# Teaching Mathematics through Verbal–Linguistic Intelligence

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**ABSTRACT—** ***This paper is based on a quasi–experiment conducted last SY 2009-2010. From six sections of Pre–College Algebra course offered during first semester in Silliman University, one section was randomly chosen to be taught using verbal–linguistic approach and another section was chosen as the control. The control section made use of the traditional lecture method. Preests were given to both sections as well as posttests. The topics covered were (a) operations on algebraic expressions, and (b) factoring. There were 37 students in the experimental group and 33 in the control group.***

***After the data had been analyzed using the method of Analysis of Covariance, the computed F–value for the pre–test is 26.276 with p–value of 0.00 and the F–value for treatment between Verbal–Linguistic and Control is 5.817 with p–value of 0.019. The first p–value of 0.00 signified that there is a relationship between pre–test results and post–test results and hence, the difference in the means between the control and experimental groups is due to teaching methods. The second p–value of 0.019 on treatment implies that the group that received using the methods of Verbal–linguistic instruction performed better than those that received using the traditional lecture method.***

**Keywords** – Multiple intelligences, verbal-linguistic, mathematically under-prepared, pre-College Algebra, traditional lecture method

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## 1. INTRODUCTION

In Silliman University, Dumaguete City, students are admitted on the basis of their performance in the admission and placement examination (SUAPE) given days before the start of classes. This system of admission was in place in Silliman University until school year 2011-2012. The entrance exam requires that the incoming student should obtain a minimum percentile rank of 40 to be admitted to the University. A student who obtains a percentile rank of less than 40 are placed under probationary status as long as it is not lower than 20. Students obtaining below 20 are refused admission to the University.

In school year 2005–2006, an in–house study was conducted by the Silliman University Mathematics Department on the attrition rate in College Algebra from school year 2001–2002 to school year 2005–2006. From this study, it was found out that about 11% of those who took College Algebra got failing grades while about 37% obtained grades ranging from failure to below average. Thus, in school year 2005–2006, a study was conducted by one of the graduate students of the University to find out the factors that lead to the dismal performance of students in College Algebra. The study revealed that under–preparedness of the students to take up college mathematics is one of the major reasons [5]. This was identified through the mathematics component of the SUAPE as correlation analysis of the data showed that there was a high correlation between the SUAPE Math scores and College Algebra grades.

In school year 2006–2007, the administration of Silliman University adopted the proposal of the Mathematics Department to offer a non–credit course in College Algebra to those who obtained SUAPE Math scores of less than 25. The students were advised to take this course in preparation to the regular general education course College Algebra. In school year 2008–2009, an assessment study was then made to find out the effect of the program on the attrition rate. The findings were as follows: a) the percentage of failures dropped from 10.98% to 7.2% and b) the percentage of those who obtained grades that are below average decreased from 36.77% to 29.67% [7].

These findings led to the conclusion that there is a reason to believe that the college entrants who were advised to take up the Pre–College Algebra course were mathematically under–prepared. And for this, the next query of interest to the researcher was on the question on intelligence of the mathematically under–prepared college entrants. Specifically, based

on Howard Gardner's theory on multiple intelligences [2], what particular intelligence is dominant among the mathematically under–prepared students of Silliman University.

### *1.1 The Theory of Multiple Intelligences*

In 1983, Dr. Howard Gardner of Harvard University in Massachusetts developed the Theory of Multiples Intelligences which asserts that everyone has some level of intelligence and that everyone has their own intellectual profile. These intelligences were classified by Dr. Gardner into the following categories: Bodily–Kinesthetic, Interpersonal, Intrapersonal, Logical–Mathematical, Musical, Naturalistic, Spatial, and Verbal–Linguistic.

As discussed in the previous article, these eight can be briefly explained as follows: First, The Bodily-Kinesthetically intelligent people are obviously good at physical activities such as sports, play, and even dance. They prefer learning by using their body to communicate, by moving around, by touching materials or tools, and talking with people as they process knowledge through their body sensations. Second, those people that have Interpersonal intelligence have a number of friends as they constantly join groups and talk to other people. They learn by sharing information, comparing notes, relating with others, cooperating in group activities, and interviewing other knowledgeable people. Thus, they are very good at understanding human interaction, in leading and manipulating other, in organizing events, and in mediating conflicts. The third one, on the other hand, refers to people who have Intrapersonal intelligence. These people would pursue their own interests and would prefer to work alone as they learn best at their own pace. In addition, they are good at being original, following instincts, reflecting on their dreams and feelings, and understanding their own self. Fourth, the Logical-mathematically intelligent people like to do tasks dealing with numbers, to ask questions, and to explore relationships and patterns of objects around them. They learn best by organizing -- classifying and categorizing -- ideas and by working on abstracts; thus, they are good at reasoning and problem-solving. Fifth, there are those people whose intelligence deal with music — they love to hum tunes or sing, to listen to songs, and to play an instrument. Interestingly, they not only love to do these things, but they are good at it; thus, they learn best when there is rhythm and melody. The sixth one is the Spatially intelligent ones who like to build and design things, to draw sketches, to watch movies, and to play with machines. This is because they are good in reading maps and charts, solving puzzles, and sensing the changes around them. Thus, they would learn best when lessons involved using their mind's eye, such as visualizing or dreaming. Seventh, Naturalistic people are those, as the name implies, that are sensitive to the changes in their natural environment to which they are interested in nurturing and exploring. They learn best when they are asked to describe the features of things. Last, the Verbal-Linguistically intelligent individuals are those that learn best when they speak, hear, and see words as they love to tell stories, to read, and to write. Moreover, they are very good with memorization [6].

**Table 1:** Top Five Intelligences of Pre–College Algebra Students

| Intelligence | Mean | Standard deviation | Rank |
|---|---|---|---|
| Verbal–linguistic | 2.98 | 1.08 | 1 |
| Musical | 2.89 | 1.11 | 2 |
| Intra–personal | 2.72 | 1.20 | 3 |
| Inter–personal | 2.70 | 1.07 | 4 |
| Spatial | 2.68 | 1.11 | 5 |

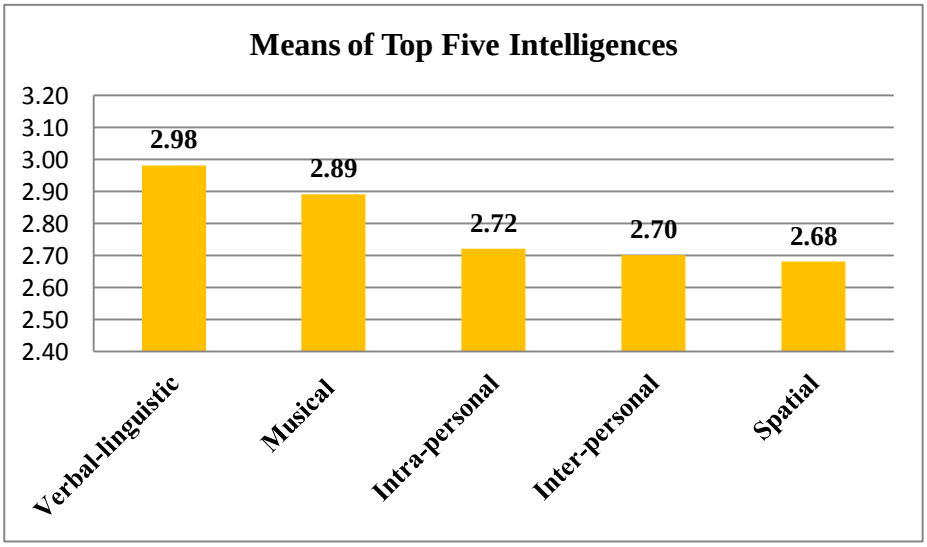


**Figure1:** Bar Graph of the Means of Top Five Intelligences of Under-prepared College Entrants

To answer the question on the dominant intelligence that the mathematically under–prepared students of the university possess, an intelligence inventory survey was conducted in July 2008 to 253 randomly selected Pre–College Algebra students in Silliman University using a researcher–formulated survey questionnaire. On a rating scale of 1 to 4, with 1 as the lowest and 4 as the highest, the top five intelligences of the Pre–College Algebra students are the following:

It would be interesting to note that Logical–Mathematical Intelligence ranks the lowest with mean of 2.22 and standard deviation (s.d.) of 0.98 and the dominant intelligence is verbal–linguistic intelligence.

### *1.2 Verbal Linguistic Intelligence*

Verbal–linguistic people are "word smart" people. They like to read, write, and tell stories. They are good at memorizing and learn best by saying, hearing, and seeing words. They love to play with words and can endure reading for hours. An example of such a person is Thomas Stearns Elliot. T.S. Eliot is an American playwright and poet who lived from 1888 to 1965. At the age of ten he wrote a magazine with eight complete issues each one included poems, adventure stories, a gossip column, and humor and he made all these in three days [2].

In teaching mathematics through verbal–linguistic intelligence approach, the teacher needs to engage students into oral discussion, debates, writing, storytelling, conferences, etc. He/She may ask the students to write an article on something of the child's interest, develop a newscast, explain an artifact, write a letter to someone about what happened recently in the family, or develop an advertising campaign [8].

In using the verbal-linguistic approach to teaching College Algebra to under-prepared mathematics students for this experiment in Silliman University, the teacher exerts effort in writing to the board the concepts he intends to impart to the students. In the lecture method, these concepts are normally recited and verbally discussed. He also allows the students to discuss by themselves how answers relate to the problem at hand or its relevance to practical applications.

### *1.3 The Traditional Lecture Method Approach*

At the Mathematics Department of Silliman University, generally the method of teaching mathematical concepts follows the following pattern: a) The teacher introduces the concept by writing the title of the concept on the board; b) Then the teacher discusses the concept by giving illustrations and examples that best elucidates the concept. This strategy has two labels. First, Freire [1] calls this "banking education", where the teachers are the depositors. They merely make deposits which the students passively receive, obediently memorize and repeat. Second is called traditional approach, according to Keast [4], wherein the students, in the classroom, do individual tasks that discourage interaction. Moreover, in this strategy, the teacher is an authoritative figure, and he imparts information to the students which is not necessarily relevant to the students' reality or life — not to mention, that when the students to tasks, the answers are already fixed, not giving enough opportunity for students to explore or to discover new things. Because of this, students perceive mathematics negatively. Basically, this is the method of teaching that is placed side-by-side with the verbal-linguistic approach in this experiment.

## 2. METHOD

In SY 2009–2010, a quasi–experiment was conducted on the use of the technique based on verbal–linguistic intelligence versus a traditional lecture method. From the six sections in Pre–College Algebra course offered during that semester, one section was randomly chosen to be taught using the verbal–linguistic approach. Another section was chosen as the control. Pre–tests were given to both sections as well as post–tests after the research period. The topics covered were a) operations on algebraic expressions, and b) factoring. There were 37 students in the experimental group and 33 in the control group.

The statistical tool used to analyze the data was Analysis of Covariance. This tool is appropriate for this type of data since ANCOVA has a way of telling whether sampling error exists in the course of the experiment. It examines possible relationship that may exist between pre–tests and post–tests. If there is none, then an error may have occurred in the sampling and the difference or non–difference in the means between pre–test and post–test may not be significant.

After the data had been analyzed using the method of Analysis of Covariance, the computed F–value for the pre–test is 26.276 with p–value of 0.00 and the F–value for treatment between Verbal–Linguistic and Control is 5.817 with p–value of 0.019. The first p–value of 0.00 means that there is a relationship between pre–test results and post–test results and hence, the difference in the means between the control and experimental groups is due to teaching methods [3].

**Table 2:** ANCOVA Table on Traditional Method vs. Verbal–Linguistic Method.

| Source | Mean Square | F | p–value |
|---|---|---|---|
| Verbal–Linguistic vs. Control Pre–test | 9611.9 | 26.27 | 0.00 |
| Verbal–Linguistic vs. Control Treatment | 2127.6 | 5.817 | 0.019 |

The second p–value of 0.019 on treatment implies that the group that received using the methods of Verbal–linguistic instruction performed better than those that received using the traditional lecture method. The difference of the means between the pre–test and post–test is as follows:

**Table 3:** Post–Test of Traditional and Verbal–Linguistic Methods

| Methods | Mean | Std. Deviation | N |
|---|---|---|---|
| Verbal–Linguistic | 76.6216 | 20.34201 | 37 |
| Traditional Method | 69.4242 | 24.51024 | 33 |

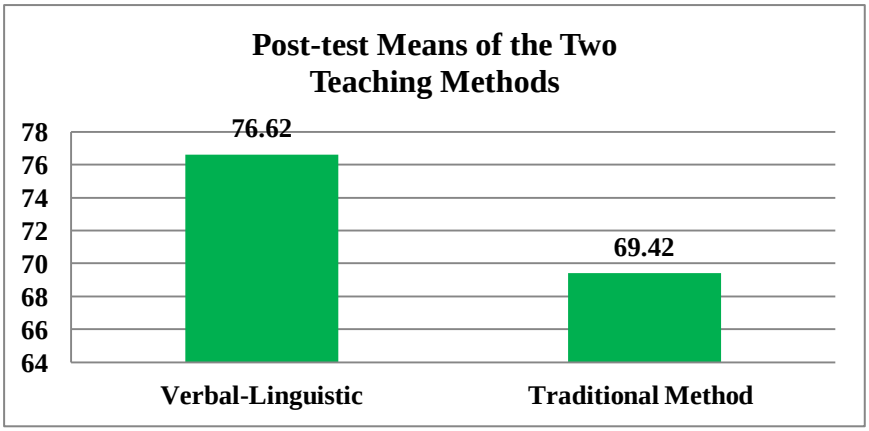


**Figure 2:** Bar Graph on the Post-test Means of Verbal-Linguistic and Traditional Methods

## 3. SUMMARY AND CONCLUSION AND RECOMMENDATION

In this paper an intelligence survey was conducted on mathematically under–prepared students in order to devise a better approach to mathematics teaching. It was found out that the dominant intelligence that the mathematically under–prepared students possess is on verbal–linguistic. When implemented to the students and compared with the traditional approach, it was found that the students who received instruction using the verbal–linguistic approach performed better than the students who received instruction using the traditional approach. The comparison was through pre–test, post–test approach using analysis of covariance. The p–value on treatment was 0.019.

One approach to improving methods of teaching is by adopting Howard Gardner's theory of multiple intelligences in mathematics classrooms. In this theory, it is believed that people differ in levels of intelligence and intelligence profiles. Thus, in order to formulate a better approach that could enhance the teaching of mathematics, it is recommended that schools conduct their own intelligence survey to their mathematics students and from there devise a method that suits best to their level. The following books are recommended as guide: *So each may learn: Integrating learning styles and multiple intelligences* [8], and *Math for humans: Teaching math through 8 intelligences* [9].

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