United International Journal for Research & Technology

Volume 05, Issue 06, 2024 | Open Access | ISSN: 2582-6832

Code-Switching and Mathematical Understanding of High School Students

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***Abstract*—** The main concern of this study was to determine the influence of code-switching on the mathematical understanding of the high school students. A quantitative non-experimental design utilizing correlational technique was used. A total of 248 grade 8 students belonging to the randomly selected students of all Public Secondary Schools of New Bataan District, Compostela Valley Division, Philippines were taken as a sample. The study was conducted with the use of validated researcher's made survey- questionnaire and researcher's made test. The statistical treatment like mean and Pearson-r had given the result that there was no significant relationship between the extent of utilization of code-switching and mathematical understanding of high school students. Then, the utilization of code-switching did not significantly influence the mathematical understanding of high school students. This study provide essential inputs to the teachers, and school administrators to do some intervention, plans and strategies to improve mathematical understanding.

***Keywords*—** Education, Code-Switching, Mathematical Understanding, Quantitative Non-Experimental, Grade 8 Students, Pearson-r, Philippines

THE PROBLEM AND ITS SETTING

Background of the Study

Mathematics ability plays an essential part in daily living skills. Math helps the mind to reason and organized complicated situations or problems into clear, simple and logical steps. Mathematics is a core subject of the National Curriculum and our aim is to ensure that we foster an understanding and appreciation of Math, so students can use their skills in their everyday lives and able them strategically solve problems especially non-routine problems and avoid common misunderstandings as well as inflexible knowledge and skills (Wiggins, 2014).

However, the Philippines ranked 41st in science and 42nd in math among 45 countries in the 2003 Trends in International Mathematics and Science Study (TIMSS) an international assessment of Math and Science Skills among primary and secondary school students conducted every 4 years. The Philippines has not improved its ranking since 1999 and did not participate in the 2007, 2011 and 2015 TIMSS. This stagnation shows that the Philippine education system is in need of improvement.

Statement of the Problem

The main concern of this study is to determine the influence of code-switching on the mathematical understanding of the high school students.

Specifically, this study sought answers to the following questions:

1. What is the extent of the utilization of code-switching in terms of :
    a. explaining concepts;
    b. clarifying statements or question;
    c. emphasizing points;
    d. making connections;
    e. classroom management and maintaining discipline; and
    f. affective purposes?
2. What is the level of mathematical understanding of students in terms of:
    a. knowing;
    b. formalizing;
    c. observing;
    d. structuring; and
    e. inventing?
3. Is there a significant relationship between the utilization of code-switching and the mathematical understanding of high school students?
4. Does utilization of code-switching significantly influence the mathematical understanding of high school students?

Hypotheses

1. There is no significant relationship between the utilization of code-switching and the mathematical understanding of high school students.
2. The utilization of code-switching does not significantly influence the mathematical understanding of high school students

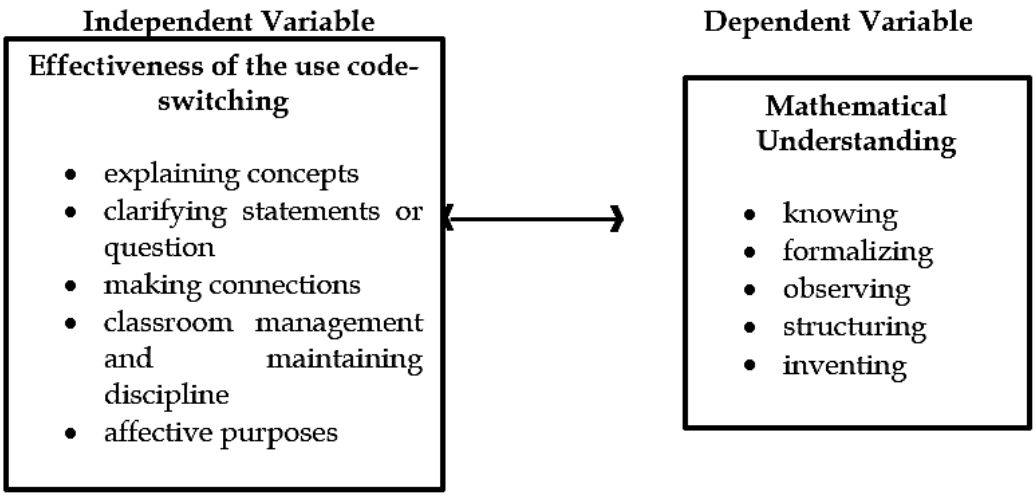

Figure 1. *Theoretical and Conceptual Paradigm of the Study*

Significance of the Study

This study on code-switching and mathematical understanding of high school students is beneficial to the following entities:

- **Department of Education (DepEd) Officials.** The results of this study would furnish information about the extent of utilization of code-switching and mathematical understanding of high school students. Therefore, appropriate instruction or programs shall be done to strengthen teaching and learning process for Mathematics.
- **School Administrators.** This study will give awareness to the school administration in the formulation of plans to improve achievement in mathematics, teacher's continuous professional growth and other related academic developments.
- **Mathematics Teachers.** Specifically, to the Mathematics teachers may also benefit in this study by being aware of how students perceive them during their lectures and conversations inside the classroom. Thus, will help them explore a wider horizon in understanding the broad field of mathematics.
- **Students.** Through this study, students would be aware in the implications of this practice in their learning wherein most students are not fully aware of this phenomenon. And can help them develop mastery of mathematical concepts through their teachers and eventually improve their prevailing low achievement rate.
- **Other Researchers.** Researchers may also benefit through the findings where they relate to their quest of discovering in depth knowledge about code-switching.

METHOD

This chapter presents the research methods used in the study. It contains the design, the respondents, data gathering procedure, instruments and statistical treatment.

Research Design

This study used quantitative non-experimental design utilizing correlational technique. Non-experimental research method is used to describe variables and its relationship wherein the researcher cannot control or alter the predictor variable or subjects, but instead relies on interpretation, observation or interactions to come to a conclusion (Kowalczyk, 2015). The study employed the correlation method to determine whether the relationships exists between the extent of the use of code-switching and the level of mathematical understanding of high school students.

Research Subject

The subjects of this study were the teachers from all public secondary schools of New Bataan district, namely New Bataan National High School, Camanlangan National High School, Bantacan National High School and Andap National High School. The respondents were the 248 students in above mention schools. Respondents were chosen through stratified random sampling. Out of the total population, the sample size was identified by the use of Slovin's Formula.

Table 1 shows the distribution of respondents. As shown in the table, there were 248 respondents. New Bataan NHS with 103 respondents, Camanlangan NHS with 69

respondents, Bantacan NHS with 49 respondents and Andap NHS with 27 respondents.

Figure 2 shows the map of Compostela Valley where the study was conducted. Compostela Valley is one of the province of Region XI. This province is known for its vast gold deposits. It is composed of 11 municipalities namely New Bataan, Compostela, Monkayo, Pantukan, Laak, Montevista, Mawab, Maco, Mabini and Nabunturan.

Research Instrument

There were two validated research instruments in this study. All were answered by the student-respondents. The first instrument was a researcher made-questionnaire containing the personal information about the student, it was used to determine the utilization of code-switching of high school students with the six indicators of the study stand as independent variable: explaining concepts, clarifying statements or questions, emphasizing points, making connections, classroom management and maintaining discipline and affective purposes with 5 questions on every indicator.

Table 1. *Distribution of Respondents*

School	Population Size	Sample Size
New Bataan NHS	270	103
Camanlangan NHS	180	69
Bantacan NHS	130	49
Andap NHS	72	27
Total	652	248

In testing the reliability of the questionnaire, pilot testing was done at Assumption Academy of Mawab, Mawab, Compostela Valley. After that, the data were tested for reliability using Cronbach alpha. It was used to determine how closely related a set of items are as a group. Based on the computation in the utilization of code-switching, the reliability coefficient obtained by correlating the mean scores on the first half items with the mean scores on the half items was 0.98. The reliability of the whole questionnaire was 0.57. This means that the whole questionnaire is reliable because it obtained a moderate positive correlation. This means that the whole questionnaire was reliable.

The following parameter limits was used to determine the extent of the utilization of code-switching were utilized:

Parameter Limits	Description	Interpretation
4.50 – 5.00	Always	This means that the utilization of code-switching is observed at all times.
3.50 – 4.49	Often	This means that the utilization of code-switching is observed most of the time.
2.50 – 3.49	Sometimes	This means that the utilization of code-switching is observed occasionally.
1.50 - 2.49	Seldom	This means that the utilization of code-switching is observed rarely.
1.00 - 1.49	Never	This means that the utilization of code-switching is not observed

The second instrument was a teacher-made questionnaire consisting of 8 questions relating to each level of mathematical understanding.

The following parameter limits were adopted from DepEd Order no. 8 series of 2015 in order to determine the level of mathematical understanding of high school students.

Parameter Limits	Description	Interpretation
90 - 100	Very High	This means that the mathematical understanding of students is outstanding.
85 - 89	High	This means that the mathematical understanding of students is very satisfactory.
80 - 84	Moderate	This means that the mathematical understanding of students is satisfactory.
75 - 79	Low	This means that the mathematical understanding of students is fairly satisfactory.
75 and Below	Very Low	This means that the mathematical understanding of students did not meet expectation.

Statistical Treatment of Data

The statistical tools employed were as follows.

- **Mean.** This tools was used to determine the extent of utilization of code-switching and mathematical understanding of high school students. Specifically, it was utilized to answer questions 1 and 2 of this study.
- **Pearson r.** This was used to determine the relationship between the relationship between the extent of the use of code-switching and the level of mathematical understanding of high school students. This was used to answer problem number 3.

RESULTS AND DISCUSSION

In this chapter, the researcher discusses the findings and results from the data gathered. The results are presented in tabular and textual forms.

Table 2 presents the summary on the level of mathematical understanding in terms of knowing, formalizing, observing, structuring, inventing. The indicator of knowing got the highest mean of 83.91 with a description of moderate, followed by the indicator of inventing that obtained a mean of 83.31 with a description of moderate. The indicator of formalizing got the lowest mean of 82.45 with a description of moderate. This means that the mathematical understanding is satisfactory. This implies that mathematical understanding is directly connected to their instructional choices procedures. And to gain a deep understanding of mathematical ideas, students need to be able to integrate and connect a variety of concepts in many different ways.

Based on the results, the level of mathematical understanding of high school students in terms of knowing, formalizing, observing, structuring, inventing has an overall mean of 83.06 with a description of moderate. This means that the level of mathematical understanding is satisfactory. The result is strengthened by Gadamer (2008), a person who understands, understands himself. Understanding begins when something addresses us. This requires the fundamental suspension of our own prejudices.

Table 2. *Table Summary on Level of Mathematical Understanding*

Indicators	Mean	Description
A) Knowing	83.91	Moderate
B) Formalizing	82.45	Moderate
C) Observing	82.79	Moderate
D) Structuring	82.85	Moderate
C) Inventing	83.31	Moderate
Overall	83.06	Moderate

Table 3 shows the significant relationship between the utilization of code-switching and mathematical understanding of high school students.

The coefficient of correlation between the utilization of code-switching and mathematical understanding of high school students is 0.2049. This indicates a low positive correlation. The computed t - value is 0.3626 and the tabulated p - value is 0.7409. Thus, the tabulated p - value is greater than $\alpha = 0.05$. Therefore, the null hypothesis is accepted. It means that there is no significant relationship between the utilization of code-switching and mathematical understanding of high school students.

As noted in the coefficient of determination, Table 15 shows that r2 has a value of 0.0420 or 4.20%. This means that of the total respondents of the study, 4.20% of the variation in mathematical understanding of high school students could be attributed to the variation in the utilization of code-switching.

The ninety-five point eighty percent (95.80%) of mathematical understanding is chance variation or can be explained by the variance of other variables. The other factors could be the teaching strategies of teacher's and the study habits of the students. Thus, the data are not enough to reject the null hypothesis.

Since there is no significant relationship between the utilization of code-switching and mathematical

understanding of high school students it negates the concept of Adler and Setati (1998) that states that code-switching was noted as a valuable educational resource, and as means to foster mathematical understanding of the students.

Table 3. *Relationship between the Utilization of Code-Switching and Mathematical Understanding of High School Students*

Variables	r - value	Interpretation	t-value	p-value	Decision α = 0.05	Conclusion on Relationship
Utilization of Code-Switching		Low Positive Correlation	0.3626	0.7409	Accepted	Not Significant
Mathematical Understanding of Students	0.2049					
r2	Coefficient of Determination				0.0420	

SUMMARY, CONCLUSION AND RECOMMENDATION

Presented in this chapter are the summary of findings, the pertinent conclusions and the recommendations given by the researcher based on the obtained results.

Summary of Findings

The following findings were enumerated and summarized as discussed in the preceding chapter.

1. Based on the result, the utilization of code-switching in terms of explaining concepts, clarifying statements or questions, emphasizing points, making connections, classroom management and maintaining discipline, and affective purposes has an overall mean of 3.88 with a description of often.
2. The level of mathematical understanding of high school students in terms of knowing, formalizing, observing, structuring and inventing has an overall mean of 83.31 with a description of moderate.
3. The coefficient of correlation between the extent of utilization of code-switching and mathematical understanding was 0.2049. This implies a moderately positive correlation.

Conclusion

On the light of the aforementioned findings of the study, the following conclusions are drawn:

1. The extent of the utilization of code-switching is observed most of the time.
2. The level of mathematical understanding of high school students is satisfactory.
3. There is no significant relationship between the extent of the utilization of code-switching and mathematical understanding of high school students.
4. The utilization of code-switching does not significantly influence the mathematical understanding of high school students.

Recommendations

After a careful review of the findings and conclusion of the study even it shows that there is no significant relationship between the extent of utilization of code-switching and the level of mathematical understanding, still the following recommendations were given:

1. The teacher should provide opportunities to the students to improve mathematical skills through solving different mathematical word problems.
2. The teacher should involve students to integrate and connect variety of concepts in many different ways to gain a deep understanding of mathematical ideas through activities, simulations and games.
3. The students should engage themselves in group activities, and observe and solve problems by working in groups to understand the problems and find solutions and develop mathematical understanding.
4. The administrators are encouraged to address the need of teacher on professional development programs that place a high priority on improving teachers' skills and competent in teaching mathematics.
5. Future researchers are encouraged to open their minds to explore the relevance of this study and would inspire with their investigations to make the readers more inspired in appreciating mathematics and further conduct study in other setting that might contribute to the mathematical understanding of students in mathematics.

REFERENCES

[1] Ackerman, P.L. (1991). Trainee characteristics. In J.E. Morrison (Ed), Training for performance: Principles of applied human learning. (pp190-193)

[2] Airasian, P.W & Russell, M.K (2008). Classroom assessment concepts and applications, 6th Edn, New York, McGraw Hill Higher Education.

[3] Alibali, Martha (2005). Concepts and procedures reinforce each other. November 2, 2016, retrieved from http://www.wcerwisc.edu/news/coverStories/concepts_and_procedures_reinforce

[4] Applebaum, L & Miller, L.D.(2001). Translations toward connection mathematics, National Council of Teacher of Mathematics Publishing.

[5] Arter, Judith, (2005). Classroom Assessment for Student Learning: Doing it Right, Using it Well. Portland, Oregon: Assessment Training Institute.

[6] Baker, S. Gersten, R, & Lee, D., (2002). A synthesis of empirical research on teaching mathematics to low achieving students. Elementary School Publication, 103, 45-74.

[7] Bautista, Maria Lourdes, Tagalog-English Code Switching as a Mode of Discourse, Asia Pacific Edition Review, (2004), Vol. 5, No.2, De La Salle University, Philippines.

[8] Bodovski, K., and G. Farkas. "Mathematics Growth in Early Elementary School: The Roles of Beginning Knowledge, Student Engagement, and Instruction." The Elementary School Journal, vol. 108, no. 2, November 2007, pp. 115–130.

[9] Borman, G.D. "Designing Field Trials of Educational Interventions." In Scale-Up in Education, Volume II: Issues in Practice, edited by B. Schneider and S.-K. McDonald. Lanham, MD: Rowman & Littlefield, 2007.

[10] Brookfield, Stephen D. (2012). Teaching for Critical Thinking: Tools and Techniques to help Students Question their Assumption, San Francisco: Jossey-Bass.

[11] Brophy, J. "Research on Teacher Effects: Uses and Abuses." The Elementary School Journal, vol. 89, no. 1, September 1988, pp. 3–21.

[12] Brown, Carmens. (2009). Teaching Children Mathematics, Volume 15, Issue 8, p. 475

[13] Bruner, Jerome (1996). The Culture of Education. CEO Publication.

[14] Clements, D.H., and J. Sarama. "Learning and Teaching Early and Elementary Mathematics." In Instructional Strategies for Improving Student Learning: Focus on Early Mathematics and Reading (vol. 3 of Psychological Perspectives on Contemporary Educational Issues), edited by J.S. Carlson and J.R. Levine. Charlotte, NC: Information Age Publishing, 2012.

[15] Clements, D.H., and J. Sarama Learning and Teaching Early Math: The Learning Trajectories Approach. New York, NY: Routledge, 2009.

[16] Cobb, P., and K. McClain. "Supporting Students' Learning of Significant Mathematical Ideas." In Learning for Life in the 21st Century: Sociocultural Perspectives on the Future of Education, edited by G. Wells and G. Claxton. Oxford, U.K.: Blackwell, 2002, pp. 154–166.

[17] Dewey, J. (1993). How we think. Boston: health and Comp.