

Reform Initiatives in Mathematics Instruction for Public Secondary Schools in Calabarzon Area

Riza Capacia Gusano

Supervisor, Department of Education, Batangas, Philippines

Abstract: Mathematics education has undergone many changes in the past few decades in terms of programs, curriculum, assessments and teaching strategies. Unfortunately despite all the changes and initiatives, there are still problems in mathematics education. Result showed that students in CALABARZON need improvement in mathematics based from the result of the National Achievement Test (NAT) 2014. The study aimed to evaluate the Mathematics instruction of Public Secondary Mathematics Teachers in CALABARZON and was conceive with the target of introducing relevant, comprehensive reform initiatives in Mathematics that will both benefit the teachers and students. Respondents of this study were 200 school heads, 299 key teachers and 346 mathematics teachers from CALABARZON Area. Data were gathered through data analysis, questionnaires, interview and focus group discussion. Data were tallied and interpreted with the use of percentage, weighted mean, F- test and Chi-square. Mathematics instruction in CALABARZON in terms of content and pedagogy was moderately evident. Students' scores in National Achievement Test (NAT) was perceived to be 41-50%. The DepEd programs and projects were moderately implemented and the intervention programs in mathematics were sometimes participated. There was a significant relationship between the profile of mathematics teachers and their mathematics instruction in terms of content and pedagogy, students' score in NAT and seminars and trainings attended.

Keywords: Mathematics Instruction, National Achievement Test (NAT), Reform Initiatives

1. Introduction

For today and tomorrow's world, the necessity of mathematical literacy and mathematical education reform has become more important than ever. In a society that has become a technically oriented, "innumeracy" has replaced illiteracy. Mathematical applications are crucial in today's competitive world. Excellence in mathematics education requires high expectations and strong support for all students. Mathematics needs to be rejuvenated in several ways. Mathematics education can not only keep up, it will become a leader in producing mathematically literate students. Teachers then must ensure good instruction so that students develop their ability to explore, reason logically, perform calculations accurately and apply principles in real life situations. Results showed that Filipino students had poor performance with them at the bottom

of the ranking of Trends in International Mathematics and Science Study (TIMSS). More so, students in the CALABARZON region need to improve their performance for the National Achievement Test 2014. These shows urgent need to find ways to improve mathematics program and instruction. There is also a need for quality and competent teachers to fully strengthen the state of teaching mathematics. In view of the low performance, it cannot be denied that reform initiatives in mathematics are urgent and critical. Believing that teachers have a powerful, long lasting influence on the students, building a knowledge base for the teaching profession is a must. The varied ways they interact with one another and the world around them have to be enhanced and reinforced. The apparent reforms initiatives in Mathematics instructions in CALABARZON have encouraged the researcher to determine the need for it to meet the demand of globalization. This study is a timely endeavor to take a serious look at the loopholes and find remediation through reform initiatives in mathematics for teachers and students.

2. Statement of the problem

The study aimed to evaluate the mathematics instruction of public secondary mathematics teacher in the CALABARZON area and was conceived with the target of introducing relevant, comprehensive, reform initiatives in mathematics that will both benefit the teachers and students. Specifically, this study seeks to answer the following questions:

What is the profile of the mathematics teachers in terms of:

- Educational qualification;
- Teaching loads;
- Seminars and trainings attended; and
- Participation in Mathematics competitions?

What are assessments of the school heads, key teachers and mathematics teachers themselves on the mathematics instruction in terms of:

- Content and pedagogy;
 - Students' scores in NAT;
 - Implementation of DepEd programs and projects; and
 - Participation in school based activities?
1. Is there a significant relationship between the profile

of the mathematics teachers and their mathematics instruction?

2. How do the responses of the three groups compare? Are there significant differences?
3. What are the common problems met by the mathematics teachers and students?
4. What reform initiatives in Mathematics instruction may be proposed?

3. Review of related literature and studies

This chapter presents conceptual study and research literature that the researcher collected and found to be relevant to her study.

A. Conceptual Literature

K to 12 Mathematics Curriculum. The framework of K to 12 Mathematics is supported by the following underlying learning principles and theories: Experiential and Situated Learning, Reflective Learning, Constructivism, Cooperative Learning and Discovery and Inquiry- based Learning. The present mathematics curriculum is grounded in these theories. For mathematics instruction to contribute to the building of a socially just and diverse democracy will require more than care with curriculum and teaching. It will also require more than committed teachers, sensitive to and skillful in working toward these aims. Mathematics instruction should be based on the evidence of sound research that has been verified by classroom practice (Boudeth, 2005).

Challenges faced by Mathematics teachers. Real teachers in real schools face real challenges implementing the numerous standards and recommendations for mathematics teachers nowadays. Mathematics teachers are experiencing major changes not only in the mathematics content they teach, but also in the way they teach. Now teachers are called on to teach new, more challenging mathematics to a very diverse audience using active learning approaches designed to develop understanding. Mathematics Reform Initiatives. For the past 20 years, an important goal for mathematics teacher educators has been to change the nature of mathematics teaching and learning in classrooms. Reformers have proposed substantial changes in the content and pedagogy of the k to 12 mathematics curriculum, so that all students have the opportunity to learn more intellectually demanding mathematics. According to Yee (2008) mathematics reform initiatives must be focuses on a continuous process of adjustment to the needs of the youth and society. The Need for Intervention in K to 12 Mathematics. Differentiating instruction and providing intervention and instructional support to meet students' needs are necessities if we are to become a mathematically literate society. Spellings (2009) stated in the No Child Left Behind Act (NCLBA) of 2001, "To have a mathematically literate society, it is essential that our educational system try to meet the mathematical needs of all students before they fail".

B. Research literature

As cited by Flores (2005), the complexity of global competitiveness requires teachers to be more responsive to the needs of the students to deliver quality service. Krainer (2006) pointed out that "The one- size fits- all curriculum model and instructional plan of yesteryear does not accomplish what is needed in today's classroom to successfully reach all students. Ebreo (2006) cited that differentiating instruction and providing intervention and instructional support to meet students' needs are also necessities if we are to become a mathematically literate society. In the study of Gao (2014) cited that pioneer school managed to maintain balanced between promoting reform pedagogies and employing examination-oriented approaches. Parallel to the study of Crespo (2006) revealed that variations in the level of the teacher's instructional competence and execution of instructional design had different influence on the leaning of their respective students. Flynn (2013) mentioned that educational reform is an ongoing process with many ideas being offered to improve our school system. Reform initiatives were launched and research conducted to illustrate the effect of standard based reform implementation on variety of student teaching outcomes. Wood (2008) concluded that globalization has had impact on education reform. The reform themselves have yielded some positive benefits for the beneficiaries but much remains to be done to ensure the expansion of access and equity as well as improvements in the relevance and quality of education.

C. Synthesis

Both the conceptual and research literatures have strong and significant learnings in the thrust of the present study. The study likewise provided very relevant and important insights to the researcher. In particular the literature presented by Ebreo (2006), Krainer (2006), and Crespo (2006) revealed similar findings while the study of Flores (2005),Gao (2014), Flynn (2013) and Wood (2008) have similarities to the present study.

D. Theoretical framework

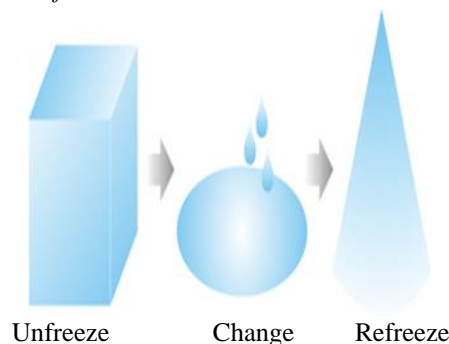
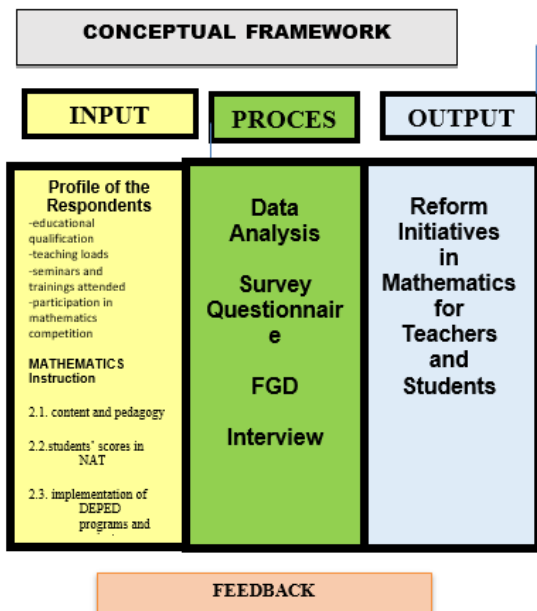


Fig. 1. Theoretical Framework

Gagne believed that learning requires more amount of practice to have a building process. Edward Deming theory of Total Quality Management (TQM) stated that "Do it Right for the First Time". Though we are in beginning of K to 12

implementation, the researcher believed that it could be better if we give students appropriate intervention materials which had a great impact for a life – long learning. This study was also anchored on Lewin’s Change Model related to reforms in mathematics instruction.



The study made use of IPO system model
 Fig. 2. Conceptual Framework

4. Research methodology

This chapter presents the research design, subject of the study, research instrument in order to analyze and interpret data.

A. Research design

This is a classroom-based research wherein assessment questions on mathematics instruction was distributed and answered by school heads, key teachers and mathematics teachers.

B. Subjects of the study.

The respondents of this research were 200 school heads, 299 key teachers and 346 mathematics teachers from CALABARZON Area. The respondents were determined using the Slovin’s formula at 5% margin of error.

C. Research instruments

The researcher developed questionnaires as the main gathering instruments. Interviews and focus group discussion were also conducted to substantiate the data gathered from the questionnaires. The instruments were validated using the Alpha Cronbach method.

5. Results and discussion

This chapter presents the analysis and interpretation of data based on the responses of the subjects of the study. Based on the analysis, the following results were obtained.

- Profile of the mathematics teachers. Out of 346 Mathematics teachers, 206 or 60 percent of them were BSED major in mathematics. 112 or 30 percent of them had Master’s degree. 28 or 8 percent of the mathematics teachers had MA units. In the total respondents of 346 Mathematics teachers 282 or 82 percent of the mathematics teachers handled 5-6 teaching load. Most of them attended school and regional level seminars and trainings. They also participate mostly in school level mathematics competition
- Content and pedagogy was moderately evident, students’ scores in NAT was perceived to be 41-50%, DepEd programs and projects were moderately implemented and school based activities were sometimes participated. The composite means of 2.97, 2.88 and 2.95 indicate that the implementation of DepEd programs and projects with regards to mathematics instruction are assessed to be moderately implemented by the three groups of respondents. The composite means of 2.57, 2.59 and 2.58 indicate that the three groups of respondents sometimes participate in school activities connected with mathematics instruction.

Table 1
 Difference on the Assessment of the Respondents on the Mathematics Instruction in CALABARZON

Variables	p-values	Computed f-values	Decision on Ho	Verbal Interpretation
Content and Pedagogy	0.007	4.93	Reject	Significant
Students’ scores in NAT	0.000	36.41	Reject	Significant
Implementation of DepEd Programs and Projects	0.000	29.008	Reject	Significant
Participation in school based activities	0.36	1.012	Failed to Reject	Not Significant

- Since the p-values of .36 is higher than .05 level of significance, then the computed f-values of 1.012 is found to be not significant. Hence, there is no significant differences on the responses of the three groups of respondents in terms of participation in school based activities. On the other hand, since the p-values of .007, .000 and .000 are lower than .05 level of significance, then the computed f-values of 3.93, 36.41 and 29.008 are found to be significant. Hence, there are significant differences on the responses of the three groups of respondents in terms of content and pedagogy, students’ scores in NAT and implementation of DepEd programs and projects.
- Clearly, school heads, key teachers and math teachers have different responses on content and pedagogy,

students' scores in NAT and implementation of DepEd programs and project simply because they see through these things in different perspectives - math teachers being in the frontline and those who work closely with the students, key teachers being the middle supervisors and school heads who are the administrators. There is a significant relationship between profile of mathematics teachers and their mathematics instruction.

Table 2

Relationship between the Mathematics Teachers' Educational Attainment and their Mathematics Instruction

Variables	p-values	Computed values	Decision on Ho	Verbal Interpretation
Content and Pedagogy	0.000	40.709	Reject	Significant
Students' scores in NAT	0.000	30.92	Reject	Significant
Implementation of DepEd Programs and Projects	0.99	0.0001	Failed to Reject	Not Significant
Participation in school based activities	0.025	5.023	Reject	Significant

- Since the p-values of 0.587, 0.98 and 0.849 are higher than .05 level of significance, then the computed chi-square values of 0.295, 0.0002 and 0.036 are found to be not significant. This indicates that the mathematics teachers' teaching load and their mathematics instruction is independent to the students' scores in NAT, implementation of DepEd programs and projects and participation in school based activities. On the other hand, since the p-value of 0.035 is lower than .05 level of significance, then the computed chi-square value of 4.43 is found to be significant. This could also mean that the mathematics teachers' teaching load and their mathematics instruction is dependent on the content and pedagogy.
- Teachers encountered common problems such as oversized and crowded classrooms, inadequate learning materials, lack of seminars, no close supervision of the school heads, public attitude towards new curriculum and poor student achievement. Students encountered problems like poor study habit, lack of equipment and poor communication of the teachers.
- For teachers, the researcher proposes enrolment in graduate studies, conduct seminars, summer Math enrichment, team-based competitions, competency based worksheets, peer learning, updates on current trends and practices, demonstration teaching, action research, benchmarking, digital tools, develop web page, video class differentiated instruction, localization, contextualization and awareness in net

generation. For students, the researcher proposes the use of problem-solving curriculum, spiral curriculum, outcome-based learning, summer enrichment programs, Saturday enrichment programs, hands on experiments, manipulative models, paired assignment, and exposed to the video class and 21st century skills.

6. Conclusion

Based on the findings of the study the following conclusions were drawn.

- Most of Mathematics teachers are BSE/BSED- major in Math. They have 5-6 teaching load and they participated mostly in school level Math competitions.
- The Mathematics instruction in CALABARZON in terms of content and pedagogy is moderately evident, students' scores in NAT perceived to be 41-50%, DepEd programs and projects on Mathematics instruction is moderately implemented and school-based activities are sometimes participated.
- There is significant difference on the responses of the three groups of respondents in terms of content and pedagogy, students' scores in NAT and implementation in DepEd programs and projects.
- There is significant relation between educational attainment and their mathematics instruction particularly in teaching load nature and level of trainings.
- Teachers encountered common problems such as oversized and crowded classrooms, inadequate learning materials, lack of seminars, no close supervision of the school heads, public attitude towards new curriculum and poor student achievement. Students encountered problems such as poor study habit, lack of appropriate equipment and poor communication of the teachers.
- For teachers, the researcher proposes enrolment in graduate studies, conduct seminars, summer Math enrichment, team-based competitions, competency based worksheets, peer learning, updates on current trends and practices, demonstration teaching, action research, benchmarking, digital tools, develop web page, video class, differentiated instruction, localization, contextualization and awareness in net generation.
- For students, the use of problem solving curriculum, spiral curriculum, outcome-based learning, summer enrichment programs, Saturday enrichment programs, hands on experiments, manipulatives models, paired assignment, exposed them to video class and 21st century skills.

Recommendations

In the light of the findings revealed in the study and the conclusions drawn, the researcher offered the following recommendations:

- Mathematics teachers should be encouraged to pursue graduate studies, attend seminars and participate in competition and school based activities for continuing professional development.
- The Mathematics instruction in CALABARZON Area in terms of content and pedagogy should be improve such that it would be more evident.
- Students' scores in NAT should also be improved.
- Implementation of DepEd programs and projects be actively implemented.
- Participation in school -based activities should be likewise be encouraged.
- The proposed reform initiatives in Mathematics instruction is recommended for both mathematics teachers and students.

References

- [1] Ball, D.C. Teaching Mathematics for Understanding. New York: Teachers College Press 2006
- [2] Boudeth Parker. (2005) Data Wise: A Step= by Step Guide to Using assessment Results to Improve Teaching and Learning.
- [3] Wood, T. Approaching Teacher Development Practice into Theory. Mathematics Teacher Education Falmer Press, 2008.
- [4] Crespo, S. "Changing Preservice Teachers' Mathematical Understanding: The case of Division by Zero School Science and Mathematics". Unpublished Materials, Dissertation, 2006.
- [5] Ebreo, Sonia C. "Capability Enhancement Program for Secondary Scholl Mathematics Teachers" Unpublished Dissertation, Batangas State University, 2006.
- [6] Gao, Wei. "The Chinese New Mathematics Curricula Reform: Two Cases Compared" Unpublished Dissertation, 2014. Retrieved December 9, 2014 from <http://surface.syr.edu/etd.108>
- [7] Flores, Imelda. "Mathematics Teaching Competencies of Faculty in Colleges and Universities in Batangas City: For continuing Education". Unpublished Dissertation. Batangas State University, Batangas City, 2005.
- [8] Flynn, Mary Leslie. "STEM Standards- Based Reform Initiatives: The Impact on Student Learning and the Curricular, Instructional, and Assessment Practices of Teachers" Unpublished Dissertation, University of Minnesota, 2013.
- [9] Krainer, K. "A Teacher in Service Education Course as a Contribution to the Improvement of professional Practice in Mathematics Instruction." Unpublished Dissertation, Philippine Normal University, 2006.
- [10] Zamora, Rowena P. "Evaluation of the Remedial Program in High School mathematics: Basis of Redesigning the Program" Unpublished Dissertation, Philippine Normal University, 2007.
- [11] Boaler, J. "Learning from Teaching: Exploring the Relationship between Reform Curriculum and Equity." Journal for Research in Mathematics Education 2006. 33, 239-218.
- [12] CALABARZON C2BER. Conference of CALABARZON ON Basic Educational Researchers. Research Journal, 2014.
- [13] National Council of Teachers of Mathematics "Principles and Standards for School Mathematics". Oct 13, 2014.
- [14] Yee, Lee P. (2008) Teaching Secondary School Mathematics: A Resource Book.
- [15] National Council of Mathematics Teachers. "Curriculum and Evaluation Standards for School Mathematics." Reston VA: National Council Inc. p 83, 2005.
- [16] A Primer of the National Competency Based Teacher Standard-Teachers Strengths and Needs Assessment 9 NCBTS- TSNA).
- [17] Department of Education (2006) Basic Education sector reform agenda (2006-2010) National Educational for all Committee (NEC).
- [18] Regional Memorandum s. 2014 C2BER.