

Instructional Medium and its Effect on Students' Mathematics Achievement

Ramona M. Launio

Capiz State University, Tapaz, Capiz, Philippines

Accepted 25 May April 2015, Available online 26 May 2015, Vol.3 (May/June 2015 issue)

Abstract

The need to connect with students is necessary to successfully transfer learning. Thus, the medium of instruction plays a role. Success in mathematics is also influenced by the medium of instruction used inside the class. It is on this premise that the researcher wanted to look into the relative effects of the use of pure English (Control) and the use of English supplemented with Hiligaynon (Experimental) as the medium of instruction in the teaching of mathematics. Specifically, it aimed to determine the level of mathematics achievement fourth year students when two different mediums of instruction were used. It also evaluated the level of significance the significance of the difference between the mean achievement scores of the experimental and the control groups. The study was limited to the comparative effects of two mediums of instruction: using pure English, and using English supplemented with Hiligaynon in teaching mathematics. The subjects of the study were fifty fourth year high school students studying circular functions, and trigonometry and statistics. The results show that respondents' mathematics performance at the start of the study was low but progressed to average" in the posttest after they were exposed to bilingual instruction. The experimental group was more homogeneous in term of their scores in the posttest. It was also found that teaching mathematics in English supplemented with Hiligaynon is better than teaching the subject in English only, thus, students learn better when taught in bilingual.

Keywords: Instructional Medium, Mathematics Achievement etc.

Introduction

One unique feature of the Philippine educational system is the use of foreign tongue as a medium of instruction. The idea of having different language for schools and home was started by the European who colonized the Americans (Mackey, 1978). Bilingualism and bilingual education are realities in the modern world, a social phenomenon as Miller (2013) put it. Bilingualism is one's ability to speak separately two languages or the constant oral use of two languages. In Philippine education, bilingual education is defined operationally as the separate use of Filipino and English.

Comparing bilingual to English-only programs, many advantage have been found for the former (Willig, 1985; Wong-Fillmare and Valadez, 1986 in Eggen and Kauchak, 1994). Student achievement was higher in math and reading, students had more positive attitudes toward school and themselves and because of their exposure to two languages, and they also better understood the role of language in communication (Diaz, 1983 in Eggen and Kauchak). Skaalvic and Rankin (1995) found out that both math and verbal self perception were strongly related to corresponding achievement. According to Lin (1993, in Yap, 2003) students' achievement is an important

indicator of teaching and learning effectiveness. Likewise, Sulit (2013), the findings revealed that the common learning style of the participants was auditory and the prevalent teacher's teaching style as perceived by the participants was tactile.

Many schools use the second language as a medium of instruction in the classroom (Demavibas, 2012), with emphasis on strengthening the community in maintaining the close link between it and the individual (Chavez, 2012). Bilingualism should support the maintenance, development and full flowering of the ethnic language. In the country, the English language is used in teaching of mathematics, which is quite a problem to some classroom teachers. Complaints are heard among classroom mathematics teachers that students could hardly understand simple pure English as a medium of instruction in mathematics lessons. This may be one of the reasons for the poor performance of our students in mathematics. The studies conducted by the Survey Outcome of Elementary Education, the Program for Decentralized Education and by the center for Education Measurement showed that Filipino students do poorly in mathematics. These findings are supplemented by similar findings of National College Entrance Examination (Philippine journal of Education, 2012). Thus, the

researcher wants to determine the relative effectiveness of the use of pure English and the use of English supplemented with Hiligaynon as the medium of instruction in the learning of mathematics. Specifically, this study aimed to answer the following questions:

1. What is the level of mathematics achievement of the control group and the experimental group in the pre-test?
2. What is the level of mathematics achievement of the control group and the experimental group in the post test?
3. Is there a significant difference in the level of mathematics achievement of the control and the experimental group in the pre-test?
4. Is there a significant difference in the level of mathematics achievement of the control and the experimental group in the post-test?
5. Is there a significant difference in the mean achievement gains between the level of mathematics achievement of the control and the experimental group?

Theoretical Framework

This study is based on Cummins Theory on the role of language proficiency and Ausubel's Theory of Meaningful Verbal Learning. Cummins Theory explains that, by using the first language as the medium of instruction, Bilingual can easily learn and acquire academic skills. It also emphasized the purpose of language proficiency assessment in bilingual education which is the placement of students to classes taught through the language which will best promote learning. This theory supports the idea that with the use of instructional medium the students could easily learn and there is a high possibility that the students could understand better and it results to a high performance of the students.

Ausubel's Theory of Meaningful Verbal Learning explains that effective instruction occurs when new information is associated with prior learning at every step in the process.

The effectiveness of the communication depends upon certain factors within the individual. The point is to be made more evident upon several aspect of the relation between individual processes and the nature of communication. Such indeed, was the early conception of mass communication in relation to the individual. (Anderson, in Morandante).

Methodology

The experimental design, specifically the pretest-posttest equivalent group design, was used in the study. The subjects of the study were the fourth year students enrolled at Tapaz National High School for school year 2014-2015. Two groups of twenty students each were used; the control and the experimental group. The control group was exposed to mathematics instruction in

English only, and the experimental group was exposed to mathematics instruction in English supplemented with Hiligaynon.

A teacher-made test was utilized to measure the students' achievement in mathematics. The lessons covered the units on 'Circular Function and Trigonometry and Statistics taken from the Mathematics IV textbook (Advance Algebra, Trigonometry and Statistics) prescribed by the Department of Education.

Statistical treatments employed were mean and standard deviation for descriptive analysis and the t-test for inferential analysis of the data. Level of significance was set at .05 alpha which is a liberal estimate for educational researches. Statistical computations were done using the Statistical Package for Social Sciences (SPSS). A pilot test was conducted to determine the reliability of the instrument. The revised instrument was administered to 25 respondents who were also fourth year students but were not included in the subjects of the study. A high coefficient of correlation ($r = 0.81$) was obtained using Pearson r , with coefficient of correlation at .05 level.

Results and Discussion

Level of Mathematics Achievements of Fourth Year Students

Level of Achievement in Pretest

Table 3 shows the level of mathematics achievement of the subjects before they were exposed to mathematics instruction. The data revealed that the students both from the experimental and control groups had low level of achievement in the pretest. This result was backed by the findings of Espulgar (2013) who pointed out that high school students performed poorly in mathematics. This could be attributed to the low self-efficacy belief of students, lack of mastery of basic mathematical operations, failure to cope with mathematical anxiety and poor mathematical background.

Table 3 Mathematics Achievement of Fourth Year Students in the Pretest

Group	n	Mean	Description	SD
Experimental	20	16.55	Low	3.52
Control	20	17.4	Low	3.05
Total	40	16.98	Low	3.28

A t-test for independent means was performed (shown in Table 4) to compare the pretest mathematics achievements of the two groups. It was found that there is no significant difference between the pretest mathematical achievements of the two groups, thus, both groups reported low performance in the pretest.

Table 4 Comparison of Mathematics Achievement of Fourth Year Students in the Pretest

Group	Mean	Diff	t	df	p
Experimental	16.55	0.85	0.817	38	0.419
Control	17.4				

Level of Achievement in the Posttest

The posttest mean score of the experimental group revealed average level of mathematics achievement of both the experimental and control groups. The standard deviations show that the experimental group was more homogeneous in terms of their scores in the posttest.

Table 5 Mathematics Achievement of Fourth Year Students in the Posttest

Group	n	Mean	Description	SD
Experimental	20	29	Average	3.52
Control	20	25.95	Average	4.39
Total	40	27.48	Average	4.22

Table 6 shows that there is a significant difference between the mathematics achievements of the two groups in the posttest. Furthermore, it was found that the experimental group performed better in than the control group in the posttest. This result is similar to that of Yap's study (2013) which concluded that students from schools using English and Chinese performed better than those who were taught in English only.

Table 6 Comparison of Mathematics Achievement of Fourth Year Students in the Posttest

Group	Mean	Diff	t	df	p
Experimental	29	3.05	2.42	38	0.02
Control	25.95				

Data on Table 7 revealed that the experimental group showed greater increase than the experimental group. Based on Skinner's Theory of Behaviorism, once there is a systematic change in the environment, which could be possible, be it the technique and style in teaching, the learners will have a high possibility of assimilating the lessons.

Table 7 Comparison of Pretest and Posttest Mathematics Achievement of Fourth Year Students

Group	Mean Pretest	Mean Posttest	Diff	t	df	p
Experimental	16.55	29	12.45	11.51	19	0
Control	17.4	25.95	8.55	-8.85	19	0

The t-test was used further to compare the mean gains of the two groups. The result shown in Table 8 reported that the improvement in the achievement of the students in the experimental group was significantly greater than that of the control group. Findings of Demavibas (2011) supported this result, after concluding that the experimental group had a higher mean gain than the control group during the posttest. However, Ho (2012) believes that students' achievement, motivation and effort were not significantly better when lessons were taught in their mother tongue.

Table 8 Comparison of Mean Gain Scores of Experimental and Control Group

Group	Mean	Diff	t	df	p
Experimental	12.4	3.9	2.69	38	0.011
Control	8.55				

Conclusions

From the results and findings of the study, the following conclusions were drawn:

1. The respondents' mathematics performance at the start of the study was "low."
2. The respondent's mathematics achievement rose to "average" after the posttest, with the experimental group more homogeneous in term of their scores in the posttest.
3. The experimental group performed better than the control group in the posttest. Teaching mathematics in English supplemented with Hiligaynon is better than teaching the subject in English only, thus, students learn better when taught in bilingual.

Recommendations

In view of the findings of the study and the conclusions drawn, the following recommendations are given:

1. The learner's first language should be used as a supplement to English in teaching mathematics to enhance the learner's understanding of the concept.
2. Teachers should explain the lessons in the learners' language, particularly when the teacher notices that the students are having difficulty in understanding the topic.
3. School administrators should recommend to their teachers the use of the learners' first language as supplement for teaching mathematics and other subjects and support them in developing instructional materials for this purpose.
4. A similar study on the use of the learners' first language may be conducted using different subjects and a larger number of participants to ascertain the validity of the results of this study.

References

- [1]. Bernardino, V. (2006). *Planning for National Development*, Philippines.
- [2]. Best, J. (1970). *Research in education*. Englewood Cliffs, N.J: Prentice- Hall, Inc.
- [3]. Boaker, J. (1993) Encouraging the Transfer of School Mathematics to the Real World through the integration of process and the content, context and culture. *Educational Studies in Mathematics*. 25(4), 341-373.
- [4]. Borbon, V.X.L (2009). The Comparative Effectiveness of Filipino and English as Media for Instruction in Developing Science Inquiry Skills. Unpublished doctoral dissertation. University of the Philippines, Diliman, Quezon City.
- [5]. Brown, T. (1994). Creating and Knowing Mathematics through Language and Experience. *Educational Studies in Mathematics*, 27(1), 79-100.
- [6]. Cummins, J. (1984). The Role of Primary Language Development in promoting educational success for language minority students. In *Schooling and Language Minority Students. A Theoretical Framework*, edited by D.P. Dolson. Los Angeles.
- [7]. Department of Education, Culture and Sports (1989). *Primer on Secretary Education Development Program*.
- [8]. Department of Education, Culture and Sports (1989). *Primer on Secondary Education Development Program. Education News*.
- [9]. Dofitas, A.B. (2009). Problems of the Teachers in Arithmetic using the local vernacular as a medium of Instruction. Unpublished Master's Thesis. University of San Agustin, Iloilo City.
- [10]. Downie, N. and Health R. (1984). *Basic Statistical Methods* (8th ed). New York: Harper and Row.
- [11]. Good, C.J. (1973). *Dictionary of Education*. New York: Mc Graw- Hill Book of Company, Inc.
- [12]. Libutaque, M. B. [1999]. The use of Filipino as Mathematics Instruction Medium as Perceived by Secondary School Teachers.
- [13]. Macky, W.F (1978). The Importance of bilingual education models. In *Georgetown University Round Table on Language and Linguistics 1978: International Dimension of Bilingual Education*. James E. Alatis, (Editor). Washington D.C.: Georgetown University Press.
- [14]. Miller, J. (1983). *Many Voices- Bilingualism, Culture and Education*. London: Billing and Sons Ltd.
- [15]. Milroy, W.L. (2014). Exploring the Nature of Street Mathematics. *Journal for Research in Mathematics Education*, 25(3).
- [16]. Muzones, R. [2012]. In a personal Interview with Alma Jalandoni, cited in and Translated Hiligaynon short stories as supplementary materials for senior high school s in students of West Visayas State University. Unpublished Master's thesis. WVSU, Iloilo city.
- [17]. Oquendo, J.A. [1987]. Achievement of second year students in Algebra when taught in English and when taught in English supplemented with Aklanon. Unpublished Master's thesis, West Visayas State University, Iloilo City.
- [18]. Pagoso, C., et al.(1978). *Fundamental Statistics for College Students*. Quezon City: Sinag- Tala Publishers, Inc.
- [19]. Pascasio, E.M. [2007]. Language and Communication for National Development. In *Language Planning and the Building of a National Language*, edited by Sibayan and Gonzales, FCS, 328-340, Manila LSP and LSC, PNC.
- [20]. Quisumbing, L.R. [1995]. Three Language needed for Functional Literacy. *Education News*. 1 [9], 2.
- [21]. Sibayan, B.P. (1994). Philippines Language Problems. In *The Language Issue in Education*, edited by J. Acana, Congressional Oversight Committee on Education.
- [22]. Tabilog, F.G. [2013].The extent of Implementation of Filipino as a Medium of Instruction at the West Visayas State University as Perceived by Teachers. Unpublished Master's Thesis, West Visayas State University, Iloilo City.
- [23]. Trance, A.S. [1995].Why Teach Mathematics in Filipino?. A plenary paper presented during the 22nd Annual Convention of the Mathematical Society of the Philippines, PUP, Manila, May 27, 1995.