

Classroom Assessment Thoughts, Skills, and Practices of Secondary School Mathematics Teachers: An In-Depth Analysis

Jerry D. Cruz, Ph.D.

DepEd Schools Division of City of Meycauayan, Bulacan, Philippines
jerry.dacruz@deped.gov.ph

Abstract: The study sought to identify and evaluate the classroom assessment thoughts, practices and skills of secondary mathematics teachers in Bulacan. The study revealed that there are no significant relationships between teachers' thoughts of classroom assessments and practices, and classroom assessment practices and skills. However, there is significant relationship between teachers' thoughts of classroom assessments and skills. There are no significant differences between the teachers' thoughts of classroom assessments and their age, educational attainment, teaching experience, number of years in teaching mathematics and in-service training. There is a significant relationship between the teachers' thoughts of classroom assessment and their classroom assessment skills. In the light of the findings, the researcher recommends that: Secondary mathematics teachers should adopt varied and innovative ways of assessing students' learning in mathematics. School administrators should ensure that all teachers with appropriate certificates must take more training courses in assessment to improve their skills and use of desirable classroom assessment practices. Further research may focus on the relationship between mathematics teachers' assessment skills and thoughts, practices and skills, and thoughts and practices.

Keywords—Classroom assessment, mathematics teachers, in-depth analysis

1. INTRODUCTION

In the past decades, there had been increased research on classroom assessment as an essential aspect of effective teaching and learning [1]. It is becoming more and more evident that classroom assessment is an integral component of the teaching and learning process. The National Council of Teachers in Mathematics (NCTM) (2000) regards assessment as a tool for learning Mathematics [2]. The NCTM contends that effective Mathematics teaching requires understanding what students know and what they need to know. Assessment informs the teacher about what students think and about how they think [3]. Classroom assessment helps teachers establish what students already know and what they need to learn. An author contends that if a teacher is to plan effectively, skills, abilities, and attitudes must be known to him/her [4].

It is the intention of the researcher to observe what normally characterizes Mathematics teachers' work reality and level of competence in classroom assessment. These apprehensions have led the research proponent to ponder about the quest for knowledge concerning the teachers' classroom assessment practices. In the light of the foregoing discussion, the researcher wanted to pursue this study in order to examine what practices currently being used by secondary Mathematics teachers address the needs of a diverse student population and what new and innovative ways are the teachers attempting to discover to meet the needs of the students.

2. RELATED WORKS

Research has revealed that most students perceive Mathematics as a difficult subject, which has no meaning in real life [5]. This thought begins to develop at elementary schools where students find the subject very abstract and heavily relying on algorithm, which the students fail to understand. This trend continues up to high school and college. By the time students get to high school, they have

already lost interest in Mathematics and they cannot explain some of the operations any longer.

Most research studies in both education and cognitive psychology have reported weaknesses in the way Mathematics is taught. The most serious weakness is the psychological assumption about how Mathematics is learned which is based on the "stimulus-response" theory. The "stimulus-response" theory states that learning occurs when a "bond" is established between a stimulus and a person's response to it. A researcher went further to say that, in the above scenario, drill becomes a major component in the instructional process because the more often a correct response is made to the stimulus, the more established the bond becomes [6]. Under this theory, teachers give students lengthy and often complex problems, particularly computations, with the belief that the exercises will strengthen the mind. Schools and teachers need to realize that great philosophers, psychologists, scientists, mathematicians, and many others created knowledge through investigation and experimentation. They understood cause and effect through curiosity and investigation. They were free to study nature and phenomenon, as they existed. Today, learning Mathematics suggests repeating operations that were already done by other people and examinations that seek to fulfil the same pattern [7].

Hence, in so far as the classroom assessment practices are concerned, the researcher wanted to contribute to empirical research in analyzing the classroom assessment by focusing on the thoughts, skills and practices of secondary school Mathematics teachers. Consequently, one can gain understanding into Mathematics teachers' view on assessment, especially inside the classroom. Also, one can identify the assessment practices used by secondary Mathematics teachers in improving their Mathematics teaching and look at the implications of Mathematics teachers' thoughts of classroom assessment and skills on their practices for students learning.

3. STATEMENT OF THE PROBLEM

The general problem of the study is: How can the classroom assessment perceptions, skills and practices of secondary school Mathematics teachers in Bulacan be analyzed?

Specifically, this study sought answers to the following questions:

1. How can the secondary school Mathematics teachers be analyzed in terms of their thoughts of classroom assessments?
2. What classroom assessment practices do secondary school Mathematics teachers in Bulacan currently utilize to improve the Mathematics teaching?
3. In what areas of classroom assessment do teachers believe they are most skilled?
4. Is there any significant relationship between the following variables of interest:
 - 4.1. thoughts and practices;
 - 4.2. thoughts and skills; and,
 - 4.3. practices and skills?
5. What are the implications of teachers' thoughts of classroom assessment on their classroom assessment practices; teachers' thoughts of classroom assessment on their classroom assessment skills; and the teachers' classroom assessment practices on their classroom assessment skills?

4. METHODOLOGY

A non-experimental descriptive research method including surveys and interviews was used to assess the classroom assessment thoughts, skills, and practices of secondary school mathematics teachers of Bulacan.

According to a scholar, descriptive research was used to describe the practices, skills and characteristics of a group of subjects [8].

The use of the descriptive survey method of research was particularly suitable in this study since it addressed the general and specific problems of the study, which revolved around the in-depth evaluation of the classroom assessment thought, skills, and practices of secondary school Mathematics teachers in Bulacan.

Five hundred twelve (512) public secondary Mathematics teachers in the Division of Bulacan composed the population of the study. They came from the four (4) districts of Bulacan: EDDIS I, II, III, and IV. The Mathematics teachers who served in these schools have different levels of teaching training. These teachers have a certificate in secondary education and specialized in Mathematics. Some of them have graduated from their masters' degree and some were currently

enrolled in their master's degree. The participants were teachers in Mathematics.

The Classroom Assessment Practices and Skills (CAPS) questionnaire was used as the data collection instrument. The questionnaire contained 66 closed-ended items and divided into three main sections. The first section was divided into two subsections. The first subsection asked the teachers' demographic information, their sex, age, educational background, teaching experience, years in teaching mathematics and assessment training received related to Mathematics within a year (6 items). The second subsection was based on the theoretical framework described in the literature on teacher's classroom assessment practices. The purpose of this section of the questionnaire was to document, using closed-ended items, the quality of the assessment training teachers received, the purpose of classroom assessment, their thoughts about test construction and grading practices. (17 items). A 5-point Likert Scale ranging from "Poor" to "Very Satisfactory" options was used to measure such thoughts.

The statistical treatments used in this study were frequency counts, percentages, means, Pearson r correlation analysis, and analysis of variance.

5. RESULTS AND DISCUSSIONS

Thoughts of Classroom Assessments of the Secondary School Mathematics Teachers

The respondents marked a "SATISFACTORY" level of classroom assessment in terms of thoughts. The overall and the individual mean scores recorded in the aforementioned table speak on this finding. One of the common thoughts is found in item no. 2 "the purpose of classroom assessments is to determine whether students have mastered the learning objectives", and this thought predictor got the highest mean score of 4.40, compared to the other fourteen indicators; though each of them got numerical rating which is verbally interpreted as "SATISFACTORY". Like what researchers mentioned that the teachers' thought of assessment is important in the sense that it provides an indication of how different forms of assessment are being used or misused and what could be done to improve the situation [9].

Classroom Assessment Practices of Secondary School Mathematics Teachers to Improve the Mathematics Teaching

The group recorded "very good" level of classroom assessment in all practice predictors, as shown by the individual computed mean scores ranging from 4.34 to 4.71. This finding is statistically supported by the computed overall mean score of 4.57. This conformed to a study in which assessment practices and students' characteristics are interacted significantly resulting to students' achievement goals [10]. A very good level of classroom assessment

practices is convincing and therefore there is need for teachers to sustain this for the facilitation of learning.

Assessment practices play an important role when technology is introduced in innovative mathematics and teaching projects. Observation and interviews with teachers showed that even when they used the activities designed for the course, and their classroom practices were in accordance with the philosophical and didactical frameworks of the projects, their assessment practices continued to be focused on traditional questions where the role of technology was not taken into account.

Most Skilled Areas of Classroom Assessment of Teachers

Teachers' use of distinct types of assessments is one aspect of the classroom assessment environment. For the most part, assessment methods can be classified as traditional or alternative based on the realism and complexity of the assessment tasks and the amount of time needed for the assessment. Traditional assessments such as multiple-choice, true-false, and matching type items are often lower in realism and complexities of the tasks assessed but require little time to administer and score [11]. Alternative assessments such as portfolios, observations, and other performance-based assessments are higher in both realism and complexity of the tasks assessed but requires more time to use and score than traditional assessment.

The individual computed mean scores ranging from 3.35 to 4.21, and the computed overall skills mean score is 3.97. This result shows how teachers are good in the classroom assessment skills. Based on the data presented in Table 11 reveals that only 1 skill (writing an essay question) out of 28 indicators is considered "somewhat skilled", and the rest are skilled in terms of level of classroom assessment skills. In a study, mentioned that there is a significant impact on the teaching strategies that the Grade II mathematics teachers proposed in the performance of the respondents. He also mentioned that this can be a compliment to the assessment skills of the teachers [12]. The results conformed to the study conducted that the competencies of the student on the different mathematical concepts were enhanced through using portfolio [13]. This can also be complemented to the classroom assessment skills of the teachers who think and use the different classroom assessment practices.

Correlations Between the Thoughts and Practices, Thoughts and Skills, and Practices and Skills

Table 1. Correlations Between the Thoughts and Practices, Thoughts and Skills, and Practices and Skills

| | R-VALUE | T-TEST | P-VALUE | INTERPRETATION |
|-----------------------|---------|--------|---------|--------------------------------------|
| THOUGHTS VS PRACTICES | 0.04 | 0.55 | 0.58 | there is no significant relationship |

| | | | | |
|---------------------|------|-------|------|--------------------------------------|
| THOUGHTS VS SKILLS | 0.66 | 10.92 | 0.00 | significant relationship |
| PRACTICES VS SKILLS | 0.02 | 0.27 | 0.79 | there is no significant relationship |

Table 1 shows that among the following variables of interest: a) thoughts and practices (p-value of 0.58); b) thoughts and skills (p-value of 0.00); c) practices and skills (p-value of 0.79), only thoughts and skills has significant relationship and both the thoughts and practices; practices and skills have no significant relationship (p-value of 0.79). This indicates that there is significant correlation between thoughts and skills. However, as seen in the table thoughts and practices, and practices and skills do not show any significant correlation.

In relation to this, a study pointed out that the teachers' thoughts of classroom assessment do not affect their assessment classroom practices [14]. Likewise, as seen in the table, thoughts and practices, and practices and skills do not show any significant correlation. However, a author on his own study about "Classroom Assessment Practices: A Survey of Botswana Primary and Secondary School Teachers", found out that the thoughts of the teachers about classroom assessment and identify classroom assessment practices teachers perceive to be skilled and those that they used most [15]. Botswana teachers held positive beliefs about mastery and performance orientations to student assessment. Teachers were unsure about adequacy of their assessment training but indicated that they needed further training in assessment. The results also showed that primary teachers, particularly those with only a certificate needed more skill training in assessment applications, statistical applications, and criterion referenced testing. The more experienced teachers were, the more they agreed with mastery and performance orientations, and the more they had perceived skill and use of desirable classroom assessment practices.

Implications of Teachers' Thoughts of Classroom Assessment on Their Classroom Assessment Practices; Teachers' Thoughts of Classroom Assessment on Their Classroom Assessment Skills; and Teachers' Classroom Assessment Skills on Their Classroom Assessment Practices

Teachers hold positive and mutual support for performance and mastery orientations for classroom assessment practices. The implications for these findings are not only important for school administrators but also essential for policy makers. Understanding their thoughts provides guides to teachers in adopting assessment practices. For example, if teachers thought that students' performance compared to others is important, such thinking could guide decisions for instructions for instance, teachers can be encouraged to adopt assessment methods that stimulate students' performance and have motivation to learn. Similarly, teachers' thoughts about

mastery could inform assessment practices, such as: choosing assessment tasks that are more challenging for students, choosing assessment methods that determine if students have mastered skills, and assigning remedial activities for students who have failed to master a set of skills.

For policy makers, having a clear understanding on the beliefs teachers have about classroom assessment practices is critical. Understanding the beliefs teachers hold, particularly about students' performance, can be used as a framework for identifying educational resources meant to help both schools and students to perform. For example, if teacher supports performance orientations, the Department of Education can work with teachers to devise national academic competitions that can enhance students' performance and motivation to learn. Similarly, if policy makers are aware of teachers' beliefs regarding mastery, they can help teachers to formulate assessment practices that promote critical thinking skills and content mastery.

In addition, although the current practices at school level do not favor classroom assessment, a well-managed classroom assessment could result in improvement of educational standards. Schools have stopped paying attention to aspects that could have helped them improve the standards of both learning and teaching such as classroom assessment and learning resources. However, the teachers always held misconceptions about classroom assessment. This was evident by their inconsistency in responding to related questions on classroom assessment and the mismatch between their thoughts of classroom assessment and classroom assessment practices. Generally, the teachers perceived assessment as testing. Good classroom practices existed at the schools, but there was no evidence that the good classroom practices were being shared. Thus, the focal point of this is that at the end of the classroom assessment the students really complied and responded accurately and suitably as the main evidences of learning.

6. CONCLUSIONS

The findings conclude that there are no significant relationships between teachers' thoughts of classroom assessments and practices, and classroom assessment practices and skills. However, there is significant relationship between teachers' thoughts of classroom assessments and skills.

7. RECOMMENDATIONS

In the light of the foregoing findings and conclusions, the following recommendations were offered:

Secondary mathematics teachers should adopt varied and innovative ways of assessing students' learning in mathematics. School administrators should ensure that all teachers with appropriate certificates must take more training courses in assessment to improve their skills and use of desirable classroom assessment practices. Teacher educators

should analyze content of assessment courses and work towards matching teachers' classroom assessment need with training. School administrators should develop a mentoring program to match new and experienced teachers to share reciprocal knowledge and skills on classroom assessment practices. Teacher educators in Bulacan should evaluate the current teacher training programs. They should overhaul their programs and consider offering a minimum of two assessment courses for pre-service teachers.

School administrators should work with other stakeholders and ensure that teachers are sent for in-service training or workshops in assessment on a regular basis to ascertain that they maintain current classroom assessment skills. They should see to it that mathematics teachers use varied assessment methods and techniques in order to come up with more reliable instructional decisions, such as placing, advancing, or retaining students at a particular level. This can be done by close instructional supervision of teachers.

Further research may focus on the relationship between mathematics teachers' assessment skills and thoughts, practices and skills, and thoughts and practices. Further studies also may focus on what assessment skills may facilitate improvement in assessment practices and/or what practices are pre-requisite to developing assessment skills.

REFERENCES

- [1] McMillan, J. M., Myran, S., & Workman, D. (2002). Elementary Teachers' Classroom Assessment and Grading Practices. *Journal of Educational research*, 95, pp. 203 – 213.
- [2] Stiggins, R.J. (2002). Where is our Assessment Future and How can we get there from here? In R.W. Lissitz and W.D. Schafer (Eds.). *Assessment in Educational Reform: Both Means and ends* (112 – 125). Boston: Allyn and Bacon.
- [3] National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston: Virginia.
- [4] Roberts, F. J. (2000). *Mathematics in the 21st Century Learners*. Unpublished Journal. New Time Agent. Open University Press.5.
- [5] Ampiah, J.G., Hart, K., Bkhata, B., & Nyirenda, D.M.C. (2003). *Teachers' Guide to Numeracy Assessment Instrument*. (DfID-Funded Research Project Report). Nottingham: University of Nottingham.
- [6] Van de Walle, J.A. (2001). *Elementary and Middle School Mathematics*. New York: Longman.
- [7] Cathcart, W.G., Pothier, Y.M., Vance, J.H., & Bezuk, N.S. (2001). *Learning Mathematics in Elementary and Middle Schools*. Columbus: Merrill Prentice Hall.
- [8] McMillan, J.H., & Schumacher, S.S. (2000). *Research in Education: A Conceptual Introduction*. New York: Longman.
- [9] Chester, C., & Quilter, S.M. (2000). In-service Teachers' Perceptions of Educational Assessment. *Journal for Research in Mathematics Education*, 33(2), 210 – 236.

[10] Alkharusi, H. (2008). *Effects of Classroom Assessment Practices on Students' Achievement Goals*. Educational Assessment. Taylor & francis Group, LLC.

[11] Gronlund, N.E. (2006). *Assessment of Students' Achievement*. (8th Ed.) Boston: Pearson.

[12] Dumalo, D.J.O. (2010). *Assessment of Teaching Strategies in Mathematics of Grade Two Teachers in Payatas A Elementary School*. Unpublished Master's Thesis. University of Rizal System, Rodriguez, Rizal.

[13] Borais, D.B. (2006). *Portfolio Assessment in Mathematics IV: An Analysis*. Unpublished Dissertation. Bicol University, Legaspi City.

[14] Chester, C., & Quilter, S.M. (2000). *In-service Teachers' Perceptions of Educational Assessment*. *Journal for Research in Mathematics Education*, 33(2), 210 – 236.

[15] Koloi-Keaikitse, S. (2012). *Classroom Assessment Practices: A Survey of Botswana's Primary and Secondary Shool Teachers*. Teachers College, Botswana, South Africa.