



INSTRUCTIONAL MATERIALS IN THE TEACHING OF PROBLEM-SOLVING IN MATHEMATICS TO GRADE 8 LEARNERS

RUBY B. BAUTISTA

Institute of Graduate and Professional Studies,
Lyceum-Northwestern University
Dagupan City

Abstract : This study focused on the proposed instructional materials in the teaching of problem-solving in Mathematics to Grade 8 learners at Cabiao National High School, Schools Division Office of Nueva Ecija during the School Year 2023-2024. It made use of descriptive method with questionnaire as the research instrument. There were 75 Grade 8 learners included in this study. The data gathered were properly recorded, tallied, tabulated and interpreted using the SPSS for windows. The study found out that generally, the Grade 8 learners have low performance in solving Mathematics problems. The least learned skill of the Grade 8 learners during the second quarter is linear inequalities. The developed problem solving instructional material was based on the least learned skill. The instructional material met the criteria for validity. The researcher recommended that the Grade 8 learners should be encouraged to exert more effort in studying Mathematics. They should be motivated to change their impression of Mathematics as a difficult subject, but rather they could have fun in studying it. Weekly assessment of the Mathematics skills of the students should be done to monitor their performance. Parents and teachers should join hands in improving the performance of the students. Teachers should tell the parents about the difficulties encountered by their children in learning Mathematics. The least learned skill in Mathematics should be given emphasis in teaching. Teachers should use appropriate strategies and techniques to develop the skill and give more exercises for the learners to master the skill. The proposed instructional material should be presented to the Schools Division Superintendent for its reproduction and utilization.

Keywords: instructional materials, problem-solving

INTRODUCTION

Education is the primary agent of transformation towards sustainable development, increasing people's capacities to transform their vision for society into reality. Education not only provides scientific and technical skills; it also provides the motivation, justification and social support for pursuing and applying the skills.

Education plays a vital role in human development and societal transformation. It is considered one of the many pillars in developing a particular race or culture. It allows an individual to undergo a process of gaining knowledge, specialized skill or talent to be able to fully function and exist, and to pave the way in building a better society (Franche, 2009).

According to Orfiano (2011), quality education is a prerequisite for education for sustainable development. It is defined by five key dimensions. 1) What learners bring. Children and young people who are physically and psychologically healthy, well-nourished, ready to participate and learn by families or communities are more likely to benefit from quality education. 2) Environment. The learning environment is a critical dimension of educational quality, it must be gender-sensitive, healthy and safe for children, protective of them and successful in helping them learn. A quality learning environment includes adequate facilities—a school building where girls and boys have the same access to physical exercise, adequate hygiene and sanitation facilities, clean water and health services. 3) Quality Content. It includes relevant curriculum and learning materials developed in the context of national goals for education. Government should adapt relevant, student-centered and discriminatory curriculum plans that are easily understood by teachers. 4) Outcome. From a quality basic education comes healthy children who can read and write critically and access Mathematics, science technologies and other skills for life. 5) Process that support quality education include well-trained teachers who continually engage in professional learning and development; well managed, child-friendly and gender fair classrooms

and schools; skills-based, children centered participatory methods; skillful assessment to facilitate learning and appropriate technologies.

In today's fast paced world where individuals deal with information generated from computers and calculators to that of mental estimations of daily purchases, it is imperative that students become proficient in mathematics. Not only must learners deal with a wide range of operational skills, such as computing decimals, percents, fractions to accomplish tasks but must also understand underlying numerical concepts in order to succeed in a variety of effectively with these tasks, citizens must develop self efficacy, feel positive about them and accept that the are accountable for their actions was revealed. In an age now driven by the relentless necessity of scientific and technological advances. Mathematics performance has been assessed to determine whether young people of our country have still been coping up in today's modern trend and to stay competitive in an integral global economy (Chandler, 1998).

In an age now driven by the relentless necessity of scientific and technological advances, Mathematics performance has been assessed to determine whether young people of our country have still been coping up in today's modern trend and to stay competitive in an integral global economy.

In order for a country to develop and be globally competitive, there is a need to widen the knowledge, improve the needed skills, and familiarize new concepts, changes, and to things that can help to improve our country. As cited in the study of Frempong (2000), the recent report on the performance of our students from both the Third International Mathematics and Science Study (TIMSS) and the National Assessment of Education Progress (NAEP) stated that "Our young people aren't performing well enough in Mathematics to take firm command of our own futures. In line with this context, programs have been planned and materialized in order to achieve Mathematics competency. Our country in its quest to respond to the globalization demand has been striving to upgrade and provide competency in Mathematics among our young people.

There are four important and enduring reasons that underscore the need for our students to achieve competency in Mathematics; 1) the rapid pace of change in both the increasingly interdependent global economy and in the workplace demands widespread mathematics-related knowledge and abilities, 2) citizens need mathematics for their everyday decision making, 3) mathematics is inextricably linked to the nation's security interests, and 4) the deeper, intrinsic value of Mathematics shapes and defines our common life, history, and culture. It is one primary source of lifelong learning and the progress of our civilization (Mattesson, 2006).

Learners' Performance

Performance improvement is the concept of measuring the output of a particular process or procedure, then modifying the process or procedure to increase the output, increase efficiency, or increase the effectiveness of the process or procedure. It is a measure of the results achieved. Performance efficiency is the ratio between effort expended and results achieved. The difference between current performance and the theoretical performance limit is the performance improvement zone (Connolly, et.al, 1999).

The extent of student's learning in academics may be determined by the grades a student earns for a period of learning that has been done. It is believed that a grade is a primary indicator of such learning. If a learner earns high grades, it is concluded that she/he may also have learned a lot while low grades indicate lesser learning. However, many experiences and studies found out that there are also several factors that would account for the grades. No single factor can be definitely pointed out as predicting grades. It has been interplay of so many factors-genders, IQ, study habits, age, year, level, parent's educational attainment, social status, number of siblings, birth order, etc. In fact, almost all of existing environmental and personal factors are a variable of academic performance. An important measure of children's well-being is their academic performance. Poor achievement increases the chances that a child will not have the skills and opportunities to participate fully in and contribute to the society as an adult. Furthermore, one of the most important factors for building resiliency in children is ensuring that they achieved success in school (Connolly, et.al. 1999). Mathematics performance should be determined by using standardized tests, and her findings imply that performance of students while in high school could predict a good performance in college.

Mathematical literacy is an important skill that is gaining the attention of Mathematics educators. Students are increasingly challenged on standardized assessment to read, create, use and comprehend numerous mathematical representations as a way of demonstrating mathematical literacy. The analysis showed a heavy emphasis on verbal representations even though algebra items were to use verbal, numerical, graphical and symbolic representations. The variety of representations on assessment has implications for professional development opportunities for mathematics educators. Alagic and Palenz (2006), cited that a particular focus of the professional development was two-dimensional; a) deepening teachers' understanding of linear and exponential growth through technology-based representation, and b) providing effective context for students' learning from the same technology-based representations. They described exploration of exponential and linear growth spreadsheets and graphing calculators, grounded on a rich, open-minded and real-life problem. This addresses to the issues relevant to the cognitive goals of information and communication technology integration in the mathematics classroom.

The most significant problem of African-American students in America's schools is the wide achievement gap in mathematics. This is the report gathered by Johnson and Kritsonis (2006). Furthermore, achievement of minority students lag behind that of whites and non-minority students. Data collected on instructional practices indicated differences between how minority and white students are taught. The data showed that many minority students are not experiencing instructional practices consistent with the recommendations suggestion by the National Teachers of Mathematics (NCTM). According to Furgasz (2006), students learning will be enhanced with the use of technology computers and calculators in the classrooms.

According to DepEd, the evaluation of students' performance can indicate: 1) whether specific pupils have acquired specific DepEd mandated competencies to be earned; 2) how a pupil's performance can be compared with the average performance of his class, his school, all schools, and that of the group on which the test was normed; 3) how many pupils have learned each mandated competency; 4) how do pupils as a whole can be compared with those of another school, , the best of the schools and the norm group, 5) how its pupils in a given year can be compared with its pupils last year, the year before, and any other year of interest, both in the school or any other group chosen to be compared.

Statement of the Problem

This study sought to propose instructional materials in the teaching of problem-solving in Mathematics to Grade 8 learners at Cabiao National High School, Schools Division Office of Nueva Ecija during the School Year 2023-2024.

Specifically, it sought to answer the following sub-problems:

1. What is the performance level of the Grade 8 learners along the objectives in problem solving in Mathematics?
2. What is the Grade 8 learners' least learned skill in problem solving in Mathematics along the aforementioned objectives?
3. Based on the findings, what instructional materials in problem solving can be developed and tried out to the Grade 8 learners?
4. How valid are the proposed instructional materials in problem solving in Mathematics based on the results of the try-out?

METHODOLOGY

This chapter discusses the research design, sources of data, instrumentation and data collection and the tools for data analysis.

Research Design

The study used descriptive method with questionnaire as the research instrument. Descriptive research method obtains facts about existing conditions or significant relationship between current phenomena. This study focused on the proposed instructional materials in the teaching of problem-solving in Mathematics to Grade 8 learners at Cabiao National High School, Schools Division Office of Nueva Ecija during the School Year 2023-2024 in terms of the performance level of the Grade 8 learners along the objectives in problem solving in Mathematics, Grade 8 learners' least learned skill in problem solving in Mathematics along the aforementioned objectives, validity of the the proposed instructional materials in problem solving in Mathematics based on the results of the try-out.

Sources of Data

The research subjects of this study were the 75 Grade 8 learners at Cabiao National High School, Schools Division Office of Nueva Ecija who were randomly selected using the Calmorin formula.

Table 1 shows the distribution of research subjects per section.

Table 1. Distribution of Research Subjects

Respondents	Number of Students (N)	Number of Respondents (n)
1	41	8
2	41	8
3	42	8
4	42	8
5	40	8
6	37	7
7	37	7
8	35	7
9	35	7
10	35	7
Total	385	75

Instrumentation and Data Collection

The main data-gathering instrument of the study was a test question. The test question focused on solving Mathematical word problems.

The items in the test were formulated by the researcher and were validated by the Mathematics Supervisor and teachers. Suggestions were incorporated in the final draft of the test.

A formal permission to conduct the study and to float the questionnaire was secured from the Schools Division Superintendent of Nueva Ecija.

The researcher personally administered the questionnaire to the respondents in each section and immediately checked the papers in order to get the least learned skill.

Tools for Data Analysis

In this study, the researcher used the following statistical measures to analyze the data for the problems.

To answer sub-problem 1 on the performance level of the Grade 8 learners along the objectives in problem solving in Mathematics, frequency counts and percentages were used.

To answer sub-problem 2 on the Grade 8 learners' least learned skill in problem solving in Mathematics along the aforementioned objectives, frequency counts and percentages were used using the formula below.

$$\text{Percentage} = \frac{F}{N} \times 100$$

Where:

F = Frequency

N = total number of respondents

To answer sub-problem 4 on the validity of the the proposed instructional materials in problem solving in Mathematics based on the results of the try-out, average weighted mean was used using the formula and rating scale below.

$$\frac{\sum WM}{I}$$

Where:

$\sum WM$ = Weighted Mean

I = no. of items/indicators

Rating	Mean Range	Descriptive Equivalent
5	4.21 - 5.00	Very Much Valid (VMV)
4	3.41 - 4.20	Highly Valid (HV)
3	2.61 - 3.40	Moderately Valid (MV)
2	1.81 - 2.60	Slightly Valid (SV)
	1	1.00 - 1.80 Not Valid (NV)

RESULTS AND DISCUSSION

This chapter presents the elements of presenting and interpreting data to answer the sub-problems posited in the chapter of the study.

Performance Level of Grade 8 Learners in Problem Solving in Mathematics

The level of performance of Grade 8 students in solving Mathematics problems is presented in Table 2.

Table 2. Performance Level of Grade 8 Learners in Solving Mathematics Problems

Performance Level	Descriptive Equivalent	Frequency	Percentage
41-50	OP	8	10.67
31-40	VHP	11	14.67
21-30	HP	14	18.67
11-20	AP	24	32
6-10	LP	17	22.67
0-5	VLP	1	1.32
Total		75	100

Legend

Score	Descriptive Equivalent
41-50	Outstanding Performance (O)
31-40	Very High Performance (VHP)
21-30	High Performance (HP)
11-20	Average Performance (AP)
6-10	Low Performance (LP)
0-5	Very Low Performance (VLP)

It can be seen in Table 2 that Grade 8 learners averagely performed in Mathematics as reflected by their scores. There are 24 or 32% who 11-20 scores described as average performance, 17 or 22.67% who got 6-10 scores described as low performance, 14 or 18.67% with 21-30 scores described as high performance, 11 or 14.67% with 31-40 scores described as very high performance, 8 or 10.67% with 41-50 scores described as outstanding performance, and only 1 or 1.32% who got very low performance.

Least Learned Skill in Problem Solving in Mathematics

It is reflected in Table 3 that the least learned skill in solving Mathematics during the second quarter is Linear Inequalities with only 35 out of 75 respondents who got the correct answer. In the light of the findings revealed by the study, learners really need instructional materials in Linear inequalities in studying Mathematics to improve their performance.

Table 3. Least Learned Skill in Problem Solving in Mathematics

Topics/Lessons	No. of Learners Who Got the Item Right	Percentage	Level of Mastery
1. Linear Inequalities	35	47	Average (A)

Legend:

Percentage	Descriptive Equivalent
96% - 100%	Mastered (M)
86% - 95%	Closely Approximating Mastery (CAM)
66% - 85%	Moving Towards Mastery (MTM)
35% - 65%	Average (AVR)
15% - 34%	Low (L)
5% - 14%	Very Low (VL)
0% - 4%	Absolutely No Mastery (ANM)

Table 4. Validity of the Problem Solving Instructional Material

Indicators	Weighted Mean	Descriptive Equivalent
1. The background knowledge and skills are appropriate to for the Grade 8 students.	4.90	Highly Valid
2. The background knowledge and skills are based on Mathematics competency.	4.90	Highly Valid
3. The Instructional Materials really measure the students' performance in Linear Inequalities.	4.80	Highly Valid
4. The exercises are appropriate to the development of the solving skill to stimulate the interest and challenge the students in performing problem-solving	4.90	Highly Valid
5. The exercises are designed not only to improve their English but also to gain knowledge about the world for they are content-based.	4.90	Highly Valid

6. The exercises jibe with the background knowledge and skills	4.80	Highly Valid
7. The exercises are varied to meet individual differences	4.90	Highly Valid
8. The exercises encourage students to apply what they learned	4.90	Highly Valid
Overall Average Weighted Mean	4.88	Highly Valid

Legend**Alpha = .8996**

Point Value	Limits	Descriptive Equivalents
5	4.21 - 5.00	Highly Valid
4	3.41 - 4.20	Valid
3	2.61 - 3.40	Moderately Valid
2	1.81 - 2.60	Slightly Valid
1	1.00 - 1.80	Not Valid

The Grade 8 teachers of Cabiao National High School, Schools Division Office of Nueva Ecija evaluated the Instructional Material in Problem Solving in terms of its content, the purpose of which was to determine whether the instructional material covered what was intended to tackle.

Table 4 on the previous page presents the content validity of the instructional material in Mathematics 8. The table indicates that the overall average weighted mean of **4.88** is interpreted as **Highly Valid**. This is supported by the average weighted means of all indicators which are also described as **Highly Valid**.

Conclusions

Based on the findings of the study, the following conclusions were drawn:

1. Generally, the Grade 8 learners have low performance in problem solving in Mathematics.
2. The least learned skill of the Grade 8 learners during the second quarter is linear inequalities.
3. The developed problem solving instructional material was based on the least learned skills.
4. The instructional material met the criteria for validity.

Recommendations

On the basis of the foregoing findings and conclusions, the following are hereby recommended:

1. The Grade 8 learners should be encouraged to exert more effort in studying Mathematics. They should be motivated to change their impression of Mathematics as a difficult subject, but rather they could have fun in studying it.
2. Teachers should make intervention measures to improve the performance of the learners. Such intervention measure helps them understand more clearly the concepts.
3. Weekly assessment of the Mathematics skills of the learners should be done to monitor their performance.
4. Parents and teachers should join hands in improving the performance of the learners. Teachers should tell the parents about the difficulties encountered by their children in learning Mathematics. Parents should also monitor the performance of their children in the school. They should give their full support in their studies like attending PTA meetings and have follow-ups in their studies.
5. The least learned skill in Mathematics should be given emphasis in teaching. Teachers should use appropriate strategies and techniques to develop the skill and give more exercises for the learners to master the skill.
6. The proposed instructional material should be presented to the Schools Division Superintendent for its reproduction and utilization to help the Mathematics teachers.

REFERENCES

- Chandler, B.J. 1988. Education and the Teacher. New York Mc Graw Hill.
- Connolly, et.al.1999. Educational Quarterly Review.
- Elsbree, W.S. et.al. 1959. Elementary School Administration and Supervision. New York American Book Co.
- Frempong, G. 2000. Socio-economic Gradients in Mathematics Achievement: Finding for Canada from the Third International Mathematics and Science Study. Ph.D. Dissertation, University of British Columbia, Vancouver, B.C.
- Mansergh, Gerald. 1988. Dynamics of Management by Objective for School Administration, Danville: The Interstate Printers and Publishers, Inc.
- Mort, P. 1988. Modern Educational Practice. New York: Mc Graw Hill.
- Ainley, Janet; Pratt, Dave Hansen, Alice 2006. "Connecting Engagement and Focus in Pedagogies Task Design", British Educational Research Journal.
- Alagic, Mara; Palenz, Diana. 2006. "Teachers Explore Linear and Experimental Growth: spreadsheets as Cognitive Tools.
- Bafumo, Mary Ellen. 2006. "Best Practices: The Power of Language".
- Cavanagh, Jean. 2006. "Advocates Urge Bush to Boost Federal Role in Math and Science.
- Cefre, Tito R. 2007. "Effectiveness of Teaching Mathematics by Specialization in Aporao Elementary School", Action Research, PSU-OUS Lingayen.
- Delabajan, Rowena Roma. 2011. "The Mathematical Performance of Grade Six Pupils in Solving Word Problems", Tiburcio Tancino Memorial Institute of Science and Technology.
- Dickenson, D.J. 2010. "The Effects of Success and Failure on the task Behavior of High Achieving Students. Education and Treatment of Children.
- Franch-Dollie G. 2009. "Status of Implementation of Resctructured Basic Education Curriculum (RBEC)". The Modern Teacher. Vol. LVIII No. 1
- Furgasz, Helen. 2006. "Factors that Encourage or Inhibit Computer Use for Secondary mathematics Teaching.
- Gathercole, Susan Elizabeth. 2006. Alloway, Tracy Packiam; Willis, Catherine, "Working Memory in Children with Reading Disabilities".
- Hohowar, Vaishali. 2006. "Adjunct Teachers" Could Do End Run Around NCLB Act"

- Lubienski, S. T. 2010. "Problem Solving as a means toward Mathematics for All", An Exploratory look through a Class Lens, Journal for Research in Mathematics Education.
- Jones Kristie K, Byrnes, James P. 2006. "Characteristics of students Who Benefit from High Quality Mathematics Instruction" Contemporary Educational Psychology.
- Johnson, Clarence; Kritsnits, William. 2006. "The Achievement Gap in Mathematics: A Significant Problem for African-American Students" Online Submission.
- Matteson, Shirley M. 2006. "Mathematical Literacy and Standardized Mathematical Assessments.
- Nesbit, Paul L; Burton, Susan, "Student Justice Perceptions Following Assignment Feedback"2006.
- Orfiano, Patronicia A. 2011. "Quality Education for All Throughout Life." The Modern Teacher, Vol. LVIII, No. 1.
- Shaftel, Julia; Betton-Kocher Evelyn; Glasnapp, Douglas, Poggio, John 2006. "The Impact of Language Characteristics in Mathematics Test Items on the Performance of English Language Learners and Students with Disabilities" Educational Assessment.
- Yun-peng; Ching-Chung Lam; Ngai-ving, Wong "Chinese Primary Schols Mathematics Teachers Working in a Centralized Curriculum System: 2006. A Case Study of Two Primary Schools in North East China" Compare: A Journal of Comparative Education.
- Aspiras R. 2005. "**Predictors of Students Level of Performance in Math II (Intermediate Algebra) at Christ the King College, San Fernando City**", Mater's Thesis, DMMMSU-MLUC, San Fernando City.
- Bautista, Emer. 2007. "**Comparison of the Achievement in Mathematics of 3rd year Students Taught by Modern Technique and Those Taught by Traditional Method**", Master's Thesis, Philippine Normal University, Manila.
- Bete, Handerson. 2005. "**Reciprocal Relationships Between Attitude toward Mathematics and Achievement**", Master's Thesis, Western Washington University.
- De Veas, Erliza C. 2012. "**A Mathematics Enrichment Program for Bacnotan National High School**", Master's Thesis, DMMMSU-MLUC, San Fernando City.
- Domingo, Jose C. 2012. "**Relationship Between Word Solving Ability and Some Variables Among Grade V Pupils of Gerona South District**", Master's Thesis, Tarlac State University, Tarlac City.
- Dua, G. 2005. "**The Correlation of Mathematics Achievement among Fourth Year College Students in Selected Public and Private Schools in North Cotabato Province**", Master's Thesis, NDU-NDKC Consortium, Kidapawan City, 2005.
- Ekman, George A. 2006. "**Comparative Study of Mathematics Achievement**", Master's Thesis, University of Mindanao.
- Elevados, Maria R. 2008. "**Effectiveness of Modern and the Traditional Method in Teaching Rational Numbers**", Master's Thesis, Colegio Milagrosa Sorsogon, Sorsogon.
- Fernandez, Roxanne S. 2013. "**Performance Level of Grade VI Pupils in Mathematics in Lingayen I District, Division of Pangasinan I**", Master's Thesis, The Adelphi College, Lingayen, Pangasinan.
- Forte, Jennifer. 2007. "**Factors Contributing to the Attitudes of College Students Towards Mathematics**". Master's Thesis, Western Wahington University.
- Mistretta, Clarence. 2004. **Relationship Between Word Solving Ability and Some Variables in Selected Schools**. Master's Thesis, Western Wahington University.
- Montecalvo, Teresita P. 2010. "**Problem Solving Skills in Foundation, Decimals and Percentage of Grade VI Pupils of Linamon District, S.Y. 1999-2000**" Master's Thesis, Mindanao State University, Iligan Institute of Technology, Iligan City.
- Ordinario R. 2009. "**Mathematics Test Anxiety and Performance of Third Year High School Students**", Master's Thesis, DMMMSU-MLUC, San Fernando City.
- Somera, Rodrigo S. 2007. "**The Mathematics Achievement of Grade V Pupils of Cabungao District, Division of Ilocos Sur**", Master's Thesis, University of Northern Philippines.

