



ENHANCING STUDENT'S HIGHER ORDER THINKING SKILLS THROUGH CONTEXTUALIZATION OF A SOCIOCULTURAL MATHEMATICS TEACHING

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ABSTRACT

Promoting contextualization in Mathematics teaching has been the advocacy of the Department of Education (DepEd) in the hope of enhancing students' learning. Another important emphasis in the current setting is placed on the socio-cultural aspect of Mathematics education in the country. In this study, a socio-cultural Mathematics classroom adopted contextualization to enhance the higher order thinking skills of the students in a public Secondary High School in the province of Laguna. Moreover, it utilized a descriptive design but experimental in nature involving 112 Grade 8 students. Through data investigation and using Sample Paired T- Test and Pearson- Product Moment findings revealed that contextualization in a socio-cultural classroom has produced positive effects on the students' higher order thinking skills since the performance of Grade 8 students as to their analyzing, evaluating, and creating skills significantly improved. Furthermore, contextualizing a sociocultural classroom by using everyday life scenario in connecting Mathematics to the real world and presenting the lesson with a contextual problem motivate students, challenge them to apply Mathematical reasoning to different circumstances, and deliberately involve them in higher order thinking.

Keywords: contextualization, sociocultural, Higher order thinking skills, Classroom methodology, assessment, Contextual problem

INTRODUCTION

The Department of Education Culture of sports via Executive Order No. 117 declares that the education system shall make the maximum contribution to the achievement of national development goals; that the State should facilitate and preserve equal access and benefit from education for all citizens; and in order to enrich their participation in community and national life and to unify all Filipinos into a free and just society, the state will use education as an instrument for the growth of the cultural communities of the nation and of the deprived communities.

The Educational system today is aligned to the Standard Principle R.A. No. 10533 known

as the "Enhanced Basic Education Act 2013" which states that:

"The curriculum shall be culture-sensitive; The curriculum Shall be contextualized and global: the curriculum shall use pedagogical approaches that are constructivist, inquiry based, reflective, collaborative and integrative: The Multilingual Education (MTB-MLE) which starts from where the learners are and from what they already knew proceeding from the known to the unknown."



Recent developments in Mathematics education seek change from the traditional exposition and practice methodology to reform methods by connecting Mathematics to the real world that may help students develop critical thinking and problem-solving skills (NCCA, 2012).

In the Division of Laguna, Public schools are encouraged to follow a curriculum according to their local circumstance, and the material and teaching strategies must be connected to their local climate. The instructions delivered by the teacher have the purpose of providing learning opportunities to meet the learners' needs, interests and abilities.

The researcher's experience as a Mathematics teacher for ten years used to deal with students' questions such as "Why do I need to know this?" or "When am I going to use this?" or "Will this be on the test?" Contextualization in mathematics teaching refers to placing the target mathematical concept in a realistic setting to make the learning process meaningful to the students. Students who study in a contextual setting are exposed to the importance of the learning material, which proportionately increases motivation.

According to Orpwood et al., (2010) the term "contextualization" may include one or more of the following components: interdisciplinary learning, use of students' informal out of school knowledge, teacher collaboration to distinguish real world examples, student collaboration and active student-centered learning

Prior knowledge, encouraging conceptual change, and fostering metacognition are the three principles that support the use of contextualization of content. It has been observed that instructions with contextualized content can activate learners' prior knowledge and facilitate more efficient problem solving. Encouraging conceptual change can be improved in interactive classroom engagement activities that inspire students with the importance of a concept. Contextualizing content also allows students to reflect on their learning by connecting ideas from a familiar concrete context to an abstract

concept, allowing them to identify their own personal connection to these concepts (Kraus et al 2016).

While contextualization in teaching Mathematics has been implemented in many school districts in the Division of Laguna, more research needs to be done to determine if this model of instruction provide a beneficial effect for students.

Thus, the researchers wanted to determine the effectiveness of contextualization of sociocultural Mathematics teaching in improving the performance of Grade 8 students in Alaminos Integrated National High School. The researchers found out that there is a need to measure the effectiveness of the strategies used by the teachers in teaching as part of the students' performance.

OBJECTIVES OF THE STUDY

This study determined the relationship between contextualized instruction and performance of the Grade 8 Mathematics Students in Alaminos Integrated National High School. Specifically, it sought to 1) describe the level of contextualization of the socio-cultural teaching of Mathematics 8 in terms of classroom methodology; assessment; and identity change; 2) determine the mean of pre-test and post-test scores of the Grade 8 students in their higher order thinking skills terms of: analyzing, evaluating, and creating; 3) determine whether significant difference exists between the pre-test and post-test scores of the respondents; and 4) determine if there is a significant relationship between the level of contextualization of a socio-cultural teaching and the students' higher order thinking skills after the treatment.

METHODOLOGY

This study adopted a descriptive design that attempted to describe and analyze the effectiveness of contextualization of a socio-cultural Mathematics teaching on the student's higher order thinking skills. Through collection



of numeric data, it will answer the extent of contextualization of the socio-cultural Mathematics teaching (Sevilla et al, 2002).

This is also a pre-experimental research, specifically single pre-test and post-test design method of research which involves three steps: administering pre-test, applying the experimental treatment to the subject, and administering a post-test. Differences attributed to the application of the experimental treatment are then measured by comparing the pre-test and posttest scores. After the orientation, the researchers administered the pre-test to get the level of performance of Grade 8 students, then executed the lesson plan that uses socio-cultural contextualization as a strategy in teaching mathematics. After the last topic of the said quarter, the post-test was personally administered and retrieved by the researcher to get the level of performance of the students. After that, the researchers and other experts validated the scores of the students. The statistical procedure, analysis, and interpretation of data was done.

The researchers constructed lesson plan, pre-test and post-test and the questionnaire that were used to determine the extent of contextualization of teaching grade 8 mathematics. The instruments underwent content and language validation. Both lesson logs, and teacher made pre-test and post-test were validated by the two English Teachers, three Grade 8 Mathematics Teachers, and 2 Master teachers of Alaminos Integrated National High School. The corrected research instruments were used by the researchers. The respondents of this study are the 112 selected Grade 8 students at Alaminos Integrated National High School. These came from the three (3) heterogeneous sections of Grade 8. Cluster sampling was used to determine the sections of the students who participated in this study. The mean and standard deviation to describe the extent of contextualization of the socio-cultural Mathematics teaching, paired-sample t-test was used to determine the significant difference between the pre- and post-test scores of the respondents and the Pearson correlation to determine whether the extent of

contextualization of the socio-cultural teaching significantly relate to the students' higher order thinking skills.

RESULTS AND DISCUSSION

1. Contextualization of the socio-cultural mathematics teaching

In terms of classroom methodology, the findings of the study showed that the respondents strongly agreed that the teacher stimulated their interest in Mathematics ($\bar{x} = 4.79, SD = .45$). This is a manifestation that contextualized instructions in a sociocultural classroom can capture students' attention by connecting experiences into the mathematical concept. This supported the statement of Kraus et al (2016) that contextualization in interactive classroom engagement activities motivates and can improve learning. On the other hand, respondents moderately agreed that the classroom methodology of a contextualized socio-cultural mathematics teaching allowed the students to compare their performance with others ($\bar{x} = 2.9, SD = 1.4$). Finally, findings also revealed the overall mean for student's perception on classroom methodology is ($M=4.33, SD=0.43$). The students' strong agreement on the indicators implied that there is a very high level of contextualization in the socio-cultural Mathematics teaching in terms of classroom methodology.

In terms of assessment, there were indicators that students responded "strongly agree". These were indicator 3, stating that "My teacher explained how each assessment is to be used"; indicator 4, expressing that "I was asked to apply my learning to real-life situation."; indicator 5 reflecting that "My assessment task was useful for everyday life" and last is indicator 7 saying that "My teacher had explained to me how each type of assessment is to be used. The findings also show that students agreed that they were given advanced information of the things they will be assessed, and they can complete the tasks that were given to them ($M=3.8, SD=0.9$). Most of the students agreed that there is a high level of



contextualization in the sociocultural classroom in terms of assessment, with an overall mean of 4.21. Based on the result, the respondents strongly agreed that their assessment in class tests included what they understood ($\bar{x}=4.51$, SD 0.63).

Lastly, findings revealed the perceptions of the respondents regarding contextualization of a sociocultural Mathematics teaching as to identity change. The respondents strongly agreed that they developed new skills and knowledge from other members in their group. They strongly believed that the lesson in probability helped them develop new skills and knowledge from the other members of the group ($M=4.54$, $SD=0.67$). However, most of these respondents only agreed that after learning lessons in Probability in a contextualized socio-cultural teaching they were able to relate their learning to other fields or disciplines ($M=3.95$, $SD=1.05$). The data gathered also revealed the overall mean of 4.24 and a verbal interpretation of Strongly Agree that there is an expectancy of success of students' belief that they would benefit very high from contextualization. This further verifies the findings of Tinong R., (2018) which state that if students were put in an actual learning environment letting them collaborate with other to manipulate, relate, and adapt to various learning opportunities and resources available within the locality or community, profound learning will be assured and realized. It helps students comprehend concepts by relating lesson on the context of prevailing local environment, culture, and resources. Hence, lessons are becoming more real-life, customized, and appropriate.

2. Pretest and Posttest Scores in the Higher Order Thinking Skills of the Respondents

Table 4 is the frequency distributions of the pretest and posttest score of the students in terms of analyzing. This result suggests that students' higher order thinking skills before contextualizing the mathematics teaching in terms of analyzing is from unsatisfactory to fairly satisfactory.

Table 1
Performance in the Pretest and Posttest of Higher Order Thinking Skills in terms of Analyze

Score	Pretest		Posttest		Remarks
	f	%	f	%	
93 and above	-	-	13	11	Outstanding
88 – 92	-	-	50	45	Very satisfactory
80 – 87	5	5	41	37	Satisfactory
72 – 79	54	48	8	7	Fairly satisfactory
71 and below	53	47	-	-	Unsatisfactory

Furthermore, it showed that most of the students failed to visualize and examine information in solving the mathematical problem. After exposing students in a contextualized approach, majority of the students are from satisfactory to very satisfactory performance. Thus, their post test result highlights that there is a marked improvement in their analytical skills in terms of illustrating the experimental and theoretical probability and solving problems involving simple probability.

Table 2
Performance in the Pretest and Posttest of Higher Order Thinking Skills in terms of Evaluate

Score	Pretest		Posttest		Remarks
	f	%	f	%	
93 and above	-	-	15	13	Outstanding
88 – 92	1	1	26	23	Very satisfactory
80 – 87	17	15	58	52	Satisfactory
72 – 79	55	49	12	1	Fairly satisfactory
71 and below	39	35	1	1	Unsatisfactory

Table 5 showed the pretest and posttest result of the respondents in terms of evaluating. It can be gleaned from the table that majority of the respondent's performance ranged from unsatisfactory to fairly satisfactory. This result only showed that students have limited idea of the probability of simple events and theoretical and experimental probability. Although the prior knowledge can give them insights into the



answer to the test, this knowledge seems not enough to obtain a high result. The table also revealed that after the experimentation, the performance of most of the students ranged

from satisfactory to outstanding. This result implies that most of the students were able to check, critique and make a judgement based on the given criteria or standards.

Table 3
Performance in the Pretest and Posttest of Higher Order Thinking Skills in terms of Evaluate

Score	Pretest		Posttest		Remarks
	f	%	f	%	
93 and above	-		15	13	Outstanding
88 – 92	1	1	26	23	Very satisfactory
80 – 87	17	15	58	52	Satisfactory
72 – 79	55	49	12	1	Fairly satisfactory
71 and below	39	35	1	1	Unsatisfactory

Table 6 is the frequency distributions of the pretest and posttest score of students in terms of create. In the pretest assessment, the students were asked to solve a problem that required them to create a tree diagram on the total number of choices of the plan trips from Alaminos to Baguio. It shows that students have a fairly satisfactory and unsatisfactory performance. On the other hand, it can be seen that after the lesson was taken by the students,

most of the students in the class got a score of 88-92 which was interpreted as very satisfactory, and 26 students got an outstanding performance. This result implies that after applying contextualization in a socio-cultural classroom, most of the students used an appropriate strategy with an incomplete solution but arrived with the correct answer. Some of these students were able to give the correct diagram for the possible

3. Test of Significant Difference Between Pretest and Posttest Scores

Table 4
Test of Significant Difference Between Pretest and Posttest of Higher Order Thinking Skills

Higher Order Thinking Skills	Pretest		Posttest		Mean Diff	SD	95% CID		T	df	Sig. (2-tailed)
	M	SD	M	SD			Lower	Upper			
Analyze	69.68	5.03	86.71	6.13	-17.04	7.47	-18.44	-15.64	-24.123	111	.000
Evaluate	72.18	5.96	85.18	7.22	-13.00	8.12	-14.52	-11.48	-16.951	111	.000
Create	65.43	2.33	88.61	6.90	-23.18	6.77	-24.45	-21.91	-36.216	111	.000

Table 7 revealed that there is a significant difference between the pretest and posttest performance of the students in their higher order thinking skills in terms of analyzing, evaluating and creating. This significant difference implies that contextualizing a socio-cultural classroom, i.e. by using everyday life scenario in connecting Mathematics to real world is effective in enhancing higher order thinking skills. Specifically, presenting the lesson with a contextual problem motivate and

challenge the learners to apply mathematical reasoning to different contexts and deliberately involve them in higher order thinking. In turn, in a socio-cultural classroom, contextualization has created positive effects on the higher order thought abilities of the students. This result found support from the study of Samo et al. (2017) where presentation of contextual problems can be viewed to local cultural sense that encourages students to learn Mathematics



in real context which promotes the enhancement of higher order thinking skills.

Furthermore, the result is a confirmation of the findings of Garrison and Akyol (2013) which states that collaboration and critical dialogue are strengthened and maintained when social presence is established. The establishment of social presence also represents positive outcomes of learning, enhanced satisfaction, and increased retention. Integrating socio-cultural traditions into learning design spontaneously introduces the previous awareness, association and cultural experience of a learner into the learning process and enculturates the learner through specific behaviors and interactions into the new culture of practice.

4. Test of Significant Relationship Between Level of Contextualization of Socio-cultural and The Higher Order Thinking Skills

Table 5
Test of Significant Relationship Between Perceived Contextualization of Socio-cultural teaching and Level of Higher Order Thinking Skills

Level of Contextualization of Socio-cultural teaching	Higher Order Thinking Skills		
	Analyze	Evaluate	Create
Classroom methodology	.126	.180	.298**
Assessment	.233*	.227*	.180
Identity change	.275**	.229*	.250**

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

It is gleaned from the table that the level of contextualization of a socio-cultural classroom methodology is positively and significantly related to the higher thinking skills specifically creating. This implies that as the level of contextualization occur in a socio-cultural classroom gets higher, their creative skills also get higher. Green et. al (2016) found that the epistemological beliefs is associated with students' cognitive processes which in this

study may refer to the higher order thinking skills.

The table also displays that the assessment in a sociocultural classroom is significantly related to the students analyzing and evaluating skills. This result is attributed to the application of the contextualization strategy employed by the teacher. In a contextualized approach, students are exposed with different group activities, solved contextual problems, explored ideas through hands-on experience, and created explanation for their output. Guidance from the teacher helped students to examined and synthesized their ideas, built models and clarified concepts. Additionally, using contextualized approach in a sociocultural classroom, enable students to assess what they have learned and how they have learned it. This mode of teaching consequently improved the analyzing and evaluating skills of the learners.

This is aligned with the transferring characteristics of contextual assessment that explains that this assessment will enable the learners to transform the concepts of knowledge they learn in the classroom into a new context (Widana, 2017). Processing information is achieved by involving students in activities in the sense of familiar content that include sorting, evaluating, and understanding new information.

Moreover, it can be seen from the table that there is a significant relationship between higher thinking skills and identity change. This finding suggests that in a socio-cultural learning environment, contextualized teaching enables students to consciously build new knowledge in more practical and interactive ways. They are no longer a passive receiver of knowledge rather they explore on their prior knowledge and experiences, looking to one another for knowledge, and discover information for themselves. This approach also involves considerable personal change. Their confidence increases and they become more independent learners.

Thus, in a sociocultural learning environment, students working collaboratively with others can perform at higher intellectual level. This result found support from the findings of (Penuel and Wertsch, n.d.) which state that



“student’s enjoyment of the social context of learning, their difficulty in adapting to group work soon faded. Working independently too, they learned new skills such as compiling articles, surveying, testing hypotheses, accessing, deciphering and presenting information, etc. A satisfying sense of self-worth developed through collective knowledge-building and respecting each other’s views”. Their confidence grew as the teacher respected their efforts and as they learned to challenge others’ beliefs. By handling similar classroom assignments and offering their own curriculum feedback, they developed a sense of responsibility for their own learning. It was clear to us that the students were distant from conventional classroom experience, the students formed a group of learners.

CONCLUSIONS

This study was designed to determine whether contextualization of a socio-cultural teaching of mathematics may enhance the higher order thinking skills of the students. The study yielded the following findings.

1. There is a high level of contextualization of classroom methodology, assessment, and identity change as components of socio-cultural Mathematics teaching.
2. During the pre-test, students’ scores as to analyze and create are 69.68, and 65.43 respectively, which are interpreted as unsatisfactory. While students score as to evaluate is 72.18 which is interpreted as fairly satisfactory.
3. The respondents’ post test score as to analyze and evaluate after experimentation are 86.71, and 85.18 respectively which are interpreted as satisfactory, on the other hand students’ creative skills is 88.61 which fell under very satisfactory level.
4. There is a significant difference between the scores in the pre-test and post-test of the respondents in terms of analyzing, evaluating, and creating, thus the use of contextualization is effective.

5. There is a significant relationship between Contextualization of a sociocultural Mathematics teaching and performance of Grade 8 students as to their analyzing, evaluating, and creating skills.

RECOMMENDATION

Based on the conclusions formulated from the findings, the following recommendations are given.

1. Other teachers may consider this as a basis for adjustment in their lesson as well as in teaching methods employed in the conduct of Mathematics instruction.
2. School administration may support the teacher to attend seminars or training related to contextualization instruction.
3. Other skills like critical thinking skills and problem-solving skills may be considered.
4. Future researchers may conduct similar study using standardized rubrics.
5. Since the study was conducted only in Grade 8, other Grade levels may also be considered for the implementation.
6. Since the study made use of contextualization in a sociocultural classroom, development of modules using contextualized instruction may be considered.

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