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Assessing Mathematical Proficiency of Elementary School Teachers

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Abstract: Mathematics teachers should have an extensive knowledge of mathematics. This knowledge allows her to confidently explain concepts and processes to her students. Hence, this study determined the mathematical proficiency of 30 elementary school teachers from Teodoro M. Kalaw Memorial School. Specifically, this study sought answers to the following questions: How do the respondents asses their mathematical proficiency along the following strands: conceptual understanding; procedural fluency; strategic competence; adaptive reasoning and productive disposition? and What is the implication of the findings of this study to the teaching of Mathematics in the elementary level?
Results showed that the respondents assessed themselves as highly proficient in mathematics along different strands. They find ways to enable their students learn new ideas by connecting those ideas to what they already know. They try their best to carry out the procedures flexibly, accurately, efficiently, and appropriately and they have the ability to formulate, represent, and solve mathematical problems.
The above-mentioned findings recommended that schools may support engagement in sustained efforts for continuous improvement of mathematics instruction by providing teachers the needed time and resources. Mathematics teachers may use extensively appropriate objects and aids to guarantee that all pupils understand and are able to use the language of quantity in solving problems. Similar research may be conducted focusing on the nature, development and assessment of mathematical proficiency.
Keywords: Mathematical Proficiency, Conceptual Understanding, Procedural Fluency, Strategic Competence, Adaptive Reasoning, Productive Disposition.

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Introduction

Mathematics is the science that deals with the logic of shape, quantity and arrangement. It is the building block for everything in one's daily lives, including mobile devices, architecture, art, money, engineering, and even sports. Over several years, a lot has been said about developing deep understanding in Mathematics. To teach for mathematical proficiency requires a lot of effort.

Tasks must be strategically selected to help students build connections since concepts and connections develop over time. However, the important benefits to be derived from relational understanding make the effort not only worthwhile but also essential. The importance of mathematics extends beyond the academic domain. It is a trademark that in teaching, specifically in Mathematics, the approach is anchored with too much problem to analyze, numbers to compute and measurements to find (Marasigan, 2018).

Young people who are in transition to adulthood with limited mathematics skills are likely to find it difficult to function in society. Basic arithmetic skills are required for everyday computations, and sometimes for job applications. Additionally, competence in mathematics skills is related to higher levels of employability.

People sometimes assume that only the brightest students who are most attuned to school can achieve mathematical proficiency. Becoming mathematically proficient is necessary and appropriate for all students. As students go from pre-kindergarten to eighth grade, all students should become increasingly proficient in mathematics. That proficiency should enable them to cope with the mathematical challenges of daily life and enable them to continue their study of mathematics in high school and beyond. Everyone will benefit from a program in which mathematical proficiency is the goal.

Undeniably, not all students like Mathematics, but a good Mathematics teacher has the power to change that. A good Mathematics teacher can help students who have traditionally struggled with arithmetic begin to build confidence in their skills. For students who are usually bored with numbers, a good Mathematics teacher can breathe new life into the subject. She makes her class a place where students want to be.

Mathematics teachers should have an extensive knowledge of mathematics. This knowledge allows her to confidently explain concepts and processes to her students. She is not constantly consulting the answer key in the back of the teacher's guide to help students solve problems. This confidence boosts her credibility and helps students trust in her ability to teach them what they need to know (Zeiger, 2018).

It is for this reason that this research was conceived. The researchers, being Mathematics teachers deem it significant to assess the 30 elementary school teachers' mathematical proficiency along the five strands with the end view of determining its implication to the teaching of Mathematics in the elementary level.

Objective of the Study

The main purpose of this study was to gauge the mathematical proficiency of 30 elementary school teachers from Teodoro M. Kalaw Memorial School. Specifically, this study sought answers to the following questions: How do the respondents asses their mathematical proficiency along the following strands: conceptual understanding; procedural fluency; strategic competence; adaptive reasoning and productive disposition? and What is the implication of the findings of this study to the teaching of Mathematics in the elementary level?

Methodology

The main purpose of this study was to assess the mathematical proficiency of elementary school teachers. For this reason, this study made use of the descriptive method of research, a fact-finding method, through the use of researcher-made questionnaire. Using the

questionnaire, the researchers assessed the respondents' mathematical proficiency using the following interpretation:

Scale	Mean Ranges	Verbal Interpretation
4	3.51 – 4.00	Strongly Agree/Highly Proficient
3	2.51 – 3.50	Agree/Proficient
2	1.51 – 2.50	Disagree/Not Proficient
1	1.00 – 1.50	Strongly Disagree/Highly Not Proficient

Results and Discussion

This presents the data gathered together with the corresponding analysis and interpretation. The data are presented in tabular form organized in a sequential manner, following the order of the specific problems posed at the beginning of the study.

1. Mathematical Proficiency of the Respondents

The succeeding tables present the respondents' assessment on their mathematical proficiency in terms of conceptual understanding, procedural fluency; strategic competence; adaptive reasoning and productive disposition. It reveals the computed mean and standard deviation for each statement with its corresponding interpretation.

Table 1. Mathematical Proficiency in Terms of Conceptual Understanding

Statements	Mean	Standard Deviation	Interpretation
As a grade school Mathematics teacher, I … 1. organize knowledge into a coherent whole which enables me to learn new ideas.	3.77	0.43	Strongly Agree
2. give more exercises to my pupils on a particular topic for retention purposes.	3.80	0.41	Strongly Agree
3. use a method of calculation which my pupils find it easy to understand.	3.83	0.38	Strongly Agree
4. verbalize connections among concepts and representations so that my pupils would appreciate the essence of the subject.	3.30	0.47	Agree
5. link related concepts and methods in appropriate ways and represent mathematical situations in real life.	3.77	0.43	Strongly Agree
Composite Mean	**3.69**	**0.42**	**Highly Proficient**

It can be observed in Table 1 that generally, the respondents strongly agreed to most items. The highest mean of 3.83 was obtained by the item *As a grade school mathematics teacher, I use a method of calculation which my pupils find it easy to understand.*

On the other hand, the least rated item got a mean rating of 3.30 where the respondents agreed that they verbalize connections among concepts and representations so that pupils would appreciate the essence of the subject.

All in all the items garnered a composite mean of 3.69 which was interpreted as highly proficient. This means that the respondents were doing ways to enable their students to learn new ideas by connecting those ideas to what they already know. In this way, they prevent common errors and supports retention.

Table 2. Mathematical Proficiency in Terms of Procedural Fluency

Statements	Mean	Standard Deviation	Interpretation
As a grade school Mathematics teacher, I … 1. analyze similarities and differences between methods of computing.	3.77	0.43	Strongly Agree
2. perform basic computations efficiently and accurately without referring to tables of the other aids.	3.67	0.48	Strongly Agree
3. simplify mental arithmetic and deal with numbers in a more flexible way.	3.80	0.41	Strongly Agree
4. develop speed and accuracy in calculating with large numbers by hand.	3.37	0.49	Agree
5. use algorithms in performing computations either mentally or in writing.	3.67	0.48	Strongly Agree
Composite Mean	**3.65**	**0.46**	**Highly Proficient**

It can be observed in Table 2 that the respondents generally agreed to all items. The highest mean of 3.80 was obtained by the item *As a grade school mathematics teacher, I simplify mental arithmetic and deal with numbers in a more flexible way.* The least rated item got a mean rating of 3.37 in which the respondents agreed that they develop speed and accuracy in calculating with large numbers by hand.

All in all the items garnered a composite mean of 3.65 which was interpreted as highly proficient. This indicates that the respondents try their best to carry out the procedures flexibly, accurately, efficiently, and appropriately.

Table 3. Mathematical Proficiency in Terms of Strategic Competence

Statements	Mean	Standard Deviation	Interpretation
As a grade school Mathematics teacher, I … 1. figure out exactly what the problem is all about and present clear and specific solution.	3.67	0.48	Strongly Agree
2. formulate mathematical problems, represent them and solve them.	3.73	0.45	Strongly Agree
3. generate a mathematical representation of a problem that captures the core of mathematical elements.	3.77	0.43	Strongly Agree
4. use a variety of solution strategies which are useful in solving a specific problem..	3.27	0.45	Agree
5. consider experiences and practice in formulating problem as well as problem solving.	3.70	0.47	Strongly Agree
Composite Mean	**3.63**	**0.46**	**Highly Proficient**

Table 3 presents the assessment of the respondents on their mathematical proficiency in terms of strategic competence. It can be gleaned from the table that the highest mean was 3.77, where the respondents declared that they generate a mathematical representation of a problem that captures the core of mathematical elements. The least rated item got mean rating of 3.27 in which the respondents agreed that they use a variety of solution strategies which are useful in solving a specific problem. All in all the items garnered a composite mean of 3.63 which was interpreted as highly proficient. This means that the respondents have the ability to formulate, represent, and solve mathematical problems.

Table 4. Mathematical Proficiency in Terms of Adaptive Reasoning

Statements	Mean	Standard Deviation	Interpretation
As a grade school Mathematics teacher, I … 1. give exercises that require my pupils to think logically about the relationships of the concepts and situations.	3.90	0.31	Strongly Agree
2. apply valid reasoning by justifying the conclusion through careful consideration of alternatives.	3.70	0.47	Strongly Agree
3. decide if the answers given by my pupils are right by following some agreed-upon	3.83	0.38	Strongly Agree

assumptions through series of logical steps.			
4. use not only informal explanation and justification but also intuitive and inductive reasoning.	3.30	0.47	Agree
5. provide sufficient reasons for proof and allow pupils to justify their mathematical ideas.	3.83	0.38	Strongly Agree
Composite Mean	**3.72**	**0.40**	**Highly Proficient**

Table 4 presents the respondents' assessment on their mathematical proficiency in terms of adaptive reasoning. It can be seen from the table that the highest mean was 3.90 where the respondents strongly agreed that they give exercises that require their pupils to think logically about the relationship of the concepts and situations. On the other hand, the lowest was 3.30 in which they agreed that they use not only informal explanation and justification but also intuitive and inductive reasoning.

All in all the items garnered composite mean of 3.72 which was interpreted as highly proficient. This means that the respondents have the capacity for logical thought, reflection, explanation, and justification.

Table 5. Mathematical Proficiency in Terms of Productive Disposition

Statements	Mean	Standard Deviation	Interpretation
As a grade school Mathematics teacher, I … 1. emphasize to my pupils that steady effort in studying or learning mathematics pays off.	3.37	0.43	Strongly Agree
2. encourage my pupils to see oneself as an effective learner and doer of mathematics.	3.80	0.41	Strongly Agree
3. inspire my pupils to build strategic competence in solving non-routine problems.	3.33	0.48	Agree
4. give my pupils challenging mathematical problems to solve and let them realize the benefits of solving those problems.	3.77	0.43	Strongly Agree
5. allow my pupils to view their mathematical ability as expandable to seek out challenging situations and learn from them.	3.77	0.41	Strongly Agree
Composite Mean	**3.61**	**0.43**	**Highly Proficient**

It can be observed in Table 5 that generally, the respondents strongly agreed to most items. The highest mean of 3.80 was obtained by the item *As a grade school mathematics teacher, I encourage my pupils to see oneself as an effective learner and doer of mathematics.* On the other hand, the least rated item got a mean rating of 3.33 where the respondents agreed that they inspire pupils to build strategic competence in solving non-routine problems.

All in all the items garnered a composite mean of 3.61 which was interpreted as highly proficient. This means that the respondents see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy (NRC, 2001).

2. Implication of the Findings to the Teaching of Mathematics in the Elementary Level

The main goal of elementary school mathematics is to develop all facets of the learners' mathematical proficiency, and the teacher of elementary mathematics needs to be able to help pupils with that development. Such proficiency on the teacher's part requires that the teacher not only understand the substance of elementary school mathematics deeply and thoroughly but also know how to guide pupils toward greater proficiency in mathematics.

Teachers require mathematical proficiency that is different from that needed in other professions. A teacher's work requires general mathematical knowledge as well as proficiency in the kinds of tasks. There is a range of proficiency in each strand, and a teacher may become increasingly proficient in the course of his or her career. At the same time, certain categories may involve greater depth of mathematical knowledge than others.

Thus, mathematics teachers must be expert in handling mathematical ideas. They must understand basic concepts, fluent in performing basic operations, reason clearly and flexibly and maintain a positive outlook toward mathematics.

Conclusion and Recommendation

This study revealed that the respondents assessed themselves as highly proficient in mathematics along different strands. They find ways to enable their students learn new ideas by connecting those ideas to what they already know. They try their best to carry out the procedures flexibly, accurately, efficiently, and appropriately and they have the ability to formulate, represent, and solve mathematical problems.

Based on the conclusion drawn from the study, the researchers suggested the following recommendations: Schools may support engagement in sustained efforts for continuous improvement of mathematics instruction by providing teachers the needed time and resources. Mathematics teachers may use extensively appropriate objects and aids to guarantee that all pupils understand and are able to use the language of quantity in solving problems. Similar research may be conducted focusing on the nature, development and assessment of mathematical proficiency.

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