

Teachers' Formative Assessment Practices on Learning Competencies in Grade 9 Mathematics

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Abstract: *This study determined the teachers' formative assessment practices on learning competencies in Grade 9 Mathematics Flagship 3 for School Year 2019-2020. The descriptive method was applied in the conduct of this study. The respondents were 10 grade 9 Mathematics teachers and 150 students. Checklist and numeracy assessment tool were used to gather data. The data gathered were tabulated and analyzed using frequency count, rank, mean, percentage, Cohen's d effect size, and t-test: paired two sample for means. Based from the data gathered, the following findings were disclosed: The top 3 formative assessment practices used by teachers per learning competencies were seat works, board works and worksheets for individual formative assessment methods while discussion, group tasks and working in pair for collaborative assessment methods. The formative assessment practices used by teacher A, B and H got the highest effect size of 7.70, 7.38 and 6.94, respectively, with a description of large effect, and the formative assessment practices used by teacher F, G and I got the lowest effect size of 1.17, 1.13 and 2.15, respectively, with a description of large effect. The competency "Solves quadratic equations by a) extracting square roots; b) factoring" with a mastery level of 89% got the highest mastery level in all 8 competencies, interpreted as Closely Approaching Mastery while the competencies, "Solves equations transformable to quadratic equations (including rational algebraic equations)", "Solves problems involving quadratic equations and rational algebraic equations", "Solves quadratic inequalities" and "Describes proportion" got the lowest mastery level with 51%, 63%, 53% and 64%, respectively with a description of Average Mastery. The formative assessment tool in Grade 9 Mathematics was proposed to serve as a guide for teachers on the use of formative assessment methods both in individual and collaborative type along the least mastered competencies. Established from the findings, the following conclusions were drawn: The formative assessment practice used by teachers in teaching Grade 9 Mathematics per learning competencies varies. All the formative assessment practices used by the teachers have large effect in improving the numeracy level of students. The mastery levels of the students when group according to learning competencies varies from Average Mastery to Closely Approaching Mastery. The formative assessment tool in Grade 9 Mathematics to serve as a guide for teachers on the use of formative assessment methods along the four identified least mastered learning competencies is hereby proposed. Based from the findings and conclusions, the following recommendations were drawn: teachers have to explore and use varied formative assessment practices along the learning competencies in Grade 9 Mathematics. The teacher may modify their use of different formative assessment practices on the learning competencies to improve the numeracy level of students. Administrators may consider conducting a seminar on the use of different formative assessment practices in improving the mastery level of the students. The proposed formative assessment tool in Grade 9 Mathematics may be adapted and implemented. Researchers may conduct similar studies having the formative assessment practices used by teachers in other learning competency in Mathematics.*

Keywords: Effectiveness, Localized Manipulative Tools, Teaching

1. Introduction

There are many factors affecting the learning of the students in Mathematics subject. However, one of the key factors which seems to contribute more is the essence of using assessment and other evaluation instrument during instructional process (Ajogbeje, 2013). The factors affecting learning apparently leads to students' negative perception of the particular subject and lower performance in Mathematics exercises and tests.

In the 2018 Programme for International Student Assessment (PISA), Philippines ranks among lowest in reading comprehension, and also ends up in the low 70's in Mathematics and Science across 79 countries in a study done by the Organization for Economic Cooperation and Development (OECD) (Paris, 2019). The deteriorating performance of Filipino students has become major challenge to Philippine education. This served as a wakeup call for the authorities in the country to respond in lifting up the quality of education.

The concept of formative assessment was first introduced in 1971 by Bloom, Hastings and Maddaus in which they formally introduced the idea that assessment need not be used solely to make summative evaluations of student performance (Centre for Educational Research and Evaluation, 2008). It means that teachers must include ungraded periods of assessment intended for gaining

important feedback regarding the success or failure of instruction.

Formative assessment is commonly referred to as assessment for learning, in which the focus is on monitoring student response to, and progress with instruction. The use of formative assessment is to provide immediate feedback to both students and teacher regarding the success and failures of learning (Corpuz and Salandanan, 2011). Feedback given as part of formative assessment helps learners become aware of any gaps that exist between their desired goal and their current knowledge, understanding, or skill and guides them through actions necessary to obtain the goal (Sadler, 2005).

Designing a formative assessment requires strategic planning and a clear understanding of one's assessment goals. When planning instructional strategies, teachers need to: keep learning goals in mind; consider assessment strategies; and determine what would constitute evidence that students have reached the learning goals (Educational Testing Service, 2003). Assessment for learning is merely a practice for students and should not be scored nor count toward a summative grade. The type of assessment that needs to be recorded should be summative and quarterly tests as well as results derived from performance tasks.

As quoted by Estolonia (2018), DepEd Central Office stated the very low result of National Achievement Test school year 2014-2015 with a mean of 23.69, standard deviation of

11.57 and Mean Percentage Score of 47.37. In line with this, the Department of Education in the Philippines launched an order to adopt a policy guideline on classroom assessment. This is to strictly allow teachers to track and measure learner's performance and to adjust instruction (DepEd Order No. 08, s. 2015). It was mentioned there that formative assessment played a major role in the teaching-learning process by means of identifying strengths and weaknesses for students to learn from assessment experience and checking the effectiveness of instruction.

Moreover, DepEd Order no. 42 series of 2017 known as the National Adoption and Implementation of the Philippine Professional Standards for Teachers (PPST) was used as a basis for learning and development programs for teachers. It aims to set out clear expectations of teachers, embrace ongoing professional learning, assess teacher's performance and identify needs and provide support for professional development.

The Philippine Professional Standard for Teachers has 7 domains comprises of 37 strands that serve as the basis in assessing the performance of every teacher. In Domain 5 known as Assessment and Reporting, teachers are encouraged to apply a variety of assessment tools and strategies in monitoring, evaluating, documenting and reporting learners' needs, progress and achievement (RPMS Manual for Teachers and School heads, page 10). The bottom line of the domain concerns the importance of formative assessment in providing feedback about learning outcomes. This enables the teachers to organize sound assessment processes.

With the goal of uplifting the performance of the students, Schools Division of Sorsogon issued a memorandum entitled, Guidelines on the Utilization of the Numeracy Level of Elementary and Secondary Level (Division Memorandum No. 126 s. 2019). The Curriculum Implementation Division (CID) led the development of Division Numeracy Tools with the primary aim of assessing the numeracy level of every learner. It also serves as a basis in providing remediation for the learners found to be non-numerates, beginning and developing numerates, and enrichment for students who are numerates.

The mandatory utilization for the pre-test of numeracy assessment tool for grade 9 was started on September 2019 as mentioned in the aforementioned division memorandum. It was three months delayed since the numeracy assessment tool was validated. Hence, teachers may have already discussed some competencies anchored in the said tool.

However, the mother schools of flagship III, namely Matnog, Sta. Magdalena and Bulan of Sorsogon province reported the alarming result. In Matnog National High School, the result of 455 students who took the test, 273 of them were classified as non-numerates (scores 0-4), 169 were beginning numerates (scores 5-10), 11 were developing numerates (scores 11-15) and only 2 were proficient/numerate (scores 16-20).

Moreover, a teacher from Sta. Magdalena National High School, stated that out of 4 sections who took the numeracy

tool, the mean was 13.60 and the mastery level was 65%. This result is still far from the target which is 75% performance level. Furthermore, according to the Department Head in Mathematics of Bulan National High School, stated that out of 756 students who took the pre-test, 537 students were non-numerates, 166 were beginning numerates, 23 were developing numerates, and 30 were proficient/numerate.

The formative assessment is essential in making instructional strategies. It provides students with immediate feedback on how well they are learning throughout the teaching-learning process (DepEd Order No. 8, s.2015, page 2). The latter result of the test called the attention of researcher to investigate the formative assessment that may use by teachers to uplift the numeracy level of students.

With these sources, it is imperative to understand the practices used by teachers with regards to formative assessment methods along specific competencies. In line with this, the research was designed to determine the teachers' formative assessment practices on learning competencies in Grade 9 Mathematics Flagship III for School Year 2019-2020. It answered how effective were the formative assessment practices in improving the numeracy level of students on grade 9 Mathematics.

2. Statement of the Problem

This study determined the teachers' formative assessment practices on learning competencies in Grade 9 Mathematics Flagship 3 for School Year 2019-2020. Specifically, it answers the following questions:

- 1) What are the formative assessment practices used by teachers in teaching Grade 9 Mathematics per learning competencies along
 - a) Individual assessment practices
 - b) Collaborative assessment practices?
- 2) How effective is the formative assessment in improving the numeracy level of students?
- 3) What is the mastery level of the students on learning competencies when grouped according to the formative assessment practices?
- 4) What formative assessment tool can be proposed based on the result of the study?

3. Methodology

3.1 Research Design

This study determined the teachers' formative assessment practices on learning competencies in Grade 9 Mathematics Flagship 3 for School Year 2019-2020. A descriptive method of research was used for this study. The respondents of this study were grade 9 Mathematics teachers teaching first section from secondary schools in the cluster of Bulan, Sta. Magdalena and Matnog in the Province of Sorsogon and their students.

Survey questionnaire and numeracy tools were used as the instruments to gather data. In order to strengthen the study by having other useful data, interview and documentary

analysis were also used. The data gathered were tabulated and analyzed using appropriate statistical tools namely: frequency count, rank, mean percentage, Cohen's d effect size, and t-test: paired two sample for means.

3.2 The Sample

Table 1 presents the respondents of the study. It includes the cluster and the number of schools where both the teacher and students' respondents belong.

Table 1: The Respondents

Cluster	No. of School	No. of Teacher	No. of Student
Bulan	5	5	75
Matnog	3	3	45
Sta. Magdalena	2	2	30
Total	10	10	150

This study employed two groups of respondents namely, teacher-respondents and student-respondents. The teacher-respondents were identified using purposive sampling. They were composed of 10 teachers teaching first section in grade 9 Mathematics for school year 2019-2020. They were from secondary public schools of Flagship 3 which composed of 3 clusters namely, Bulan, Matnog, and Sta. Magdalena in the province of Sorsogon.

On the other hand, the student-respondents were named by incidental sampling. They were the students on the first section of the identified teachers. The researcher preferred teachers teaching first section for the reason that in his observation, different kinds of formative assessment practices were used to higher sections. The student-respondents were composed 150 students as a total taken from 10 secondary schools each has a sample of 15 students. The following schools were as follows: In Bulan cluster, Bulan National High School, Gate National High School, J.P Laurel High School, Danao National High School, and Cadandanan National High School; in Sta. Magdalena cluster, Talaonga National High School and Magdalena National High School; and in Matnog cluster, Culasi National High School, Sua National High School, and Teong Henzo Memorial High School.

3.3 The Instrument

There were two sets of research instrument used in this study. The research instrument for the teacher-respondents was survey-questionnaire to determine the formative assessment practices they used along the specific learning competencies in grade 9 Mathematics. The survey-questionnaire in the form of checklist contained learning competencies and formative assessment methods. The learning competencies were from the Mathematics Curriculum Guide for grade 9 of K to 12 Basic Education Curriculum (2013) extracted from the numeracy assessment tool used. While the list of formative assessment methods was selected from DepEd Order no. 8 series of 2015 and some were from the survey-questionnaire in the study of Estolonia (2018).

On the other side, for the student-respondents, numeracy assessment tool was used for grade 9 students adapted from

the Curriculum Implementation Division (CID) of Schools Division of Sorsogon. It was used as an instrument for pretest and posttest in providing a standard numeracy tool in assessing the numeracy level of learners in Sorsogon province (Division Memorandum No. 176, s. 2019). It is composed of 20 items with an open-ended question specifically made for grade 9 Mathematics only.

The researcher presented a preliminary draft of the instruments to his thesis adviser and panel members for comments and suggestions. The dry-run was conducted on February 04, 2020 in Matnog National High School composed of 2 grade 9 Mathematics teachers to test and validate the checklist. The dry-run was conducted to determine the number of formative assessment methods used by teachers. It was found out that it was less than or equal to 3 per type of formative assessment that the teacher used per learning competency. This was due to the fact that according to the Curriculum Guide for grade 9 of K to 12 Basic Education Curriculum (2013), the time allotment to finish one learning competency was 4 hours or equivalent for one week. In DepEd order no. 8, s. 2015, formative assessment can be integrated before, during and after the learning process. Hence, the researcher employed multiple responses. Moreover, it was also found out that the pre-test result of numeracy assessment tool as a mandatory guideline of the Schools Division of Sorsogon, was checked by subject teacher. Therefore, to make it uniform, it was decided that the teacher-respondent was the checker of the post-test result used for the study.

3.4 Data Collection Procedures

In data gathering, the researcher underwent asking first permission to conduct the study. A letter of approval was made on January 15, 2020 for the Schools Division Superintendent of the Division of Sorsogon to distribute and retrieve questionnaire to secondary schools within the Flagship III that was from the cluster of Bulan, Sta. Magdalena and Matnog province of Sorsogon.

After the request was acknowledged, the researcher made a request letter to the Principal of Matnog National High School where the dry-run was conducted. The dry-run was used to revise and validate the survey-questionnaire and examined the way how teacher rated and checked the results of assessment of the students. An interview was also made to know the problems and concerns of the respondents along the data gathering. As the survey questionnaire and numeracy tool were finalized, the researcher prepared a letter to the Principals of the identified secondary schools for the permission to conduct the study in their respective schools.

The researcher personally distributed the request together with the final copies of questionnaire and assessment papers to the respondents. The data collection was conducted during the fourth quarter of school year 2019-2020 which was January to March 2020. Since, there was a mandatory utilization of the numeracy tool, the researcher took first the pre-test result of students from the teacher-respondents. The checklist and the post-test results were retrieved one to two

weeks after they were answered by the respondents. Overall, the retrieval rate of data was a hundred percent.

To validate the answers of the teachers on their use of the formative assessment, the researcher followed up teacher-respondents by asking for the sample lesson plans used in any of the 8 learning competencies. The sample lesson plan was gathered through social media.

3.5 Data Analysis Procedures

The data gathered from this study were analyzed and interpreted using appropriate statistical tools. Frequency count and rank were used to determine the formative assessment practices used by teachers in teaching specific learning competencies in grade 9 Mathematics.

The pre-test and post-test results from numeracy assessment tools were treated statistically by getting the mean score to determine the numeracy level of the student-respondents. The following scale was used to determine the numeracy level of students based from the Curriculum Implementation Division of Schools Division of Sorsogon ((Division Memorandum No. 176, s. 2019).

Scores	Numeracy Level
0-4	Non-numerates
5-10	Beginning Numerates
11-15	Developing Numerates
16-20	Proficient/Numerates

To determine the difference between the pre-test and post-test results of the students when grouped according to formative assessment used by teachers, t-test: Paired two Samples for Means with 5% level of significance was used. While for the difference among the post-test results of the students when grouped according to learning competencies, mean and percentage was used. To determine the mastery level of the student-respondents, the scale from NETRC or the National Education Testing and Research Center (as cited in Monterey, 2018) was used.

Percentage	Description
96% - 100%	Mastered (M)
86% - 95%	Closely Approaching Mastery (CAM)
66% - 85%	Moving Towards Mastery (MTM)
35% - 65%	Average Mastery (AM)
16% - 34%	Low Mastery (LM)
5% - 15%	Very Low Mastery (VLM)
0% - 4%	Absolutely No Mastery (ANM)

To determine the effect size of the pre-test and post-test results of students, the formula for Cohen's d effect size adapted in Sloan (2018) was used.

Effect Size Formula:

$$\text{Effect Size} = \frac{(\text{Mean of Posttest}) - (\text{Mean of Pretest})}{\text{Average Standard Deviation}}$$

Meanwhile, to interpret Cohen's d effect sizes, the scale based on Rubin and Babbie (2005) was adapted.

Effect Size Range	Levels of Effect Size
≥ 0.8	Large Effect

0.5 – .79	Medium Effect
0.21 – 0.49	Moderate Effect
≤ 0.20	Small Effect

4. Results and Discussions

4.1 Findings

Based from the data gathered, the following findings were disclosed:

- 1) The top 3 formative assessment practices used by teachers per learning competencies were seat works, board works and worksheets for individual formative assessment methods while discussion, group tasks and working in pair for collaborative assessment methods.
- 2) The formative assessment practices used by teacher A, B and H got the highest effect size of 7.70, 7.38 and 6.94, respectively, with a description of large effect, and the formative assessment practices used by teacher F, G and I got the lowest effect size of 1.17, 1.13 and 2.15, respectively, with a description of large effect.
- 3) The competency, "Solves equations by: a) extracting square roots; b) factoring" with a mastery level of 89% got the highest mastery level in all 8 competencies, interpreted as *Closely Approaching Mastery* while competencies, "Solves equations transformable to quadratic equations (including rational algebraic equations)", "Solves problems involving quadratic equations and rational algebraic equations", "Solves quadratic inequalities" and "Describes proportion" got the lowest mastery level with 51%, 63%, 53% and 64%, respectively with a description of *Average Mastery*.
- 4) The formative assessment tool in Grade 9 Mathematics was proposed to serve as a guide for teachers on the use formative assessment methods both in individual and collaborative type along the least mastered competencies.

4.2 Conclusions

The researcher concluded that:

- 1) The formative assessment practice used by teachers in teaching Grade 9 Mathematics per learning competencies varies.
- 2) All the formative assessment practices used by the teachers have large effect in improving the numeracy level of students.
- 3) The mastery levels of the students on learning competencies when group according to the formative assessment practices varies from *Average Mastery* to *Closely Approaching Mastery*.
- 4) The formative assessment tool in Grade 9 Mathematics to serve as guide for teachers on the use of formative assessment methods on the least mastered learning competencies is hereby proposed.

5. Recommendations

Based from the conclusions drawn after the analysis and interpretation of the data gathered from the study, the following recommendations are made.

- 1) Teachers have to explore and use varied formative assessment practices along the learning competency in Grade 9 Mathematics.

- 2) The teacher may modify their use of different formative assessment practices on the learning competencies to improve the numeracy level of students.
- 3) Administrators may consider conducting a seminar on the use of different formative assessment practices in improving the mastery level of the students.
- 4) The proposed formative assessment tools may be adapted and implemented.
- 5) Researchers may conduct similar studies having the formative assessment practices used by teachers in other learning competency in Mathematics.

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