

The Practices of Filipino Teachers in Contextualizing Mathematics

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Abstract: *Contextualizing mathematics adheres to the twin goal of mathematics, problem solving and critical thinking. This approach creates more effective learning, and relates mathematical concepts to particular setting, situation or area of application. This investigation explored how elementary and secondary mathematics teachers did the contextualization process. A 34-item, 4-point Likert scale questionnaire, pilot tested to 53 teachers was used to elicit these practices. A sample of 334 was drawn from 2, 038 teachers of the two schools divisions in Southern Philippines. The Exploratory Factor Analysis (EFA), using varimax rotation and Principal Component Analysis, extracted five practices with sub-components determined by a coding process of Strauss and Corbin (1990). It surmised that in contextualizing mathematics: Surigaonon teachers used available resources like indigenous materials and curriculum packages, involved stakeholders within their reach, utilized technologies and models, conformed their approaches to the standards of curriculum, and employed integrative, collaborative and reflective strategies.*

Keywords: contextualization, localization, mathematics education, exploratory analysis, mathematics teaching

1. Introduction

As education evolves, the occurrence of contexts and realities has become the social concern which gains much attention to school leaders and practitioners (Karkkainen, 2012). Educators emphasize that the knowledge and skills the teachers impart to students must be in real life context.

Contextualization is the practice of systematically connecting basic skills instruction to a specific content area that is meaningful and useful to students. In contextualized instruction, the primary objective is to teach the basic skills of reading, writing, or mathematics in the context of specific subject area for the purpose of meaningful application (Perin, 2011). With this Wake (2012) stressed that contextualizing the curriculum is one aspect in whereby the demand of recent times can be addressed. Schools in localized condition can create a shared local identity and a sense of place (Nitta, et al, 2010).

Many teachers assumed that teaching mathematics content using contextualization would be easy to deliver. For instance, teaching simple integers in Grade 7 mathematics to students with little knowledge should be easy. This idea consumes time to change the beliefs and practices of teachers from the simple transmission of knowledge to the creation of lessons suitable for the students' reality – ability and environment which can include learning something and learning to do something (Maggi, 2010). These efforts are, in fact, the contextualization process that requires teachers to change their belief.

The problem arises on contextualization of mathematics concept in teaching arises when the students were not motivated to learn the math skills taught in developmental education courses since they did not perceived them to be directly connected to their personal educational goals. Many educators had difficulty on practicing teaching contextualization of Mathematics because of the notion

that the only way of contextualizing mathematics is by associating it with things that might arise within the student's real life situation.

There were some questions that need to be addressed to know the problem on how to contextualize mathematics teaching. With these problems, the researcher was prompted to know the practices and the factors that affect the performance of the teachers in contextualizing mathematics.

2. Framework of the Study

This study is anchored from Article XIV, Section 14 of the 1987 Philippine Constitution which gives emphasis on the importance of Localization and Contextualization of the curriculum. It states that "The State shall foster the preservation, enrichment, and dynamic evolution of a Filipino national culture based on the principle of unity in diversity in a climate of free artistic and intellectual expression" as a legal bases. In addition, Deped Order Section 10.2 (d) and (h) – Implementing Rules and Regulations for RA 10533 "The curriculum shall be contextualized and global;" "The curriculum shall be flexible enough to enable and allow schools to localize, indigenize, and enhance it based on their respective educational and social contexts." Therefore, contextualization is indeed an educational process of relating the curriculum to a particular setting, situation or area of application to make the competencies relevant, meaningful and useful to the learners. As to degree of contextualization, localization is a process of relating learning content specified in the curriculum to local information and materials from the learner's community, such as the use of Mother tongue.

The respondents' profile served as predictors; hence, the independent variables upon which teachers' practices in contextualizing mathematics are viewed at.

These variables are elaborated furthermore, either conceptually or operationally, for purposes of clarity and better understanding of the concepts and context of this investigation.

Age. This refers to the number of years in existence. It shows that most of the teachers ranging between 25 to 29 years old, can integrate contextualization in their lessons. The present study delved into knowing if elementary and high school mathematics teachers with ages different from the above mentioned are also contextualizing Math when teaching Mathematics.

Sex. This refers to the gender profile of the participants which was used to find out if there exists a difference in the way male and female teachers infuse values education and contextualize Mathematics teaching in elementary and in high school Mathematics subject.

Highest Educational Attainment. This refers to the educational background of the teachers. Specialized teachers do have a chance to understand the ethical and psychological principles that is intertwined in every teaching-learning process (APNIEVE, UNESCO 1993). This present undertaking would like to know whether the participants' needs of contextualizing mathematics teaching differ according to their level of educational attainment.

Field of Specialization. This refers to the new way of packaging educational experiences to achieve defined outcomes (Vidal, 2014).

Number of Years in Teaching Mathematics. This refers to the participants' experience in terms of the number of years in Mathematics teaching. It is said that experienced teachers are the best teachers because the time involved in teaching hones the teachers' skills and improves methods of imparting the knowledge.

Number of Seminars on Contextualization Attended. This refers to the frequency of seminars on contextualization that the teachers have attended. Teaching values education in class requires special teaching competence in addition to the normally acquired skill of a teacher. The teacher needs to recognize the significance and the crucial needs to attend formations, trainings and workshops which can give ample information on how to integrate value in teaching and how to contextualize it (APNIEVE, UNESCO 1993).

Type of School. This refers to the type of the educational institution a certain teacher is employed, either public or private.

This study explored the practices of the elementary and secondary Mathematics teachers in Surigao City and Surigao del Norte divisions. Specifically, it sought answers to the following questions:

1. What is the profile of the participants in terms of:
Age;
Sex;
Highest Educational Attainment;

Field of Specialization;

Number of years in teaching mathematics;

Number of seminars on contextualization attended; and
Type of School?

2 To what extent do teachers contextualize math?

3 Is there a significant difference in the practices of contextualizing Mathematics between teachers of Surigao City and Surigao del Norte Divisions?

4 Is there a significant relationship between the participants' profile and their practices in contextualizing Mathematics?

3. Literature

Mathematics teaching means to learn and to teach mathematics in a better way. It is the platform to do new research in the field of mathematics. According to Besto (2015) mathematics teaching address how cultural values can affect teaching, learning and curriculum, and how mathematics education can then affect the political and social dynamics of a culture. One of the stands taken by many educators is that, it is crucial to acknowledge the cultural context of mathematics of the students by teaching culturally.

In formal education, contextualized learning has various meaning depending on the particular setting in which learning occurs. As cited by Perm (2011) in the study of Ambrose (2013) the goal of contextualized teaching and learning is consistent with constructivism, which focuses on how individuals make meaning of their worlds. Contextualization aims to "create conditions for more effective learning (Perm, 2011) by acknowledging that learners bring meanings or constructs to all new learning experiences.

According to Leite (2013) curriculum contextualization is a way to bring teaching-learning closely to students' realities. It is a prerequisite in addressing the content and organization of activities to be undertaken in the classroom. By helping students to relate the educational tasks with their knowledge and everyday experiences, curricular contextualization facilitates the linking of theory and practice.

In the study of Kenea (2014), she examined the status of curriculum contextualization in primary school. The result indicated that effort at contextualizing the curriculum is terribly lacking. Though there is institutional concern over curriculum relevance, in practice, the attempt made to model the process through inclusion of elements of curriculum contextualization into teachers' performance assessment criteria and textbook evaluation guides is extremely lacking. Teachers' lack of know-how, poor administrative support, focus on regional examinations and shortage of resources are among the challenges identified to have curbed curriculum contextualization.

Meanwhile, according to the study of Fernandes, et al (2013), the concept of education has been evolving in order to include social concerns in the teaching and learning process (Kärkkäinen, 2012), bringing about more

attention to distinct contexts and realities in which schooling occurs.

In addition, Noguerra (2011), cited that the best practices are inherent part of curriculum that exemplifies the connection and relevance identified in educational research. She further said that best practices motivate, engage and prompt students to learn and achieve. In the study of Friedman (2006) as cited by Noguerra (2011), the best practices for teachers include teaching a balanced curriculum, teaching an integrated curriculum, differentiating instruction to meet individual student's needs and providing active learning opportunities for students to internalize learning. The current puts emphasis on how students and tend to probe students ideas about natural phenomena utilizing new resources such as ICT, video, computer and multimedia.

4. Method

This study used a descriptive survey research design involving field survey technique through the use of questionnaires. Such design is used if the study tries to obtain information concerning the current status of the phenomena, and to describe what exists with respect to the variables (University of Southern California Libraries, 2016). The design was deemed appropriate since this study delved into the practices of contextualization of teaching Mathematics among Elementary and Secondary teachers of Surigao City and Surigao del Norte Divisions.

The responses to the survey checklist containing indicators of contextualization in Mathematics were statistically treated to address the goals of this study. It also used Exploratory Factor Analysis to identify the key variables or key factors.

The participants of the study were the Elementary and Secondary Mathematics teachers of Surigao City and Surigao del Norte Division. Of the 2, 038 Surigaonon Mathematics teachers of the two divisions for the school year 2016-2017, 334 teachers were identified as respondents using the Slovin's formula. Stratified random sampling technique was used to give equal chance to the teachers to be identified.

The study utilized a researcher-made questionnaire to obtain the data needed for the study. The questionnaire contained two parts. Part I sought for the profile of the participants which included sex, age, highest educational attainment, years of experience in teaching Mathematics and number of relevant trainings attended. Part II sought

for the contextualized Mathematics teaching as practiced by the participants. It was submitted to the experts for content and format validations; after which it was administered personally by the researcher to the participants with the permission from participants-schools. To test the reliability of questionnaire, the researcher conducted a pilot test to the 53 Elementary and Secondary Mathematics teachers of Siargao Division and was subjected to reliability test using the Cronbach alpha correlation which yields a coefficient of 0.86, hence the test was highlyreliable.

The researcher asked permission from the Schools Division Superintendents of Surigao City and Surigao del Norte divisions to conduct a study. Upon the approval of the request, a letter was sent to the principals of elementary and secondary schools to allow the researcher to conduct the study in their respective schools. The researcher personally administered the questionnaire to the Mathematics teachers in different schools. Each participant was given enough time to answer the said questionnaire which was retrieved by the researcher himself. The data obtained from the survey were then tabulated, treated and analyzed using appropriate statistical tools.

Using Statistica version 7, the data were analyzed utilizing frequency count, percentage distribution, exploratory factor analysis, mean, standard deviation, t-test, pearson product moment correlation and chi-square.

5. Results

Attachments A contained the summary of the Practices of Contextualizing Mathematics like using available materials that support contextualization, Involving local stakeholders, Utilizing ICT, Conforming to curricular goals and Employing integrative teaching strategies.

In table 1 shows the mean differences in the practices on contextualizing Mathematics between the elementary and secondary teachers in Surigao City and Surigao del Norte divisions. Based on the data in Table, there is a significant difference in the practices on contextualizing Mathematics between the secondary Math teachers of Surigao del Norte and Surigao City division (p -value = 0.01). As reflected, the secondary Math teachers of Surigao del Norte division have practiced to a higher extent the contextualization of Mathematics than the secondary Math teachers in Surigao City division. According to Dash (2016) that there is a significant difference between the teachers of City and Province regarding their teaching effectiveness and approaches at secondary school level.

Table 1: Mean Difference in the Practices on Contextualizing Mathematics between the Elementary and Secondary Teachers in Surigao City and Surigao del Norte Divisions

Group	Mean	SD	Difference	T-value	Df p-value	Decision
Secondary	3.12	0.33				
Elementary	3.04	0.42	0.08	1.452	332 0.147	Accept Ho
Private	3.08	0.57				
Public	3.05	0.40	0.03	0.141	332 0.887	Accept Ho
Secondary Teachers of	3.18	0.30				
Surigao del Norte						
Secondary Teachers of Surigao City	2.94	0.37	0.24	2.711	68 0.008	Reject Ho
Elementary Teachers of	3.07	0.43				
Surigao del Norte						
Elementary Teachers of Surigao City	2.99	0.38	0.08	1.412	262 0.159	Accept Ho

On the other hand, there are no significant differences in the practices on contextualizing Mathematics between the secondary and elementary Math teachers (p -value= 0.15); private and public teachers (p -value=0.89), and elementary Math teachers of Surigao del Norte and elementary Math teachers of Surigao City (p -value=0.16). These results tell that whether the teachers are secondary or elementary; whether the schools are private or public, and whether the teachers are elementary Math teachers of Surigao City and Surigao del Norte, the practices in contextualizing Mathematics do not differ. In other words, they have the same practices. It further connotes that contextual Mathematics teaching was done by the teachers no matter which level, what type of school and what division they belong.

6. Discussion

Five important factors were extracted from the 34 item indicators, 9 of which were deleted due to having factor coefficients less than 0.60. The average mean of 3.00 is not that high which connotes that Surigaonon mathematics teachers do not extensively practice contextualized instruction. It was observed that only 25 significant loading were considered. The given Factor Matrix on the Practices of teachers in contextualizing Mathematics will be seen at Attachment B.

These are the practices in contextualizing Mathematics as perceived by the teachers in Surigao City and Surigao del Norte divisions.

Employing Integrative Teaching Approach. By employing this approach, math teachers provided instances for reflective learning and simulating real-life scenarios. It encourages students to project an imagined future or unfamiliar locations, and to work in teams as they make decisions. Considered the heart of mathematics instruction, teachers applied problem-based learning approach in bringing out the mathematics towards its real context.

Utilizing Available Materials that Support Contextualization. Teachers primarily employed the suggested activities provided on mathematics textbooks and reference materials, if not modified the activities in order to further bring math concept into the context very well known to learners. The teachers produced or designed

learning materials anent to the target competency for the lesson. Also, they localize mathematics concepts through citing local scenarios, and employing local data.

Utilizing ICT Tools. The teachers supplemented their instruction with varied forms of media tools. Some of them do video sharing which exposes the students to the real nature of math as an essential workplace tool or skill. Others offered their students with technology supported learning environments through certain ICT applications and the effective use of math learning technologies like calculators. It should be noted that “technology in education involves the use of digital or analog equipment (Plair, 2010). Computer-assisted instruction would lead to a more interactive Mathematics class. According to Khan (2011), the use of Information and Communication Technology (ICT) such as animation is of utmost importance, if teachers want their classes to be productive.

Conforming to Curricular Goals. The teachers were ensured that the materials containing activities for contextualized instruction that they used met the goals of mathematics curriculum. Also, these materials are reviewed and evaluated by educators in order to ensure their effectiveness and relevance. The goal of this practice is to support intended goals of the curriculum and to report said contextualization of the curriculum. Any decisions that a teacher does regarding teaching and learning should be in conformity with the goals stipulated in the curriculum.

Involving Local Stakeholders. At this context, teachers allowed community-based projects or immersions to neighboring farms, markets or workshops making math concepts more vivid and practical. They also designed tasks or projects which necessitate students to deal with the local community. The teachers also invited local experts during school-based symposia or even during in-class discussions as resource speakers to talk on certain local issues.

7. Conclusions

In the light of the findings, the following conclusions are derived:

1. The practices of contextualizing Mathematics between the elementary and secondary teachers, between teachers in public and private schools, and between elementary teachers of Surigao City and Surigao del Norte divisions are the same or are done similarly.
2. The teachers' age, sex, HEA, number of years in teaching Mathematics, number of seminars on contextualization attended, and field of specialization do not influence the practices of contextualizing Mathematics in their classes.
3. Teachers contextualize mathematics by using available resources such as indigenous materials in the locality and curriculum materials provided by DepEd and book companies; involving stakeholders within the reach of both teachers and students; utilizing math technologies like ICT, calculators, models; conforming their approaches to the goals and standards set by the curriculum; and employing strategies that are integrative, collaborative and reflective.

8. Recommendations

1. Teachers of Surigao City and Surigao del Norte divisions should frequent the contextualization of Mathematics in the class. Appropriate applications of mathematics to the real world should be highly emphasized such that students find mathematics relevant, necessary, and interesting.
2. The Department of Education in the divisions of Surigao City and Surigao del Norte should design functional development program for teachers, particularly those who are teaching Mathematics to hone teachers' skills in contextualizing Mathematics in their classes and in assessing cognitive and analytical skills of the learners.

The school administrators of the public schools both elementary and secondary schools of Surigao City and Surigao del Norte divisions should send their teachers to seminars on contextualization in Mathematics teaching and properly monitor the application of the contextualization learned.

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Author Profile

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Attachment A

Summary Table on the Practices of Contextualizing Mathematics

Practices	Elementary		VI	Secondary		VI	Overall	
	M	SD		M	SD		M	SDVI
Using available materials that support contextualization	3.19	0.59	P	3.21	0.58	P	3.20	0.58P
Involving local stakeholders	2.65	0.73	P	2.74	0.65	P	2.69	0.69P
Utilizing ICT	2.91	0.70	P	3.10	0.60	P	3.01	0.65P
Conforming to curricular goals	2.85	0.73	P	2.87	0.54	P	2.86	0.63P
Employing integrative teaching strategies	3.19	0.61	P	3.27	0.56	P	3.24	0.56P
Overall Average	2.96	0.67	P	3.04	0.59	P	3.00	0.62P

Legend: Scale Parameter Verbal Interpretation (VI)

- 4 3.51-4.00 Highly Practiced
- 3 2.51-3.50 Practiced
- 2 1.51-2.50 Rarely Practiced
- 1 1.00-1.50 Not Practiced

Attachment B

Factor Matrix on the Practices of teachers in contextualizing Mathematics

Practices	Using Available Materials that support contextualization	Involving Local Stakeholders	Utilizing ICT	Conforming to Curricular Goals	Employing integrative teaching strategies
Materials supporting intended goals of curriculum contextualization are available.				0.8347	
Reporting on curriculum contextualization at the school level are done and available.				0.8281	
Utilizing activities suggested in math textbooks.	0.5972				
Producing their own teaching materials that would contextualize math concepts.	0.6427				
Producing teaching materials by modifying the suggested activities in math textbooks.	0.6238				
Relating available learning materials to intended competency during in-class discussions	0.6092				
Providing instances of localizing math approaches through asking probing questions or citing examples or illustrations.	0.6693				
Enabling to localize math through the use of indigenous materials.	0.6217				
Involving the utilization of local resources or local information.	0.6024				
Visiting neighboring farms, markets, or workshops to allow my math lessons to become more vivid.		0.5718			
Inviting local community elders or leaders to my classroom so that they talk to the class on some local issues.		0.8155			
Inviting experts in the locality (e.g., agriculture experts) to my classroom so that they share to my students on practical matters.		0.8399			
Giving projects or tasks which my students can complete by going out to the community (e.g., by asking community members)		0.6025			
Using local examples to make math lesson more understandable.					0.5723
Creating math materials (other than those suggested in the textbook) to use them in class and other in-campus math activities.					0.5885
Challenging my students to relate what they learned in math subject to their real life experiences.					0.7236
Presenting math concepts in real-life (outside the classroom) situations and experiences that are familiar to students.					0.7260
Providing the students with exercises that include various real, believable problem-solving situations that students can recognize its importance to current or possible future living.					0.7369
Encouraging students to apply concepts and information in useful contexts, projecting them the imagined future (e.g., possible careers) and unfamiliar locations (e.g., workplaces).					0.7414
Encouraging my students to participate regularly in groups where sharing, communicating, and responding to the important concepts and decision making occur.					0.7876
Introducing concepts by citing real-life scenarios or workplace by drawing on students' past experiences.					0.7680
Encouraging students to simulate or apply the concepts presented in the text or make discoveries either individually or in groups.					0.7396
Providing real-world applied problems in an interesting and relevant way of translating mathematics from an abstract, theoretical approach into concrete, applied approach through measurement, data collection, and real-					0.6336

world simulation.					
Sharing videos that bring the workplace into the classroom and demonstrate the importance of mathematics as an essential workplace skill			0.7690		
Ensuring technology integration in math teaching such as the effective use of graphing calculators and computers.			0.7963		
Supplementing the lesson with additional assessments and practice problems, reteaching activities, and project-based learning ideas or activities.			0.5858		
Offering students to experience innovative technology-supported learning environments in mathematics particularly in ICT applications			0.7410		