

## **THE USE OF MODULES INTEGRATING CULTURE IN TEACHING GEOMETRY**

**Florence T. Caceres**

Faculty Member, University of Eastern Philippines, Catarman, Northern Samar, Philippines  
Email: [florencecaceres@gmail.com](mailto:florencecaceres@gmail.com)

### **Abstract**

Mathematics is an integral part of many disciplines including culture. Society's rich culture could serve as an avenue of learning mathematics concepts. This descriptive-analytical and experimental study looked into the possible influence of culture integration in mathematics learning. Specifically, it determined the significant difference between the performance in mathematics of students taught using the conventional approach to the students taught using module with integration of culture and to find out how the learning materials enhance student's level of cultural awareness and appreciation. The study was conducted at Mondragon Agro-Industrial High School, Mondragon, Northern Samar involving four sections of grade seven students. Comparability among this group of respondents was established using their first quarter math grade. Mean, standard deviation, t-test for paired and independent samples was used as statistical tools in the analysis and interpretation of data. The learner's module increased respondents' awareness and appreciation of the Northern Samar culture. Likewise, students who were exposed to the use of module with culture integration show statistically significant and higher increase of scores in the posttest activities compared to other group of students. Thus, the use of module with culture integration is an effective approach in teaching mathematics concepts.

**Keywords:** culture, integration, context, module, mathematics, geometry

## 1. INTRODUCTION

Knowledge of mathematics is one measure of intellectual life needed to be active participants and purposeful interpreters of this change to be and feel empowered. Despite the countless usefulness and importance of mathematics, it is still considered a Waterloo of most students in school. Unfortunately, not all students appreciate its usefulness. For many, math is merely symbols or abstract ideas that they should know. The negative perception and attitude towards the subject seems being passed from generation to generation. Many students and even adults regard mathematics as an activity or subject in which only “gifted” individuals can engage. Others think of mathematics as a strictly computational activity. They cannot see that through mathematics, the highest form of cognitive skills - analysis, evaluation and synthesis - are formed and developed.

Participation of the Philippines in the Third International Mathematics and Science Study (TIMSS) consistently manifest a poor mathematics performance of the country. The 2007, TIMSS participated by fourth and eighth grade students whose scores, 358 and 378 respectively, are scores below than TIMSS Scale Average of 500 (TIMSS Advanced 2008 International Report). The table presented below shows the comparative scores in TIMSS 2007 and TIMSS Advanced 2008 of the different countries. Likewise, TIMSS Advanced 2008 gave the Philippine math education and educators a global warning of how far the Filipinos in terms of numerical literacy compared to other countries. The Philippines scores 355, significantly lower from TIMSS Scale Average of 500 (TIMSS Advanced 2008 International Report), the lowest score on the list. What is more alarming in this recent result is that, students enrolled in special science school program of the country are its participants. The result indicates a scenario that math education in the country is undependable.

Researchers keep on investigating what really hinders students' performance in mathematics and even on other fields. One undeniable factor, especially for the case of Filipino learners, mathematics is taught in a context unfamiliar to them. The lesson presented to the students, like the different examples in text are based on situations not interesting to them, thus negative attitude towards mathematics is developed (Baba, 2007). Problems in mathematics learning is attributed to the poor school policies and curricula plus teaching practices that is not learner-centered. Ukpokodu (2011) pointed out that practices in school continuously neglect the student's rich cultural background that will help them in their mathematical journey. For so long, mathematics discussion is still done through traditional approach. For students to appreciate the importance and usefulness of mathematics, teachers should show the bridge of the relationship of mathematics they learn in school and the mathematics outside the classroom. For learning to be more meaningful, it must be connected or anchored on something that the learner knows. It means teaching to and through the strengths of the students (Whiteford, 2009).

With the implementation of the K to 12 Curriculum, the challenge is again given to all teachers who are in the frontline of these reforms. The use of a local context or culture-based lesson is given value in the recent curriculum and since mathematics is an integral part of many other disciplines, the researcher tested the effectiveness of a learner's module that integrates mathematics and culture. In this study, the rich culture of Northern Samar will be used as context in teaching mathematics lessons for grade seven students. This teaching scenario is believed to influence the teaching of mathematics. This study looked into the possible influence of culture integration in mathematics learning. Specifically, it determined

the significant difference between the performance in mathematics of students taught using the conventional approach to the students taught using module with integration of culture and to find out how the learning materials enhance student's level of cultural awareness and appreciation.

## 2. THEORETICAL FRAMEWORK

This study is anchored on *Thorndike's Connectionism* learning theory which explains that learning is the result of associations forming between stimuli and responses. The associations is strengthened or weakened by the nature of frequency of the stimuli-response pairings. In this study, the module that integrates culture in mathematics lesson serves as stimulus in the learning situation which is expected to enhance the cultural awareness and appreciation and concept attainment in mathematics of the respondents, as response. Since the situation will make use of culture familiar to them, learning is expected to occur and they will come to see the relevance of mathematics.

Another theory that supports this study is the *Gestalt theory* of Wertheimer, Kohler and Koffka that conclude that learning takes place if the learners are active and not passive. It means that learners do not just collect information as is but they actively process and restructure information to understand it. This theory supports the present study because the use of module will make the learners active as it follows their own pace. Likewise, the integration of culture in the module as context in mathematics will show to the learners the relationship of this field in other areas of learning.

Another theory that supports this study is *Ausubel's Subsumption Theory*, in which he claims that learning takes place if new knowledge is subsumed (anchored) into learner's cognitive structure. A stable cognitive structure serves as foundation into learning new things related to previous concepts (Schunk, 2012). Through the module used in this study, making use of familiar situations or existing knowledge - the culture, integrated or subsumed in the new knowledge – mathematics concept, learning derive will be more meaningful and relevant to the learners.

## 3. METHODOLOGY

The study was conducted in Northern Samar, a province in Eastern Visayas region of the Philippines. Specifically, the study was conducted at Mondragon Agro-Industrial High School (MAIHS), Mondragon Northern Samar. Students classified as Grade 7 for the school year 2014-2015 served as the respondents of the study. Comparability of the respondents was established based on their academic performance in mathematics.

The study employed a quasi-experimental research design. Complete enumeration of the student-respondents coming from four sections was considered in this study. Academic performance in mathematics using their grades in the first grading period were subjected to statistical analysis to establish that the respondents are indeed comparable. Aside from the modules integrating culture used in the study, the subjects were made to answer a Cultural Awareness and Appreciation Survey. This twenty (20)-item instrument consists of statements that measures respondent's knowledge on some facts about Northern Samar and their agreement or disagreement in manifesting some cultural characteristics distinct to Northern Samareño. Specifically, two sections served as experimental groups and were exposed to the

module integrating culture for a period of fifteen class sessions. The other two sections or the control groups on the other hand, follow the usual discussion and they make use of the activities presented in the teacher's module provided by Department of Education prior to the K to12 curriculum. The activities and the lesson presentations found in this material do not use culture as a context in mathematics.

To identify the influence of culture integration in mathematics teaching through the learners' module, scores of the respondents in the pretest and posttest activities included in every lesson were subjected to statistical comparison and analysis. Interview or focus group discussion was also conducted to selected respondents of the experimental groups to gather their insights as to the integration of culture and mathematics. This was conducted after the last class session of using the module. The last part of the experiment measured again the respondents' cultural awareness and appreciation using the same instrument given to them before the start of the experiment. The results were used to identify if the module enhanced the extent of awareness and appreciation of students regarding culture of Northern Samar.

Mean was computed to identify the extent of cultural awareness and appreciation of the respondents regarding Northern Samar while the standard deviation determined the dispersion of the respondents' extent of cultural awareness and appreciation about Northern Samar. To find out the significant difference on the performance in Mathematics between groups, the t-test for independent samples was applied. On the other hand, paired t-test was employed to identify the significant difference of the pretest and posttest results together with the extent of cultural awareness and appreciation within the group of the respondents. The data were submitted to Management and Information Section (MIS) for data processing using Statistical Package for Social Sciences version 21 (SPSS 21).

#### **4. REVIEW OF LITERATURE**

##### *4.1 Culture as a Context in Mathematics Education*

Learning is believed to occur faster and more thoroughly when it is presented in meaningful contexts. It is meaningful in the sense that it is an event rooted in a more cultural background, cognitive and personal knowledge of the learner. Culturally responsive teaching uses students' cultural knowledge as *conduit* to facilitate teaching-learning process (Ukpokodu, 2011). It is the idea of bringing students within the context of the culture of their society as they learn other important concepts or ideas around them. Ukpokodu (2011) believed that when a classroom environment fails to present the connection of mathematics to student's cultural background or identity, it hinders student's chances to be mathematically competent.

The United Nations Educational Scientific and Cultural Organization (UNESCO) supports the dictum of integrating culture as context and part of mathematics education. The report emphasized that quality education should enable pupils to form appropriate image of mathematics. Students must understand that the mathematics taught to them in school is part of culture and history. UNESCO considered learning mathematics entails access to cultural heritage.

Whiteford (2009) suggested ways to come up with a culturally responsive mathematics classroom, (1) get to know students' "first" mathematics, (2) get to know students' mathematical procedures, (3) get to know students' cultural math, (4) get to know

how students were taught math, and (5) get to know students' mathematical understanding. In his article, he emphasized the importance of respecting students' first language and culture for those are part of their characteristics as they enter the classroom but validation is necessary to find out the underdeveloped mathematical skills for students' best interest.

Ng and Rao (2010) stress that language and culture are interrelated, thus its influence on mathematics performance is difficult to untie. Further, they emphasized the need to develop instructional methods that are based on cultural characteristics that help children learn effectively. While Johnson (2011) discussed that culturally relevant pedagogy in science guides instruction and narrow learning gaps by making students more competent, successful and critical thinkers. Teachers should use variety of strategies that will open a greater venue for learning. This can only be done if concepts are presented with a strong tie to the real world. Chitera (2011) added that mathematics classroom all over the world faces different culture and languages.

Wager (2012) pointed out that mathematics covers a wide horizon that can be used and linked to out-of-school activities. When this is adopted learning will provide more meaning. In unison, Ivanovic (2012) stress for mathematics education to improve teachers must give importance and used students interest connected to their everyday activities as learning background. She added this practice will really work out and possible if preparation starts from the curriculum and the teacher education programs.

The idea of using culture as context is also part of the new curriculum of the country. In the fifteenth congress third regular session in Manila, last July 2012, the House of Representatives promulgated, Republic Act No. 10533 or the "Enhanced Basic Education Act of 2013", Section 2c, declares that the state shall:

*make education learner-oriented and responsive to the needs, cognitive and cultural capacity, the circumstances and diversity of learners, schools and communities... as a learning resource.*

This enactment sees the relevance of meeting the diverse needs of the learners and value the background that the student have in the classroom as part of their unique set of experiences that reflect to their belief, capacity, attitude, and personality. The government mandates a basic education that will make way for teachers to use strategies that allow students to draw on their previous experiences to strengthen their learning. Language and culture are now seen as resources and not as hindrances to learning.

The enhanced basic education curriculum adheres to the following standards and principles: it is learner-centered; relevant; culture-sensitive; contextualized and global; uses pedagogical approaches that are constructivist in nature, inquiry-based, reflective, collaborative and integrative adherence to the principle of Mother Tongue-Based Multilingual Education (MTB-MLE); spiral in progression; and a flexible curriculum that is enough to enable and allow schools to localize, indigenize and enhance the same based on their respective educational and social contexts (K to 12 Curriculum Guide).

Herron and Barta (2010) conducted a study about effects of culturally relevant word problems in second grade students. Twelve classrooms of two school districts in Northern Utah participated in the study. In school A, the control group, four classrooms with 49

participants are involved. The control group is exposed to math text discussion with word problems as part of the instruction but not its focus. Problems given to them are the problems in the textbook. In school B, assigned as word problem group, 65 participants of four classrooms are involved. The group adopted math text discussion plus fifteen minute lessons on problem solving twice a week as part of the treatment. Problems in this group are also taken from the textbooks. While in school C, the group with culturally relevant word problem, there are 29 participants. As part of the treatment, students in this group also adopted math text discussion plus fifteen minute lessons on problem solving. However, problems given in this group are problems created as a result of the collaboration of the teacher and researcher which are culturally relevant. After series of class observations and using multiple regressions, analysis was conducted to predict changes to the pretest and posttest results with gender, socioeconomic status, ethnicity, treatment group and oral reading fluency level as predictor variables. Results showed that the use of culturally relevant word problem in mathematics is beneficial to the students.

Ukpokodu (2011) explore on teacher's practices that links mathematics and culture. Forty-five pre-service and in-service teachers enrolled in her graduate course class served as participants of the study. Data gathered identify the reasons of the participants for not teaching in a way that relates culture and mathematics. The result of study found out that teachers perceived that mathematics and culture are not related, it is difficult to do, their focus is to achieve high scores for national achievement test and there is no available learning material that can guide them in integrating mathematics and culture. Respondents described a mathematics teaching that address to the cultural needs of the students, it integrates culturally relevant content and social issues that foster communal learning; it is open to students' various thinking and problem-solving needs and it requires teacher's critical consciousness, advocacy and activism.

#### *4.2 Integration/Mathematical Connections*

This study anchors to one of the Principles and Standards for School Mathematics promulgated by National Council of Teachers of Mathematics (NCTM), that is, "Connections." NCTM emphasizes that mathematics is an integrated field of study and when students see the connection of mathematical ideas in other subjects and in their own interest and experiences, understanding is deeper and more lasting.

Bonner and Adams (2012) conducted a research that reveals the characteristics of culturally responsive mathematics teaching based on a qualitative data they gathered through series of interview and observation to a teacher of African-American students. Their analysis of the data revealed that knowledge about pedagogy of mathematics, knowledge about the students, knowledge of how to communicate with the students, and the need to build good relationship or trust both on students and parents with continuous reflection and revision on each component will lead to teaching success that consider culture of the students as part of learning.

Wager (2012) conducted a study that identifies how teachers integrate culture and out-of-school activities in their mathematics instruction. Participants of the study involve seventeen teachers who participated in a professional development seminar that focus on culturally relevant pedagogy in mathematics classroom. Data were gathered based on audiotapes, small group discussions, interviews, assignments, and field notes observations.

Results of the study pointed to four practices: to use experiences as context in problem solving connects the experiences to school mathematics, identify the mathematical practices that suits to experiences and to focus on shared experiences using the classroom as a site of culture. Each of the four practices is important and contributes to the students' understanding in various ways.

#### *4.3 Modular Approach in Teaching*

The trend of using modules as teaching-learning approach is becoming very popular in recent times. In this approach, the teacher uses teaching modules prepared for specific purposes instead of a traditional textbook. A module is a new way to arrange learning experiences in education. It is a well-organized learning material that focuses on a particular topic with clear objectives to be attained. Students will learn at their own levels and convenience (Demrel, 2010).

Programmed instruction in module form is an important educational innovation and a teaching technique. It also offers a solution to the problems of teaching instruction. Modular instruction promises a more efficient mass education by offering more effective individual instruction at a time when teacher is faced with a problem of producing learning in a large group all at the same time. It is a technique of self-instruction that involves the presentation of instructional materials to demonstrate their skills and comprehension (Goldschmid, 2005).

Mariani, (2009) as cited by Vasquez, stresses that the concept of module is strictly linked to the idea of a flexible curriculum, which should provide all those concerned with education (learners and teachers), parents and administrators as well as society with a framework to establish clean and realistic learning objectives. Modules can be used to any levels of subjects for it provides a clear picture of objectives and organized lessons which is beneficial to the learner. For the part of the parents, this will be a best way to follow-up the learning ability of the child.

Jenkins and Walter (2007) emphasize that the basic principles of modular courses involve division of the curriculum into limited units or modules of learning which are assessed at the end of that unit, with the students building up degree or award through such learning being credited. Since the topics in the module are broken into parts, students learning would be simple and easy. They can work at their own ability and their own convenience.

Pedreria (2012) investigated the effectiveness of modular teaching in elementary algebra. Through a pretest and posttest given to the control and experimental groups, particularly the first year students of Cawayan Integrated School of school year 2011-2012, she determined the performance of the respondents on the said test that serves as basis for determining the effectiveness of the develop module. Utilizing a quasi-experimental research design and using a teacher-made module and questionnaire, result shows a significant difference in the pretest and posttest scores of experimental groups while no significant difference in the control group, thus, revealed that the use of modular approach in teaching elementary algebra is effective.

Mollejon (2008) utilized a quasi-experimental research design to study the effectiveness of modular method in teaching chemistry. It involved the comparison between modular and traditional approach on students' achievement, attitude, and psychomotor skills.

The result shows that modular instruction was more effective approach in teaching Chemistry as it increased students' performance.

Malik (2012) addressed the differential effect on student's general comprehension trained through modular and traditional teaching approaches at secondary school level. Random selection of grade 9 students serves as sample of the experimental study. Data were gathered through administration of general comprehension based teacher-made test and analyzed by means of t-test of independent sample. Results show a significant difference on the general comprehension of the students taught using the two approaches. Findings revealed that students taught through modular approach gained higher mean score than students taught through traditional approach in the general comprehension-based test. Also a significant difference in general comprehension of male and female students was found in the study, with the male grouped outperformed female students.

Aquino (2011) determined the effectiveness of the modular instructional materials for college students enrolled in Integral Calculus by promoting understanding and mastery of the application of the different integration formulas in evaluating and simplifying integrals. Findings reveal that modular instruction was found to be as effective as the traditional method based on the performance of the students. The developed module helped students develop logical and correct thinking and better understanding of the different standard integration formulas.

Morales (2013) conducted a study that integrates the language and culture of Pangasinan in Physics education. Her main objective is to present the *how* and *why* behind the integration of language and culture in the study of physics concepts. The first part of her study is engaged on identifying the cultural dimensions, epistemological beliefs and students' views on integration of culture and language in teaching and learning process. These data serve as the cultural profile of her respondents that describe the distinct cultural characteristic of the learner which then later on use as bases for developing culturally sensitive curriculum materials in physics. The second part of the study evolves on the validation and evaluation of the curriculum material as a learning tool emphasizing the integration of culture and language of Pangasinan. The effectiveness and efficacy were established in terms of physics concept attainment and enhance student's attitude towards science through the comparison made between and among results of the pre and posttests. Her study made use of both quantitative and qualitative approaches of research. Data subjected to statistical analysis show favorable results, both concept attainment and attitude enhancement in the experimental group.

## **5. RESULTS AND DISCUSSION**

### *5.1 Comparison of the Academic Performance in Mathematics of Control and Experimental Groups*

Table 1 shows the mathematics grade of the respondents during the first quarter of the present school year. The data also present the results of statistical comparison that establishes comparability between the two groups of respondents. Establishing comparability between and among the groups of respondents involved in an experimental research is a requirement. In this part, t-test for independent samples was used.

There is no significant difference in the academic performance of the respondents in Mathematics as shown by the p-value of 0.143 which is greater than 0.05 level of significance. This implies that though their mean grades are different and that one group has higher mean than the other group, their numerical difference is not enough to show that they are statistically different. Thus, they are comparable. This result and procedure of establishing homogeneity is parallel to Lopez (2012) and Guerrero (2008).

Table 1. Grades in Mathematics

Groupings	Mean	S.D.	t-value	p-value	Sig
Experimental	77.59	3.225	-1.474	P = 0.143 > 0.05	NS
Control	78.26	2.098			

### 5.2 Respondents' Extent of Awareness and Appreciation of Northern Samar Culture

Table 2 presents the extent of awareness and appreciation of the respondents on the culture of Northern Samar measured before and after exposure to the use of module that uses culture as context while teaching basic geometry concepts. Before the exposure to the modules, results show that the respondents strongly agreed on the statements that describe about being a Northern-Samareño, as manifested by the high value of the mean and standard deviation, *like eating native delicacies, celebrating fiestas and other festivals* of the province. A high mean is also observed in statement number one and sixteen. From these results, it is good to note that despite already being *proud as Northern Samareño*, they still have a strong desire of *wanting to discover more about the province*.

It is interesting to note that despite non-exposure yet to the learning material, they disagreed to the negative ideas like *Northern Samar cannot be a tourist spot, studying local culture is a waste of time, and not to recommend to visit the well-known spots of the province*. The high value of the mean earned by these statements connotes a positive appreciation of the respondents about the culture of Northern Samar even if no intervention was made yet.

In the same presentation, improvement is clearly seen in the extent of appreciation and awareness of the respondents on Northern Samar culture after fifteen days of exposure to the modules that integrate facts about the province while teaching mathematics concepts. Particularly, increase in the value of the mean as compared to the previous result is observed in statements, *I know some histories or stories about Northern Samar* and *I am familiar about our local heroes like Agustin Sumuroy of Palapag*. Due to the integration of facts about Northern Samar in the module, respondents gained information about Northern Samar that eventually increased their knowledge about histories and local heroes of the province. It is also noted that the results showed consistency on the responses when they still disagree that *Northern Samar cannot be a tourist spot, Studying about local culture is a waste of time, and Religion is not part of Northern Samar culture*. Increase in the value of the mean for these statements as compared to the previous value is an evident of an increase of their appreciation and awareness about the culture of Northern Samar too.

Table 3. Respondents' Cultural Appreciation and Awareness Before and After Exposure to Modules

Statements	Before			After		
	Mean	SD	Interpretation	Mean	SD	Interpretation
I am proud to be a Northern Samareño.	4.41	.931	Agree	4.93	.267	Strongly Agree
I love to eat native delicacies of Northern Samar like <i>Minoron</i> , <i>Salukara</i> , & <i>Kurukod</i> ,	4.33	.832	Agree	4.67	.480	Strongly Agree
I better stay in other place than to be here in Northern Samar.	3.22*	1.188	Minimally Agree	4.04*	1.055	Disagree
I know some histories or stories about Northern Samar.	3.11	.641	Minimally Agree	4.26	.764	Agree
I am familiar about local heroes like Agustin Sumoroy of Palapag.	3.26	1.163	Minimally Agree	4.33	.920	Agree
Northern Samar cannot be a tourist spot of our country.	4.15*	1.064	Disagree	4.67*	.877	Strongly Disagree
I like to visit the different municipalities of Northern Samar.	4.00	1.000	Agree	4.63	.629	Strongly Agree
I feel irritated when other people laugh upon hearing Visayan diction.	3.89	1.155	Agree	4.26	1.163	Agree
Studying about our local culture is a waste of time.	4.30*	.912	Disagree	4.48	.802	Disagree
I love listening Visayan music like <i>Kuratsa Mayor</i> , <i>An Balud</i> , <i>Dandansoy</i> , etc.	2.85	1.167	Minimally Agree	3.81	1.001	Agree
I always look forward to different celebrations like town fiestas, <i>Ati-atihan</i> , and <i>Sakay-sakay</i> festivals of our province.	4.48	.935	Agree	4.70	.542	Strongly Agree
I will not recommend to a friend or anyone to visit well-known spots of our province (like Biri Rock Formation, Pinipisakan Falls, etc.)	4.04*	1.454	Strongly Disagree	4.56*	.892	Strongly Disagree
I know the arts and crafts of our province.	3.37	.742	Minimally Agree	3.81	1.075	Agree
Northern Samar has rich culture.	4.11	.847	Agree	4.70	.542	Strongly Agree
I do not want to speak Ninorte-Samarnon.	4.07*	1.299	Disagree	4.26*	1.318	Disagree
I want to discover more about Northern Samar.	4.59	.636	Strongly Agree	4.93	.267	Strongly Agree
I have gone to many beautiful spots in Northern Samar.	3.19	.786	Minimally Agree	4.26	.764	Agree
Religion is not part of Northern Samar culture.	4.41*	.797	Disagree	4.59*	1.010	Strongly Disagree

I am aware of some cultural beliefs, values and traditions distinct to Northern Samar.	3.85	.818	Agree	4.41	.636	Agree
If I will be born again, I do not want to be a Northern Samareño.	4.26*	.859	Disagree	4.85*	.362	Strongly Disagree
Grand Mean	3.89	.421	Agree	4.46	.248	Strongly Agree

*\*Reverse Scoring Applied*

### 5.3 Comparison of Extent of Cultural Awareness and Appreciation

The data in Table 4 shows the comparison of the extent of awareness and appreciation of the respondents on the culture of Northern Samar before and after the conduct of the experiment. The increase in the value of the means after the use of the module and the result of statistical comparison, a p-value of  $0.000 < 0.01$ , indicates a significant increase in the respondents' awareness and appreciation of their culture. The result could be attributed to the exposure of the respondents on the different modules that integrate facts like history of the municipalities, symbols of traditions, life of local hero and known spots in Northern Samar. Upon reading the different information about Northern Samar and looking at the pictures of some well known spots, the respondents discovered more about the province hence increases their cultural awareness and appreciation.

Table 4. Extent of the Respondents' Cultural Awareness and Appreciation

Cultural Awareness and Appreciation	Mean	SD	t-value	p-value	Significance
Before	3.90	0.41	-10.448	$p = 0.000 < 0.01$	VS
After	4.45	0.25			

### 5.4 Respondents' Performance in the Pretest and Posttest Activities

For the control group where conventional approach or discussion was used, it can be noted from Table 5 that there is a very significant difference in the average results of the respondents in the pretest to that of the posttest as shown by the p-value of 0.000 for each module which is less than the 0.01 level of significance. Result shows that though no intervention was given to this group of students an increase in their performance in the posttest activities is observed after the conduct of the discussion. The result is attributed to what the researcher notice during every discussion, that the students in this group are behaved as compared to the other group and some students really show interest to learn. This result is parallel to what Morales (2013), and Malik (2012), arrived in their studies. Both use pre and posttest activities and when result was compared, a difference also occurred in the performance of the control group even if discussion method was used. However, the result of the present study is contrary to what Pedrera (2012) and Guerrero (2008) derived in their studies. Both analyzed the pre and posttest results of control group that is exposed to discussion method and found out a no significant difference in the results.

Table 5. Comparison of the Pretest and Posttest Results of the Control Group

Lesson	Mean	Standard Deviation	t- value	p-value	Significance
Basic Terms					
Pre	1.90	0.740	-11.943	p=0.000<0.01	VS
Post	2.80	0.646			
Angles					
Pre	2.05	0.743	-13.153	p=0.000<0.01	VS
Post	3.42	0.622			
Polygons					
Pre	2.99	1.409	-11.730	p=0.000<0.01	VS
Post	4.94	1.242			
Triangles					
Pre	4.21	0.992	-10.619	p=0.000<0.01	VS
Post	5.71	0.879			
Quadrilaterals					
Pre	5.27	1.162	-31.802	p=0.000<0.01	VS
Post	8.80	1.033			
Circle					
Pre	3.50	0.726	-14.401	p=0.000<0.01	VS
Post	5.80	1.271			

For the experimental group, the module with culture integration served as a learning intervention material that is assumed to help students in the learning of basic geometry concepts. For the six lessons covered, thirteen modules were utilized. The topics for each lesson was carefully divided to cover the needed competencies and to maximize the teaching-learning time in every modules. The module consists of an introduction, learning objectives, learning connections, learning inputs, learning notes, learning applications, learning potpourri and learning sources. The integration of Northern Samar culture in every topic is presented in the learning connections and learning applications of the module.

Specifically, for lesson one, the component of culture integrated is on geographical location of Northern Samar, historical church and symbols commonly found in the province. In lesson two, historical sites and known spots found in the municipality are used in the integration aspect of culture. For lessons three and four, integration is done using known spots and symbol of common livelihood in the province. Meanwhile, for lessons five and six, history of the municipality, life of a local hero, symbol of traditional festive and a native delicacy of the province was used as part of the integration presented. One municipality is highlighted in every module with this thirteen of twenty-four municipalities were cited or included.

In the analysis of the pretest and posttest results for the experimental group in this study, tabular values show that the mean post test results is higher than the mean pretest results and that their difference is statistically very significant as revealed by the p-values which are less than 0.01 level of significance for each lesson. This means that there is an improvement in the performance of the students after using the module where culture of Northern Samar was integrated. Thus, the teaching method used which is modular in nature is effective. This result is similar to the outcome of the studies of Morales (2013), Pedrera and

Malik (2012), Aquino and Dubey (2011), and Mollejon (2008) that employed modular approach in handling the experimental group and as they compared the pretest and posttest scores after the use of the modules, a higher mean and significant difference were recorded in the scores of the students thus proving the effectiveness of the approach. Particularly, the study of Morales (2013) though in different discipline, manifests to a great extent the effectiveness of the module that integrates culture while teaching a concept.

Table 6. Comparison of the Pretest and Posttest Results of the Experimental Group

Lesson	Mean	Standard Deviation	t- value	p-value	Significance
Basic Terms					
Pre	2.17	0.740	-13.041	p=0.000<0.01	VS
Post	3.33	0.629			
Angles					
Pre	2.32	0.792	-13.268	p=0.000<0.01	VS
Post	4.00	1.074			
Polygons					
Pre	4.49	1.357	-20.485	p=0.000<0.01	VS
Post	9.31	1.694			
Triangles					
Pre	6.58	1.070	-20.672	p=0.000<0.01	VS
Post	11.27	1.606			
Quadrilaterals					
Pre	6.93	1.065	-27.995	p=0.000<0.01	VS
Post	12.22	1.554			
Circle					
Pre	5.37	0.607	-26.436	p=0.000<0.01	VS
Post	9.77	0.999			

### 5.5 Comparison of the Differences in the Pretest and Posttest Between Experimental and Control Groups

Since the comparison of the pretest shows that there is a significant difference between the pretest results of the two groups, the difference of the increase in the score from pretest to posttest was computed and used for the comparison for the experimental and control groups. Table 7 shows that there is a significant difference in the increase of scores from pre to post test results of the experimental and the control groups for the first module and a very significant differences in the increase of scores from the third up to the last modules or lessons. Looking at the mean differences, it can be observed that the experimental group has higher mean difference than the control group. This implies that though both methods of teaching brought increased to the posttest scores of the respondents, using module with cultural integration is better and thus more effective than the conventional method. However, on the second lesson the difference in the increase of scores is not significant although higher mean was recorded in favor of the experimental group. It is expected since the students are still adjusting in the use of the said modules. These results are parallel to the findings of Morales (2013), Malik and Pedrera (2012), Dubey and Aquino (2011) that all arrived with a common result - that is, the experimental group shows favorable result in the

posttest activities. All studies pointed out that the outcome was because of the intervention used for the said group.

Table 7. Comparison of the Differences in the Increase of Score from Pretest to Posttest

Lesson Groupings	Mean	S.D.	t-value	p-value	Sig
Basic Terms Experimental Control	1.17 0.90	.693 .636	2.283	$p = 0.024 < 0.05$	S
Angles Experimental Control	1.68 1.37	.983 .890	1.928	$p = 0.056 > 0.05$	NS
Polygons Experimental Control	4.81 1.96	1.805 1.364	10.096	$p = 0.000 < 0.01$	VS
Triangles Experimental Control	4.69 1.50	1.744 1.199	12.382	$p = 0.000 < 0.01$	VS
Quadrilateral Experimental Control	5.29 3.53	1.451 0.954	8.411	$p = 0.000 < 0.01$	VS
Circle Experimental Control	4.40 2.30	1.311 1.372	9.095	$p = 0.000 < 0.01$	VS

## 6. CONCLUSIONS

The integration of Northern Samar culture in the developed learner's module helped increase respondents' cultural awareness and appreciation. The module that uses culture as context while teaching mathematics concepts contributed to the higher posttest performance of the experimental group. The use of module with culture integration in teaching mathematics concept is an effective approach.

## REFERENCES

- Baba, T. (2007). Localization process of mathematics education in post-independence Kenya. In Masafumi Nagao, John Rogan, & Marcelita Magno (eds), *Mathematics and science education in developing countries issues, experiences, and cooperation prospects*. Quezon City: The University of the Philippines Press.
- Bonner, E.P. and T.L. Adams. (2012). Culturally responsive teaching in the context of mathematics: A grounded theory case study. *Journal of Mathematics Teacher Education*, 15.
- Chitera, N. (2011). Language of learning and teaching in schools: An issue for research in mathematics teacher education?. *Journal of Mathematics Teacher Education*, 14(3).
- Dela Cruz, M.G. (2014). *Northern Samar our home*. Quezon City: Write It Right Editorial & Publishing.
- Demrel, Y. (2010) Modular teaching and open ended design projects.
- DepEd discussion paper (2012) on the enhanced K + 12 basic education program.

- Dubey, P.K. (2011). *A study of the effect of modular teaching on achievement in chemistry of 10<sup>th</sup> grade students*. M. G. Kashi Vidyapeeth, Varanasi, UP India.
- Goldschmid, B. & Goldschmid, M.L. (2005). Centre for learning and development. McGill University, Montreal Q., Canada.
- Herron, J. and Barta, J. (2010). Culturally relevant word problems in second grade: What are the effects? *The Journal of Mathematics and Culture*, <http://www.nsamar.com/general-info>
- International Association for the Evaluation of Educational Attainment (IEA). Trends in International Mathematics and Science Study - Advanced (Data Sets). Retrieved July 15, 2014 from <http://rms.iea-dpc.org/#>.
- Ivanovic, E. V. (2012). Using culture as a resource in mathematics: the case of four Mexican-American prospective teachers in a bilingual after-school program. *Journal of Mathematics Teacher Education*, 15(1).
- Jenkins, A. and Walker, L. (2007). *Developing student capability through modular courses*. Great Britain: Biddles Ltd, Guildford and King's Lynn.
- Johnson, C. (2011). The road to culturally relevant science: exploring how teachers navigate change in pedagogy. *Journal of Research in Science Teaching*, 48(2).
- K to 12 Curriculum Guide in Mathematics, January 2012. Department of Education, Philippines.
- Lucas, M.R. and Corpuz, B. (2011). *Facilitating learning: a metacognitive process*. 2<sup>nd</sup> ed. Quezon City: Lorimar Publishing, Inc.
- Malik, S.K. (2012). Effects of modular and traditional approaches on students' general comprehension. National University of Modern Languages, Islamabad, Pakistan.
- Morales, MP. (2013). *Culture and language integration in physics education*. (unpublished dissertation paper), De La Salle University, Manila.
- Mollejon, C.V. (2008). *Effectiveness of modular method in the teaching of high school chemistry*. (unpublished dissertation paper), University of Eastern Philippines, Catarman, Northern Samar.
- Ng, S. and Rao, N. Chinese number words, culture and mathematics learning. *Review of Educational Research*, 80(2).
- Pedreria, MT A. (2012). *Modular Teaching in Elementary Algebra*. (unpublished dissertation paper), University of Eastern Philippines, Catarman N. Samar.
- Republic Act No. 10533. Retrieved August 10, 2014 from [www.gov.ph](http://www.gov.ph).
- Schunk, D.H. (2012). *Learning theories. an educational perspective*. 6<sup>th</sup> ed. USA: Pearson Education, Inc.
- Ukpokodu, O. N. (2011). How do I teach mathematics in a culturally responsive way? *Multicultural Education*.
- Vasquez, M.E. (2013). *Modular Teaching in Advanced Algebra, Trigonometry and Statistics*. (unpublished dissertation paper), University of Eastern Philippines, Catarman, Northern Samar.
- Wager, A. A. (2012). Incorporating out-of-school mathematics: from Cultural context to embedded practice. *Journal of Mathematics Teacher Education*, 15.
- Whiteford, T. (2009). The culturally responsive mathematics classroom. *Essential Teacher*, 6(1).
- \_\_\_\_\_. (2012). Challenges in basic mathematics education. UNESCO Report.