementary and high school students. There was general deterioration seen in the results from school years 2004 to 2006 but by 2008 an improvement was seen, especially in the subject of Science, with the number of students found to have low mastery of each subject consistently decreasing.

From 2006-2009, the percentage increase of 21.36 percent was achieved. This only indicates a steady improvement in primary education in the country's public school system.

2009 NAT scores showed some improvement over the previous year's results. From 64.81% mean percentage score in 2008, it now increased to 66.33% in 2009.

This improvement could be credited to the various DepEd Programs like Teacher Mentoring Program, Every-Child –A-Reader-Program, Adopt-A-School-Program, the project TURN for literacy and the intensive reviews conducted in every schools as ordered by the Regional Directors through the Schools Division Superintendent.

However, though, an average score of 66.33% cannot be a huge cause for celebration, as this Mean Percentage Score (MPS) is still off the passing grade of 75%.

The NAT 2010 also revealed an increase of MPS but still has not reached the passing grade of 75%. In Misamis Oriental for instance, a few secondary schools were assessed Poor in the NAT result while most of them obtained Very Poor in assessment. It also revealed that Araling Panlipunan was the subject that obtained the lowest competence.

In a study on the factors affecting the National Achievement Test performance of selected second year students, Victorino (2011) found out that certain measures based on facts can be adopted to solve students' problems in Mathematics. The study found out that there is a significant relationship study habits and motivation to academic performance in Mathematics. The researcher recommended that the students should be given more attention and motivation to enhance their academic performance.

In the position paper on the continuance of NAT, the following points were pointed out.

1. NAT is a good instrument in measuring students' strengths and weaknesses in particular subject and particular skills.

2. NAT is a good instrument in measuring students' achievement levels, how well they have performed.

3. NAT provides every subject teachers identify which competencies need more time for discussion.

4. NAT provides every subject teachers identify which competencies need more time for discussion.

5. NAT results help the school head and the teachers undertake some measures in addressing the students learning needs.

6. NAT allows all teachers to be serious in their teaching.

7. NAT allows every learner to identify which competencies in every subject areas have been mastered, nearly mastered, or not mastered.

8. The result of NAT can be a good way of improving the present education system.

9. NAT allows students to be responsible of their own academic performance by studying harder.

10. It serves to measure the teaching performance of the teachers.

11. The NAT results guide the decision makers in formulating policies relative to the progression and promotion of students.

12. The results of the NAT will help DepED higher officials to formulate appropriate intervention for remedial instruction.

13. NAT results provide information which schools are performing better

and which are not. So, teachers from poor performing schools can be given special trainings/seminars to help enhance their competency level in terms of the domains, strands, and indicators of the National Competency Based Teacher Standards(NCBTS).

Remedial Teaching

Maccini (2002) defines remedial teaching as a special instruction designed and delivered to alleviate deficiencies in the achievement of some of the learning objectives of an instructional program. It is a specialized instruction for students deviating from the expected norm. Remedial Teaching, thus, as the name implies, is designed to cater to the needs of children unable to keep pace with the teaching-learning process in a normal classroom .

Brants (2009) discusses the types of remediation These include educational remediation, psychological remediation, physical remediation, and infrastructural remediation. According to their study, the objectives of remedial teaching are identifying the students with learning difficulties, studying the nature and extending of learning difficulties, studying the underlying factors which lead to poor academic performance, designing relevant instructional materials for improving academic performance, planning and implementing relevant instructional interventions to enhance the academic performance, enhancing the self-esteem of below average performers, planning and implementing various psychological interventions to

overcome the psychological barriers, and re-examining the current methods of teaching and to improve it

Waycaster (2001) stresses the importance of remedial teaching. These include, universalization of education – education for all, reduction of school dropouts – out of school children, individual differences, presence of sizable number of students with learning problems, lack of home support and first generation learning gaps. He further points out that remedial teaching helps all students in a school, regardless of their strengths or weaknesses in any area, become part of the school community. They are included in the feeling of belonging among other students, teachers, and support staff

Role of Remedial Teaching

In order to improve mathematics performance in remedial instruction, Moss (2006) suggests that, A remedial teacher should have a mentality of a sympathetic doctor who has love and care for his/her patients (students).He cites, several reasons for teachers of remedial instruction to be more patient. During class interaction an under-achiever will give wrong answers frequently to the questions asked because he will appear to be confused. He may probably not respond to the questions asked in the class at all. In unit tests and term test, a student may show poor performance consistently in tests. He will also be disinterested in irrelevant activities. These reasons imply the need for preparing instructional materials which will provide interesting activities for learners in the remedial instruction.

In the diagnosis of deficiencies for remedial instruction Parsad (2003) found out that learning of concepts, computational skills, procedure of problem solving, and application of knowledge are vital. In the Learning of concepts a student's concept(s) related to a particular topic or formula which is not clear should be explained well by the teacher. Students may not be good in terms of computational skills but performing basic arithmetical operations and simplification will be of great help to them. He added that once the deficiency has been diagnosed, the teacher can explore the possible causes for poor mathematics performance.

Hoyt (1999) stresses that in the process approach for remedial instruction, focusing on the performance of the teacher and the procedural and conceptual knowledge of the students with regard to specific objectives is integral for students to get high score in the examinations. In terms of marks and subject average, the process approach is preferred for evaluative reasons. This process is based on the principle that whatever the teacher might have done in the class room is irrelevant unless the objective (of obtaining a high score in the examinations in terms of marks and subject average) is achieved. This then is the primary criteria of evaluation of both the teacher and the topics to be taught for remedial learning at all levels.

The work of the teacher does not end here. He/She must ensure that the student continuously practices upon them to ensure that the weakness does not reoccur in future.

According to Postlethwait (2001) the institution has to play a pivotal role to

achieve the ultimate objective of remedial instruction. The difference between supervised study (study under the supervision of a teacher) and remedial teaching should be clearly understood. The teacher on his part should not just while use the time for any activity but should perform these activities as suggested above in letter and spirit and then. Only then can the ultimate objective of remedial instruction be achieved. The teacher must remember that if a student fails then: the teacher has failed; the examination system has failed; the evaluation system has failed and by and large the education system as a whole has failed.

Present educational principles and practices reflect a consensus of educational theorists on what pedagogies promote learning These include: curriculum that focus on in-depth learning while at the same time making necessary connections to scaffold knowledge; formative and summative assessments that provide opportunities for further learning; and effective student learning occurs when practitioners have a good understanding of the disciplinary focus of the subjects they teach. Remedial teaching which focuses on professional collaboration in learning communities, curricular alignment, authentic pedagogy, and formative assessment is also supported by many international research studies (e.g. Newmann et. al., 1996; Smith, Lee, & Newmann, 2001; Martin et. al., 2000; Stigler & Hiebert, 1999; and Hayes et. al., 2000). In the Philippines, numerous education bodies are presently redesigning their curriculum to provide more room for remedial teaching. Likewise, in recent years, many schools (Albright et. al., 2008) in Singapore have adopted more forms of remedial teaching for academic advancements. This contributes to crucial

areas of research on the implementation of the curriculum reform, especially studies which focus on its potential impact on teachers' professional beliefs, capacity for curricular and pedagogical innovation, and its impact on student learning and achievement. It draws upon, and extends, existing NIE professional development projects (e.g. Kwek et. al., 2007) which developed teacher capacities in curriculum redesign and implementation.

The Role of Teacher-Developed Instructional Materials for Remedial Learning.

In one of the studies reported by Bettinger and Long (2005), the role of teacher-developed instructional materials in bringing quality remedial learning was pointed out. The study aims to guide teachers involved in remedial instruction in putting the development, production and evaluation of quality instructional materials to enhance personalized remediation. Snortland (2002) noted that instructional materials suited to the weaknesses of the remedial learners are indispensable for raising educational standards.

Instructional materials serve as guides for remediation. These instructional modules constructed by teachers can aid the teacher in making decisions on selecting topics which are deemed necessary and important to reach (Rientes, 2006).

There are varied reasons for using teacher- created instructional materials for remediation. Some of these are enumerated by Rientes (2006) as follows;

1. They help remediation more responsive to perceived weaknesses.
2. They maintain quality remediation. A well-developed instructional material provides students with experiences and exposure to time tested learning materials which uphold the highest learning principles.
3. Teacher-created instructional materials provide a variety of learning resources. These are personally responsive to learners who are the clienteles of remedial learning.
4. They are efficient. A well-developed instructional material save the effort of the teacher from looking for teaching materials which are adapted to the students' needs, hence the teacher has more hours spent for remedial teaching
5. Instructional materials train teachers to be curriculum planners for their students' needs for remediation.

According to Riambon (2002) some problems our country needs to address in instructional material development is producing material which are socially and culturally adapted to the educational system. We have criticisms in Philippine textbooks. In the article by Araneta (Philippine Star, 2006) , he mentioned that Former DepEd Undersecretary, Isagani Cruz said that not only grammar but content is flawed in our Philippine textbooks and cited mathematics among other examples. He found that our mathematics textbooks are not situational in nature. Our mathematics textbooks do not use what the children can see around them, thus defying the ancient- now

mistakenly called constructivist- principle that we learn only from what we already know.

In line with the use of language for instructional materials, Ebreo (2009) noted that one of the difficulties of Filipino students in mathematics is attributed to “reading deficiences in vocabulary, comprehension and study skills. Thus, developing instructional materials for remediation should consider the use of language which will be easily understood by remedial learners in the Philippine context. This will remove the language barrier which hinders the students’ thorough understanding of the concepts and principles in mathematics together with the applications.

Synthesis

The literature that were reviewed here prompted the researcher to pursue the development of an instructional material based on the National Achievement Test results in order to address the problem on the students’ level of mastery. This is the direction that was taken by the researcher as to further explore the best ways of improving the students’ attainment of the necessary skills in Mathematics.

In all the readings, the need for quality instructional materials have been considered integral for successful remediation. The importance of teacher-developed instructional material which is based on Philippine context is also indispensable for remedial teaching. Four stages were followed in the development of the instructional material. These stages are Needs Analysis and Planning Stage, Development Stage,

Validation Stage and Revision and Finalization Stage.

Furthermore, the studies mentioned here have provided the researcher valuable insights on how to develop and validate an instructional material. The bottom line is that the teachers should be able to foster learning and creativity among students. Using validated instructional materials would be an opportunity for mathematics teachers to explore methods for addressing students' weaknesses and in the long run help students in understanding mathematical concepts.

CHAPTER III

Methodology

This chapter discusses the research methodology which was employed in the study. It includes the research design, research locale, participants of the study and the stages in the development of the instructional material.

Research Design

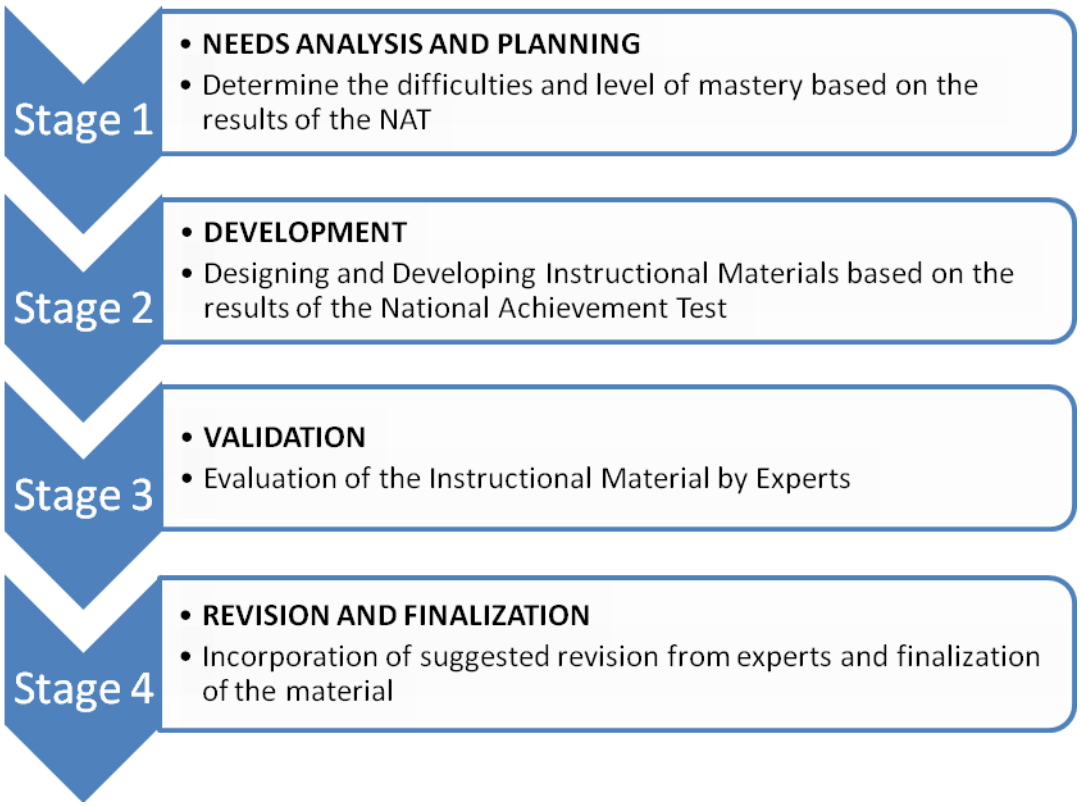
This study utilized the descriptive-development research design. According to Zulueta (2003), descriptive research, aims to “describe and interpret what is”. In this type of research, analysis of relationships among variables is not done. Only accessible conditions are described to present data.

Fraenkel and Wallen (2009) defines descriptive-development research design as the study of present or existing situations in order to address problems through the creation of a product which could be used in response to the present state, problem or condition. The study used the descriptive development-research design in order to come up with an instructional material which can address the problem on the low mastery levels in identified areas in mathematics covered by the National Achievement Test.

This study involved gathering information by examining the results of the National Achievement Test of the students obtained from the National Education Testing and Research Center. To attain the objectives of the study, four stages were

followed namely: Needs Analysis and Planning, Development, Validation and Revision of the Instructional Material.

Figure 2 shows the process of the development of the instructional material.



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Research Locale

The study was conducted in Holy Rosary Colleges Foundation, Calaba, San Isidro, Nueva Ecija. It is a private non-sectarian school situated in the fourth congressional district of Nueva Ecija. It offers pre-school, elementary, secondary and tertiary courses. Students from this institution dominated in the Metrobank-MTAP-DepEd Math Challenge for four consecutive years in Nueva Ecija in both written

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Holy Rosary Colleges Foundation is also able to produce contestants who represented the province in the regional competition for the past three years.

Participants of the Study

All the 230 second year high school students from Holy Rosary Colleges Foundation who took the National Achievement Test in school year 2010-2011 and school year 2011-2012 were the respondents of the study: Of these students, 105 were in the school year 2010-2011 and 125 were in the school year 2011-2012. All the students were included because the population in each year is only small, thus, sampling is not needed. In addition to this, all these students were considered to make the analysis of the data more comprehensive.

To evaluate the developed instructional material on its level of acceptability, a group composed of five Mathematics experts from Philippine Normal University and University of Santo Tomas were involved. Expert 1 is a doctor of Philosophy in Mathematics Education and has been teaching for 20 years. Expert 2 is an Instructor

at PNU and has an MS in Teaching Mathematics and has been on service for 23 years. Expert 3 is a Senior I at University of Santo Tomas High School with Master of Education in Mathematics. He has been teaching for 11 years. Expert 4 is a Senior I at University of Santo Tomas High School with Master of Education in Mathematics. He has been teaching for 7 years. Expert 5 is the Principal of Holy Rosary Colleges Foundation with Master of Education in Mathematics. He has been teaching for 13 years.

Stages in the Development and Evaluation of the Instructional Materials for Remediation

The development of the instructional material followed a four-stage development plan namely: Needs Analysis and Planning, Development, Validation, Revision and Finalization

Stage 1. Needs Analysis and Planning

This stage dealt with the identification of the weaknesses of the second year students based on the National Achievement Test Results. The competencies tested in the National Achievement Test were clustered into six topics namely; Systems of Linear equations and Inequalities, Quadratic Equations, Rational Expressions, Exponents and Radicals, Variations, Sequence and Series.

The competencies under each topic were identified then the mathematics performance of the second year students under competency was tallied. The number

of students and the corresponding percentage of students under each mastery level were computed. The mean mathematics performance on each competency was also computed using the MPS (mean percentage score) of each student. The mastery level was then identified using the mean. The weaknesses of the students were then identified based on the mean mathematics performance. Competencies with low mastery level became the bases for the development of instructional materials for remediation.

The discussion below presents the mathematics performance of the second year students in each topic tested in the national Achievement Test.

Table 1 shows the mathematics performance of the high school students on systems of linear equations and inequalities

Table 1
Mathematics Performance of the High School Students on Systems of Linear Equations and Inequalities

COMPETENCIES	Absolutely No Mastery (0-4%)	Low Mastery (14-34%)	Average Mastery (35-65%)	Moving Towards Mastery (86-95%)	Mastered (96-100%)
1. Find the solution of systems of 2 linear equations.	11.2%		30.40%	19.20%	39.20%
2. Use systems of linear equations to solve problems.	8.78%		51.42%	11.50	28.80%
3. Translate situations in real life to linear inequalities	18.00%	10.50%	30.80%		41.20%

In finding the solutions of systems of l2 linear equations, most students have average mastery. Only 11.20% of the students have absolutely no mastery in solving

systems of 2 linear equations. It can also be noted that the combined percentage of students who are moving towards mastery and those who have mastered is 58.4% which is a proof that more than half have mastered finding the solution of systems of two linear equations.

In addition to this, more than half (51.42%) of the students have average mastery. However, there were only 28.80% who mastered the skill in using systems of linear equations to solve problems. It is important to note also that only 8.78% have absolutely no mastery.

In translating real-life situations to linear inequality, only 41. 20% of the high school students have mastered this topic. Only 18.00% of the students had difficulty in using their skill on inequalities to real-life situations.

Table 2 presents the mathematics performance of the high school students in quadratic equations.

Table 2
Mathematics Performance of the High School Students in Quadratic Equations

COMPETENCIES	Absolutely No Mastery (0-4%)	Low Mastery (14-34%)	Average Mastery (35-65%)	Moving Towards Mastery (86-95%)	Mastered (96-100%)
1. Find the solution set of quadratic equations	51.20%		26.40%	16.80%	5.60%
2. Use quadratic equations to solve problems.	42.40%		46.40%		11.20%

In finding the solution set of quadratic equations, only 5.60% mastered finding the solutions of quadratic equations and 51.20% have absolutely no mastery.

The percentage of of those who have absolutely no mastery is more than half of the class.

Most students had no mastery (42.40% of the students)in using quadratic equations to solve problems. The students find it hard to use quadratic equations to solve problems as an effect of not mastering how to solve quadratic equations.

Almost half of the students had no mastery. There are only a few students who mastered the skill in using the quadratic equations to solve problems. This proves that quadratic equations should be given attention when teaching Algebra to the students.

Table 3 shows the mathematics performance of the high students on rational expressions.

Table 3
Mathematics Performance of the High School Students in Rational Expressions

COMPETENCIES	Absolutely No Mastery (0-4%)	Low Mastery (14-34%)	Average Mastery (35-65%)	Moving Towards Mastery (86-95%)	Mastered (96-100%)
1. Simplify rational expressions	28.57%		49.52%		21.91%
2. Solve rational equations	45.71%	9.52%	21.91%	12.78%	10.08%
3. Solve problems involving rational equations	36.24%		57.14%		6.62%
4.Perform operations of rational expressions	40.48%		57.62%		1.9%

It can be seen from the data that most students have average mastery in simplifying rational expressions. While most students have average mastery, 28.57% of the students still have absolutely no mastery. This is more than one fourth of the

population.

Based on the table, 45.71% of the students have absolutely no mastery in solving rational equations. It is also evident from the table that students had varied mastery levels in solving rational equations. Moreover, there were only a few students who have fully mastered the skill in solving rational equations.

In solving problems involving rational equations, 36.24% of the students have absolutely no mastery. 57.14% of the students had average mastery. In both years, only 6.62% of the students mastered solving problems involving rational equations. This means students cannot solve problems involving rational equations as an aftermath of not being able to master solving rational equations.

Furthermore, the data in both years reflect absolutely no mastery in performing operations of rational expressions for most students as evidenced by a 40.48% frequency percentage. Still, there were only few students who mastered the operations on rational expressions. However, it can be noted that 57.14% of the students have average mastery. The table shows that performing operations on rational expressions should also be given emphasis in teaching Algebra.

Table 4 presents the mathematics performance of the high school students in variations.

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COMPETENCIES	Absolutely No Mastery (0-4%)	Low Mastery (14-34%)	Average Mastery (35-65%)	Moving Towards Mastery (86-95%)	Mastered (96-100%)
1.Identify relationships between 2 quantities in real life that show variation	8.80%		28.00%	21.60%	41.60%
2.Represent phrases involving variations	13.00%		40.60%		46.40%
3. Solve problems on variation	3.40%		35.20%	13.20	48.60%

In identifying relationships between two quantities in real life that show direct, direct square, inverse and joint relationship, 41.60 % of the students mastered the skill. It can be seen from the data table that in terms of their skills on variation, most of them have mastery levels of average mastery, moving towards mastery and mastered.

Furthermore, 46.40% of the students had fully mastered translation or representation of the relationships in variations as equations. It is interesting to note that only 13.00% have absolutely no mastery. Again, most students have average mastery on this topic.

It is also noteworthy that, 35.20% of the students have average mastery level in solving problems on direct and direct square variations. Only 3.4% of the students had absolutely no mastery. Moreover, 48.60% of the students mastered the skill on solving problems on variations. This means that most students have mastery levels of average mastery, moving towards mastery and mastered.

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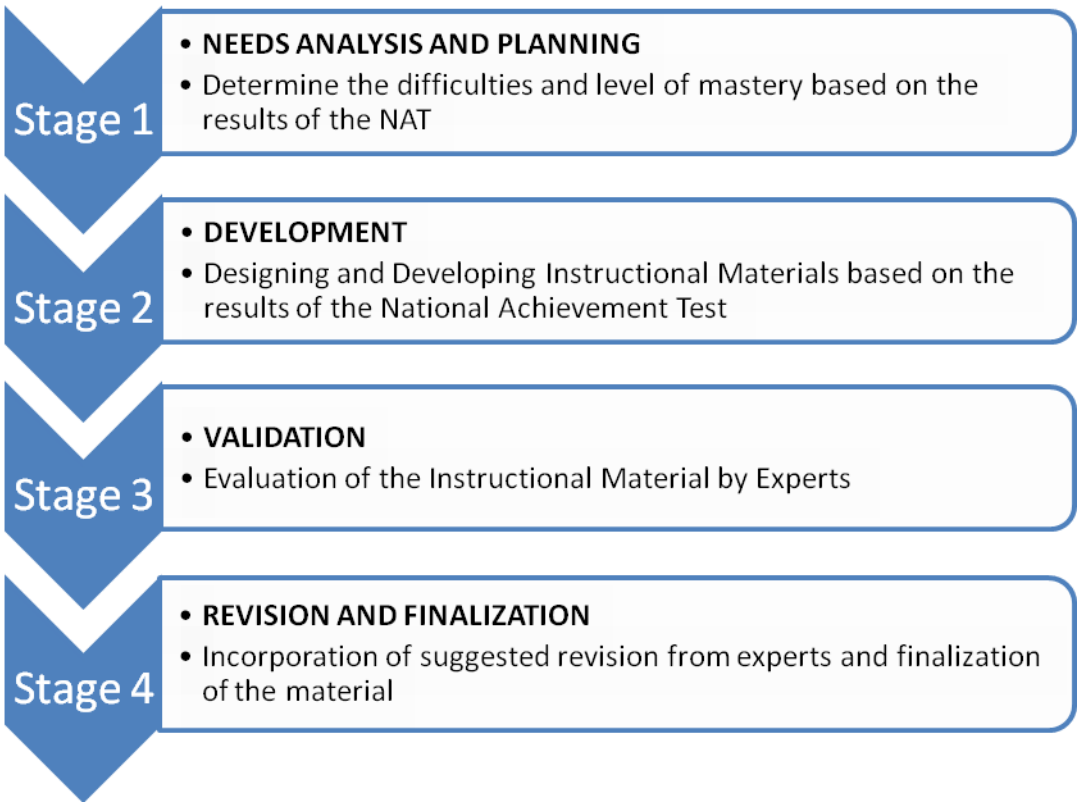

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Table 12
Assessment of the Instructional Material for Remediation in Mathematics in terms of Content (n=5)

	Indicators	Mean	Interpretation
1	The learning contents support the objectives	4.60	Very Acceptable
2	The contents are presented logically and follow a sequence suitable for the needs of the students	4.20	Very Acceptable
3	The examples are presented from simple to complex items	4.40	Very Acceptable
4	There are enough examples to explain the principles discussed in each topic	4.80	Very Acceptable
5	There are enough exercises for each topic	4.80	Very Acceptable
6	The exercises are relevant to the needs of the learners	4.40	Very Acceptable
7	The exercises assess the attainment of the required skills	4.60	Very Acceptable
8	The activities and exercises provided are within the level of the learners	4.80	Very Acceptable
9	The exercises help in the better understanding of the topics	4.80	Very Acceptable
10	The drill facilitates review of prerequisite skills	4.60	Very Acceptable
Overall		**4.58**	**Very Acceptable**

The data shows that the items 'There are enough examples to explain the principles discussed in each topic','There are enough exercises for each topic', 'The activities and exercises provided are within the level of the learners' varying attitudes and capability' and 'The exercises help in the better understanding of the topics' were rated the highest. The table shows that all the items were rated 'very acceptable' by the experts. The overall mean score also reflects a 'very acceptable' rating. This implies that in terms of content, the instructional module is very acceptable.

Table 13 shows the experts' assessment on the instructional material

developed in terms of format and appearance.

Table 13
Assessment of the Instructional Material for Remediation in Mathematics in terms of Format and Appearance (n=5)

	Indicators	Mean	Interpretation
1	The module is visually appealing to the learners	4.20	Very Acceptable
2	The design does not confuse the students	4.20	Very Acceptable
3	The structure, style and format are appropriate to the target level	4.40	Very Acceptable
4	There is consistency in the format and presentation of all lessons	4.40	Very Acceptable
5	Important concepts like definitions and the like are well emphasized	4.60	Very Acceptable
Overall		**4.36**	**Very Acceptable**

The data shows that the item 'Important concepts like definitions and the like are well emphasized' was rated the highest. The table shows that all the items were rated 'very acceptable' by the experts. The overall mean score also reflects a 'very acceptable' rating. This implies that in terms of content, the instructional module is very acceptable.

Table 14 shows the assessment of the experts on the acceptability of the material in terms of language and clarity

Table 14
Assessment of the Instructional Material for Remediation in Mathematics in terms of Language and Clarity(n=5)

	Indicators	Mean	Interpretation
1	The language is clear, concise and grammatically correct	4.36	Very Acceptable
2	The instructions are stated clearly and do not cloud the understanding of the learners	4.40	Very Acceptable
3	There are enough recognizable vocabularies to ensure the ease of learning	4.40	Very Acceptable
4	The language used is suited to the ability level of the users	4.20	Very Acceptable
Overall		**4.40**	**Very Acceptable**

The data shows that the item 'The language used is suited to the ability level of the users' was rated the highest. The table shows that all the items were rated 'very acceptable' by the experts. The overall mean score also reflects a 'very acceptable' rating. This implies that in terms of language and clarity, the instructional module is very acceptable.

Table 15 shows the overall rating of the instructional material for remediation as assessed by the experts.

Table 15
Overall Rating of Experts on the Instructional Material for Remediation in Mathematics(n=5)

	Indicators	Mean	Interpretation
1	The module does not contain unnecessary information.	4.00	Very Acceptable
2	The module aids the teacher in facilitating remediation.	4.40	Very Acceptable
Overall		**4.20**	**Very Acceptable**

Based on the table, the instructional material developed for remediation is perceived as very acceptable by experts.

Table 16 shows a summary of the evaluators' overall rating for the instructional materials for remediation.

Table 16
Summary of the Evaluators' Rating for the Instructional Materials for Remediation

	Indicators	Mean	Interpretation
1	Functionality	4.30	Very Acceptable
2	Objectives	4.70	Very Acceptable
4	Usability and Efficiency	4.37	Very Acceptable
3	Content	4.58	Very Acceptable
4	Format	4.36	Very Acceptable
5	Language and Clarity	4.40	Very Acceptable
6.	Overall Rating	4.20	Very acceptable
Grand Mean		**4.45**	**Very Acceptable**

The mean which is 4.45 indicates that the material is very acceptable for remediation. The summary of the evaluators' assessment on each indicator is also an evidence of the adequacy of the content and objectives of the instructional material. The strength of the modules developed is on the objectives and content since these indicators have the highest mean.

Stage IV. Revision and Finalization. The comments and suggestions which were given by the experts were the basis for the improved version of the instructional materials. Minor revisions and editing were done as suggested by the experts.

The experts said that there are only slight errors in terms of punctuation, capitalization and spacing which can be attributed to typing. Suggestions were given for rephrasing and using appropriate mathematical terms in the steps used in solving. Some sentences were edited and minimal errors on mathematical processes used in the discussion.

The suggestions from the experts are summarized into categories namely Layout, Organization of Content, and Grammar and Usage

Layout refers to the overall format and appearance of certain sections of the instructional material. Organization of content refers to the sequencing of topics and chunking of lessons. It also includes embedding some topics needed for each lesson. Grammar and usage refer to spelling, capitalization, punctuation, usage and coherence of sentences.

Table 17 shows the summary of the comments and suggestions of the experts for the improvement of the instructional material.

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Table 17
Summary of Comments and Suggestions of the Experts for the Improvement of the Instructional Material

Category	Pages	Suggestions	Action Taken
Layout	6,10,11,2022, 28,36,48,66,7 9,97,107,108, 132,187,239	Indent the given equations at least 2 spaces to the right of the number	Indention were considered on these pages.
	188	Use bullets for the objectives	The objectives on this page were introduced using bullets
Organization	80,81,82,122, 123,208209,2 10, 214,215, 246,247	Number the steps in presenting the solutions in tabular form	Tabular presentation of solutions was checked for consistency of numbering
	89,90,168,16 9,252, 253	Align the items in the chapter test altogether.	Indention was observed and the three chapter tests were improved in terms of format.
Grammar and Usage	23,24,25, 26,30, 31,32,33	Use *rewrite* instead of *transform* in introducing quadratic equations.	Instead of using transform the equation to standard form, “rewrite the equation in standard form” was used.

	6	Rephrase the Misconception Check	The explanation was changed to *"When we solve quadratic equations by extracting the square root of both sides, the equation has two solutions, because either the positive or negative value can be substituted for the variable.*
	137,138, 140,142	Use <u>construct</u> instead of create	In presenting the solutions on graphing quadratic equations, the sentence " Create a table of values" was used.
	23,24,25, 26,30 31,32	Use "Square half the coefficient of x then add it to both sides of the equation" in step 2 in solving quadratic equations by completing the square	The suggestion was taken and the page where this step appears were edited.
	19	Rephrase the statement	It was changed based on the suggestion given by the experts.
	59	Add <u>square</u> to the area of the rectangle	The word "square" was inserted in the value of area instead of meters only.
	9	Use "prefix the sign ±" instead of insert.	The word "insert" was replaced "prefix".

Chapter V

Summary, Conclusions and Recommendations

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

Summary

The study analyzed the mathematics performance of the second year high school students as basis for the development of instructional materials for remediation. The weaknesses and difficulties of the second year high school students in Mathematics were identified based on the results of the National Achievement Test. The descriptive-development research design was employed in this study. The development of the instructional material followed a four-stage process namely: Needs Analysis and Planning, Development, Validation, Revision and Finalization.

In the first stage, the weaknesses of the second year students were identified based on the National Achievement Test Results. The competencies tested in the National Achievement Test were clustered into six topics namely; Systems of Linear equations and Inequalities, Quadratic Equations, Rational Expressions, Exponents and Radicals, Variations, Sequence and Series. It was found out that the weaknesses of the high school students are in Quadratic Equations, Rational Expressions and Exponents and Radicals. The high school students have low mastery on these areas. The development stage involved the preparation of the instructional material based on the identified weaknesses. The validation stage dealt

the evaluation of the instructional materials by the experts. The main instrument used was the evaluation checklist used by Magdalaga (2013). The instructional material developed was evaluated in terms of functionality, objectives, usability and efficiency, format and appearance, language and clarity and overall rating. The criteria were rated using a five-point scale. The degree of acceptability of the instructional material was determined using the computed mean. The final stage involved the preparation of the final draft of the instructional materials based on the results of the evaluation and suggestions and comments of the experts.

Findings

The following were the findings of the study

1. The weaknesses of the high school students are in Quadratic Equations, Rational Expressions and Exponents and Radicals.

2. The high school students have low mastery in the following specific competencies.

    2.1 Finding the solution set of quadratic equations

    2.2 Using quadratic equations to solve problems.

    2.3 Simplifying rational expressions

    2.4 Solving rational equations

    2.5 Solving problems involving expressions with exponents

    2.6 Simplifying radical expressions

    2.7 Performing operations on radical expressions

3. The obtained means for functionality, objectives, usability and efficiency, format and appearance, language clarity and the overall rating of the instructional material developed indicate that the modules are very acceptable for remediation.

Conclusion

Based on the findings, it can be concluded that the instructional material developed is very acceptable and can be used for remediation. Having been rated this way, it can help students who will undergo the remedial program.

Recommendations

Based on the findings of the study, the following are recommended.

1. The instructional material developed could be used by Holy Rosary Colleges Foundation for remediation.

2. The instructional material developed should be used by other teachers to see if the lessons for remediation will be delivered well and provide feedback on some lessons

3. The instructional material developed should be used by other teachers to have an in-depth analysis on the strength of the modules for remediation.

Table 12
Assessment of the Instructional Material for Remediation in Mathematics in terms of Content (n=5)

	Indicators	Mean	Interpretation
1	The learning contents support the objectives	4.60	Very Acceptable
2	The contents are presented logically and follow a sequence suitable for the needs of the students	4.20	Very Acceptable
3	The examples are presented from simple to complex items	4.40	Very Acceptable
4	There are enough examples to explain the principles discussed in each topic	4.80	Very Acceptable
5	There are enough exercises for each topic	4.80	Very Acceptable
6	The exercises are relevant to the needs of the learners	4.40	Very Acceptable
7	The exercises assess the attainment of the required skills	4.60	Very Acceptable
8	The activities and exercises provided are within the level of the learners	4.80	Very Acceptable
9	The exercises help in the better understanding of the topics	4.80	Very Acceptable
10	The drill facilitates review of prerequisite skills	4.60	Very Acceptable
Overall		**4.58**	**Very Acceptable**

The data shows that the items 'There are enough examples to explain the principles discussed in each topic','There are enough exercises for each topic', 'The activities and exercises provided are within the level of the learners' varying attitudes and capability' and 'The exercises help in the better understanding of the topics' were rated the highest. The table shows that all the items were rated 'very acceptable' by the experts. The overall mean score also reflects a 'very acceptable' rating. This implies that in terms of content, the instructional module is very acceptable.

Table 13 shows the experts' assessment on the instructional material

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1	The module is visually appealing to the learners	4.20	Very Acceptable
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4	There is consistency in the format and presentation of all lessons	4.40	Very Acceptable
5	Important concepts like definitions and the like are well emphasized	4.60	Very Acceptable
Overall		**4.36**	**Very Acceptable**

The data shows that the item 'Important concepts like definitions and the like are well emphasized' was rated the highest. The table shows that all the items were rated 'very acceptable' by the experts. The overall mean score also reflects a 'very acceptable' rating. This implies that in terms of content, the instructional module is very acceptable.

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4	The language used is suited to the ability level of the users	4.20	Very Acceptable
Overall		**4.40**	**Very Acceptable**

The data shows that the item 'The language used is suited to the ability level of the users' was rated the highest. The table shows that all the items were rated 'very acceptable' by the experts. The overall mean score also reflects a 'very acceptable' rating. This implies that in terms of language and clarity, the instructional module is very acceptable.

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the evaluation of the instructional materials by the experts. The main instrument used was the evaluation checklist used by Magdalaga (2013). The instructional material developed was evaluated in terms of functionality, objectives, usability and efficiency, format and appearance, language and clarity and overall rating. The criteria were rated using a five-point scale. The degree of acceptability of the instructional material was determined using the computed mean. The final stage involved the preparation of the final draft of the instructional materials based on the results of the evaluation and suggestions and comments of the experts.

Findings

The following were the findings of the study

1. The weaknesses of the high school students are in Quadratic Equations, Rational Expressions and Exponents and Radicals.

2. The high school students have low mastery in the following specific competencies.

    2.8 Finding the solution set of quadratic equations

    2.9 Using quadratic equations to solve problems.

    2.10 Simplifying rational expressions

    2.11 Solving rational equations

    2.12 Solving problems involving expressions with exponents

    2.13 Simplifying radical expressions

    2.14 Performing operations on radical expressions

3. The obtained means for functionality, objectives, usability and efficiency, format and appearance, language clarity and the overall rating of the instructional material developed indicate that the modules are very acceptable for remediation.

Conclusion

Based on the findings, it can be concluded that the instructional material developed is very acceptable and can be used for remediation. Having been rated this way, it can help students who will undergo the remedial program.

Recommendations

Based on the findings of the study, the following are recommended.

1. The instructional material developed could be used by Holy Rosary Colleges Foundation for remediation.

2. The instructional material developed should be used by other teachers to see if the lessons for remediation will be delivered well and provide feedback on some lessons

3. The instructional material developed should be used by other teachers to have an in-depth analysis on the strength of the modules for remediation.

4. The instructional material developed should be tested for high school students to see if the use of this instructional material will improve the skills of the students undergoing the remedial program.

5. A comparative study involving pre-test and post test to determine the effectiveness of the instructional material in creating a learning environment that promotes understanding of Mathematics concepts.

6. A similar material could be developed for other year levels for the improvement of the remedial program.

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APPENDICES

APPENDIX A

Letter to the Evaluators

Dear Sir/Madam,

I am a graduate student at Philippine Normal University currently undertaking a special project entitled **"The Mathematics Performance of High School Students in The National Achievement Test: Basis for the Development of Instructional Materials for Remediation"** for which I prepared instructional modules for the remedial program.

With this, I would like to seek your help in validating the material to meet the needs of the students for remediation. Your honest response, comments, and suggestions will be of great help in the completion of this study.

Thank you in anticipation of your kindness and assistance regarding this matter.

Sincerely,

Walner A. Saturno
Researcher

APPENDIX B

Rating Scale to Validate the Developed Instructional Modules for Remediation in Mathematics

I. Personal Data
Name:_____
Position/Title:_____
Number of Years in Teaching Mathematics:_____

II. Evaluation Instrument

Directions: Kindly evaluate the following indicators according to the checklist below.

5 Highly acceptable
4 Very Acceptable
3 Acceptable
2 Fairly Acceptable
1 Not Acceptable

INDICATORS

FUNCTIONALITY

		1	2	3	4	5
1	The module performs its function					
2	The module complies with educational norms and standards					
3	The module components supplement each other					
4	The module can be used for remediation					

OBJECTIVES

		1	2	3	4	5
1	The objectives stated in each topic in the module are lined up with the K-to-12 curriculum					
2	The objectives are clearly stated in behavioral terms					
3	The objectives indicated are specific, realistic and attainable					
4	The objectives mentioned are measurable					

USABILITY AND EFFICIENCY

		1	2	3	4	5
1	The module is user friendly					
2	The topics presented are easy to learn and can be used by different learners					
3	The module is a functional learning material for remediation					
4	The module can motivate learners to be actively engaged in the learning activities					
5	The module provides ease to the teacher who will use it.					
6	The module takes into consideration the students' varying attitudes and capability					
7	The module helps in the development of mathematical skills					

CONTENT

		1	2	3	4	5
1	The learning contents support the objectives					
2	The contents are presented logically and follow a sequence suitable for the needs of the students					
3	The examples are presented from simple to complex items					
4	There are enough examples to explain the principles discussed in each topic					
5	There are enough exercises for each topic					
6	The exercises are relevant to the needs of the learners					
7	The exercises assess the attainment of the required skills					
8	The activities and exercises provided are within the level of the learners					
9	The exercises help in the better understanding of the topics					
10	The drill facilitates review of prerequisite skills					

FORMAT AND APPEARANCE

		1	2	3	4	5
1	The module is visually appealing to the learners					
2	The design does not confuse the students					
3	The structure, style and format are appropriate to the target level					
4	There is consistency in the format and presentation of all lessons					
5	Important concepts like definitions and the like are					

LANGUAGE AND CLARITY

		1	2	3	4	5
1	The language is clear, concise and grammatically correct					
2	The instructions are stated clearly and do not cloud the understanding of the learners					
3	There are enough recognizable vocabularies to ensure the ease of learning					
4	The language used is suited to the ability level of the users					

OVERALL RATING

		1	2	3	4	5
1	The module does not contain unnecessary information					
2	The module aids the teacher in facilitating remediation					

COMMENTS and SUGGESTIONS

_____
_____
_____
_____

Thank you very much,

_____
Signature of Evaluator

APPENDIX C

Summary of the Ratings of the Experts on the Developed Instructional Modules for Remediation in Mathematics

E1-Expert 1
E2-Expert 2
E3-Expert 3
E4-Expert 4
E5-Expert 5

5 Highly acceptable
4 Very Acceptable
3 Acceptable
2 Fairly Acceptable
1 Not Acceptable

INDICATORS

FUNCTIONALITY

		E1	E2	E3	E4	E5	MEAN
1	The module performs its function	5	3	4	5	4	**4.20**
2	The module complies with educational norms and standards	4	3	4	4	5	**4.00**
3	The module components supplement each other	5	3	5	5	4	**4.40**
4	The module can be used for remediation	5	3	5	5	5	**4.60**
OVERALL MEAN							**4.30**

OBJECTIVES

		E1	E2	E3	E4	E5	MEAN
1	The objectives stated in each topic in the module are lined up with the K-to-12 curriculum	5	4	4	5	5	**4.60**
2	The objectives are clearly stated in behavioral terms	5	4	5	5	4	**4.60**
3	The objectives indicated are specific, realistic and attainable	5	4	5	5	5	**4.80**
4	The objectives mentioned are measurable	5	4	5	5	5	**4.80**
OVERALL MEAN							**4.70**

USABILITY AND EFFICIENCY

		E1	E2	E3	E4	E5	MEAN
1	The module is user friendly	4	3	4	4	5	**4.00**
2	The topics presented are easy to learn and can be used by different learners	5	3	5	4	5	**4.40**
3	The module is a functional learning material for remediation	5	3	5	4	5	**4.40**
4	The module can motivate learners to be actively engaged in the learning activities	5	3	5	5	5	**4.60**
5	The module provides ease to the teacher who will use it.	5	3	3	5	5	**4.20**
6	The module takes into consideration the students' varying attitudes and capability	5	3	5	5	5	**4.60**
7	The module helps in the development of mathematical skills	5	3	5	4	5	**4.40**
OVERALL MEAN		**4.37**					

CONTENT

		E1	E2	E3	E4	E5	MEAN
1	The learning contents support the objectives	5	4	5	5	4	**4.60**
2	The contents are presented logically and follow a sequence suitable for the needs of the students	5	3	4	4	5	**4.20**
3	The examples are presented from simple to complex items	5	3	5	4	5	**4.40**
4	There are enough examples to explain the principles discussed in each topic	5	4	5	5	5	**4.80**
5	There are enough exercises for each topic	5	4	5	5	5	**4.80**
6	The exercises are relevant to the needs of the learners	5	4	4	5	4	**4.40**
7	The exercises assess the attainment of the required skills	5	4	5	4	5	**4.60**
8	The activities and exercises provided are within the level of the learners	5	4	5	5	4	**4.60**
9	The exercises help in the better understanding of the topics	5	4	5	5	5	**4.80**
10	The drill facilitates review of prerequisite skills	5	4	4	5	5	**4.60**
OVERALL MEAN		**4.58**					

FORMAT AND APPEARANCE

		E1	E2	E3	E4	E5	MEAN
1	The module is visually appealing to the learners	5	3	5	4	4	**4.20**
2	The design does not confuse the students	5	3	4	4	5	**4.20**
3	The structure, style and format are appropriate to the target level	5	3	4	5	5	**4.40**
4	There is consistency in the format and presentation of all lessons	5	2	5	5	5	**4.40**
5	Important concepts like definitions and the like are well emphasized	5	3	5	5	5	**4.60**
OVERALL MEAN		**4.36**					

LANGUAGE AND CLARITY

		E1	E2	E3	E4	E5	MEAN
1	The language is clear, concise and grammatically correct	5	3	4	5	5	**4.40**
2	The instructions are stated clearly and do not cloud the understanding of the learners	4	3	5	5	5	**4.40**
3	There are enough recognizable vocabularies to ensure the ease of learning	5	2	5	4	5	**4.20**
4	The language used is suited to the ability level of the users	5	3	5	5	5	**4.60**
OVERALL MEAN		**4.40**					

OVERALL RATING

		E1	E2	E3	E4	E5	MEAN
1	The module does not contain unnecessary information	4	3	5	4	4	**4.00**
2	The module aids the teacher in facilitating remediation	5	3	4	5	5	**4.40**
OVERALL MEAN		**4.20**					

PERSONAL DATA

Name: Walner A. Saturno

Date of Birth: September 4,1984

Place of Birth: Ibung, Villaverde, Nueva Vizcaya

Nationality: Filipino

Religion: Roman Catholic

Civil Status: Single

Father's Name: Librado V.Saturno

Mother's Name: Helen M. Alaman

Language Spoken: English, Filipino, Iloko

E-mail Address: walsat_physics@yahoo.com

EDUCATIONAL BACKGROUND

ELEMENTARY
Villaverde, Central School

Awards Received: ***Valedictorian***
Best in Math, Science, History
Scholar of the Year

SECONDARY:

First Year: Philippine Science High School
Second-Fourth Year: Fr. Villaverde High School

Awards Received: ***Valedictorian***
Mercury Drug Award for Excellence in Science
Christian Service Awards
Special Citations (Editor-in-Chief TRAILBLAZER)

COLLEGE: St. Mary's University
Bachelor of Secondary Education

Awards Received:

Cum Laude
Likha Award for Best Research Paper
Likha Award for Best Educational Portfolio
Special Citations for Managing Editor -*The Marian*
(6th Place Winner-Sports Writing in English
(4thLuzonwide Higher Education Press Conference)
4th Place Winner- Sports Writing in English
(Regional Higher Education Press Conference)

2nd Place Winner: On-the-Spot Essay Writing Contest
(CARP RegioII-16th Anniversary
1st Place Winner- On-the-Spot Essay Writing Contest
(Marian Literature Club)

MEMBERSHIP IN ORGANIZATIONS

Position	***Name of Organization***
Math Teacher	University of Santo Tomas High School
Math Coordinator (Grade School and High School)	Holy Rosary Colleges Foundation
Part-time College Instructor	Holy Rosary Colleges Foundation
Faculty	Holy Rosary Colleges Foundation(Math and Science)
Moderator	The Voice (The School Publication of HRCF)
Vice President	Class Year Organization (CYO-4)
P.I.O	Student Teachers' Organization
President	Physics Society
Vice President	Education Central Board Of Students
Business Manager	Students United in Mathematics
Coordinator	Christian Youth Movement
April 2005	
P.I.O	Marian Honor Society
Counselor	Sincerely Yours, Lea ON TV

SEMINARS/TRAININGS/CONFERENCES/AWARDS

Tranining/Conference	**Inclusive Dates**
Managing The Transition from K-12	November 18,2012 December 12,2012

Moving Forward with Backward Design: A Deeper Look At Understanding by Design (UbD) Regional Forum of Private Secondary School Administrators	January 29,2011 July 16, 2010
Trainor , 2010 Nueva Ecija Private Schools' Academic Olympiad	
Physics (Champion)	Oct. 15, 2010
Mathematics IV-Champion (Advanced Algebra, Trigonometry, Statistics, Trigonometry)	Oct. 15, 2010
Mathematics II-Champion (Intermediate Algebra)	Oct. 15, 2010
Facilitator(Fourth Year Level Team Orals)	
2009 Metrobank MTAP DepEd Math Challenge	February 12,2010
Trainor	
2009 Metrobank MTAP DepEd Math Challenge	February 12,2010
(Overall Champion in Nueva Ecija)	
(Champion –1st Year Level)	February 12,2010
(Champion –2nd Year Level)	February 12,2010
(Champion –3rd Year Level)	February 12,2010
(Champion –4th Year Level)	February 12,2010
Trainor	
2008Metrobank MTAP DepEd Math Challenge	February 13,2009
(Overall Champion in Nueva Ecija)	
(First Runner-up –1st Year Level)	February 13,2009
(Champion –2nd Year Level)	February 13,2009
(First Runner-up –3rd Year Level)	February 13,2009
(Champion –4th Year Level)	February 13,2009
Trainor	
2007Metrobank MTAP DepEd Math Challenge	February 25,2008
Trainor	
(Overall Champion in Nueva Ecija)	
(Champion –1st Year Level)	February 25,2008
(Champion –2nd Year Level)	February 25,2008
(2nd Runner-up –3rd Year Level)	February 25,2008
2006 Regional Summer Training for Private Secondary School Teachers On Content and Strategies in English, Science and Mathematics	May 17-19 2006
2007 Regional Summer Training for Private Secondary School Teachers On Content and Strategies in English, Science and Mathematics	May 15-17 2008