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Is Synchrony of Intelligence and Approach Affects the Mathematical Learning of Student- Athletes?

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Abstract
Applications of mathematical concepts in the real world are the main motivation of all educators in the process of knowledge-transfer. This study explored if the mathematical concepts presentation matched the existing intelligence of the students. Using experimental research design, involving twelve (12) grade 10 students selected purposively. Howard Gardner multiple intelligence tests were used as research instruments to measure the Multiple Intelligence test. Data were gathered from experimental and control group was statistically analyzed using software on statistical package for social sciences. Based on statistical results, findings revealed that during pre-test both group showed equal performance in a trigonometry-standardized test. In the post-test performance scores of students from both groups significantly increased and there was no significant difference between the mean-gain scores of the two groups. However, t-test results showed that there was a significant difference between the pretest and posttest scores of each group, and significant difference of students' performance from experimental and control group was noted. Thus, bodily-kinesthetic approach in teaching is an effective alternative way in teaching Trigonometry.

Keywords: bodily-kinesthetic approach, synchronized instruction, multiple intelligences, Tabango, Leyte, Philippines.

Introduction

Every person is unique and possesses unique intelligence that is not focusing to only one aspect but most of the time multiple intelligences. To cater the uniqueness of individual and recognize their multiple intelligences state universities, colleges and basic education are engage to develop students multiple intelligences. Every universities, colleges, and basic education organized an athletics group of students as part of their mandate and even in the curriculum itself not only in the Philippine Education but also across other countries as well. However, athletic students may face academic difficulties in maintaining their academic performance because they are bliss for having an inimitable college experience that balances athletic participation, academic performance, and involvement in extracurricular activities. The times of the student-athletes

become more hectic as they entered or joined in a certain sport. Furthermore, teaching methods and approaches use by the teacher may or may not suit to their interest particularly athletes are more incline to a bodily kinesthetic approach.

Survey conducted by the U. S. Department of Education on students who were playing sports revealed that students who participate in sports are three times more likely to have a grade point average of 3.0 or better" compare to the students who focuses on the academic performance. This survey holds true also in the Philippine setting since students who are engage in sports particularly in college had busy schedule, stress, pressure and most of the time missing their classes particularly if they are part of the school sports varsity. Student athletes encountered difficulty in catching up their classes to make-up their absences. Larisma, C., Centillas, C., Lumbay, C., & Pajaron, G. (2017), mentioned that there are many factors considered that could affect students' performance in trigonometry. They said that time element; students' preparedness and teaching methods might indirectly or directly affect students' academic performance.

Student athletes faced difficulties in managing and balancing their sports time and academic time. Nevertheless, despite of this difficulty, still many students engage more in college varsity because of the opportunity given to them such as free tuition fee and monthly allowance. The schedules of college athletes have even busier for they will be having workouts in the morning; sport session, trainings, assemblies, and only minute time allotted to study (Allsopp, D. H., Ph. D., Kyger, M. M., & Lovin, L. H. (2007). Studying is the common problem among student athlete because they are always tired of their sports training or they busy on sports competition to other universities. Being a student and an athlete at the same time is one of the most challenging task and nerve-wracking things ever. The stressing works of a student athlete every day, visiting other schools for practice games, hinder their preparation to study their lesson.

Understanding the academic life style of student-athletes is very crucial particularly in the part of the teachers. Teachers must extend their efforts in dealing with the student-athletes through teaching approaches that match the intelligence of the students they taught. An essential teaching approach that is congruence to the learning style of the student athletes is very important so that these students can easily catch up the lesson despite of their hectic and tiring academic schedules. This manner would elicit active participation from students and can easily transmit knowledge and learning. Matching the teaching methods to the learning preference of the learners significantly affect students participations in the class (Valdez, 2017). Usually the student-athletes come to colleges have a different academic backgrounds, culture, behavior and profile characteristics, and they come to institutions for the preparation of future life. This kind of students requires an approach that would easily be catch and understood by them. Competent teachers should acknowledge students individual differences and respond their differences for the learners to become more participative and challenging (Wilhelm, J. G., & Wilhelm, P. J., 2010). Twigg, VaniVeikoso (2010) said that inquiry-based teaching approach is effective in teaching and promote students values in learning.

In studying mathematics particularly trigonometry, mathematical literacy is very important. Mathematical literacy is one's ability to understand the applications of mathematics in context such as making wise judgments and meet the needs of individual's life. Larisma et al. (2017) pointed out that to facilitate effective learning in trigonometry, vodcasting can be used as alternative way in learning mathematics (Trigonometry) concept. Teaching trigonometry using real-life experiences and situation such as cheque book, the simple computation of income in a business, totaling the expenses, returning change, budgeting, and other day-to-day activities makes students learn faster the concepts being taught to them (Tirri, K. & Nokelainen, P., 2012). Thus, mathematical literacy played a great role in the community and the world at large.

The necessity to learn Mathematics effectively prompt the researcher as future teacher to explore teaching techniques that help enhance learners mathematical ability specifically among learners that are athletic in nature. Student athletes also give prestige to the school as they go and compete with other school. In return, they must be given additional/special treatment that will enable them to cope up and make them enjoy while they learn. Meeting the individual differences of the learners is an effective strategy to assure that no learners will be left behind (Wilhelm, J. G., & Wilhelm, P. J. (2010).

Moreover, the researchers were motivated to explore the effects if students intelligence is synchronize with the teaching approach, more specifically incorporating/relating the discussion (Trigonometry) to the intelligence (Bodily-Kinesthetic) the students possess. Determining the effect of incorporating/relating the teaching-learning process to the intelligence of the students (Bodily-Kinesthetic) and mathematical learning acquisition of students is the main goal of the researchers.

Significance of the Study

The researcher believes that the results of this research study are important to the following:

Students: They are the major recipients of the benefits of the study. If found effective, the instructional material being tested will facilitate learning; thus, improving their scholastic achievement in Mathematics.

Instructors: The strategy that was used in this study can be utilized as supplementary instructional material by the teachers handling Trigonometry. It could also be a model so that other instructors will be encouraged to look for or possibly develop their own strategy for the particular subject they are teaching.

Curriculum Planners: The study may show some of the advantages associated with the bodily-kinesthetic instruction; thus, it will help in providing baseline information for its best effect.

School Administrators: With the results of the study, they will be guided in the selection of tools for modifications and improvements of school progress and the delivery system of instruction. This may help to justify the support for student-athlete program in the school.

Future Researchers: This study will motivate them to pursue their research since this study can be used as basis for their future study. This can also give them an idea on how to structure their own instructional plan based on their students' needs and interests.

Statement of the Problem

Many factors will likely affect the learning achievement of the student. One of these factors is the strategy of instruction, Dufour et al (2006). Mathematics is branded as hard subject and it gets harder for the student athletes because of their very hectic schedule. This situation of them can be aided through a teaching method that would somehow utilize their athletic personality in learning Mathematics. Since athletes are sports minded, we the researchers try to investigate the effect of integrating/relating every piece of Mathematics discussion to sports to match their preference and could make the discussion interactive fun and exciting leading to fast acquisition of the concept.

Methods

Research Design of the Study

The study used the true experimental research design through pre-test and posttest in trigonometry concepts. Two groups were pre-tested, the control and experimental group prior to the application of treatment in the experimental group. After administering the pretest, the control group was exposed to the traditional or conventional way of teaching mathematics (trigonometry) whiles the experimental; group was exposed to the treatment by integrating/relating every piece of Mathematics discussion to sports through bodily-kinesthetic approach. At the end of the experiment, both group were given the same post-test, and the data were computed statistically using statistical software.

Collection of Data

Data gathering procedure commences through a letter of request that was sent to the school principal noted by the head of instruction, seeking permission to conduct the study in the target school. After the approval, the researcher met the target respondents for the orientation. After orientation and establishing rapport with them, they were given a pre-test using the standardized test in trigonometry. Afterwards, the participants were split into two groups; experimental and controlled group. Each group underwent the same set of topics. After the duration of the study, both groups were subjected to a posttest. Data from the scores are tabulated, collated, analyzed and interpreted according to specified query.

Treatment of Data

The researchers have identified the following statistical tool to provide analysis and further interpretation of the present study.

Arithmetic Mean: This was utilized in obtaining the pretest and posttest mean scores and the mean gain scores of each of the two treatment groups.

t-test for two correlated samples: This was used to determine the significant difference between the pretest and posttest means of each group at a level of significance of 0.05. The said test was employed to find out if the control group and the experimental groups gained from their respective instruction.

t-test (for independent samples): This was used to determine the significant difference between the mean gain scores of the two treatment groups at a level of significance of 0.05.

Findings

Table 1: Pre-Test, Post-Test and Mean Gain Scores of the Bodily-Kinesthetic and the Traditional Groups

Group	Number Of Cases	Pretest Mean Score	Posttest Mean Score	Performance (Mean Gain Score)
Traditional Group	6	5.33	6	.67
Bodily-Kinesthetic Group	6	4.67	7.33	2.66

Table 1 shows the scores of the two groups consisting of 6 number of cases each. Each method shows a remarkable increase from the pre-test to the posttest scores, which signifies improvement. The pretest means of the two groups has a noticeable variation; it differed by .66 with the traditional group higher than the experimental group. The posttests mean score of the subjects exposed to two methods of teaching varied for a couple of margin.

The difference among the pre-test and post-test mean scores of the traditional group is .67. A test for significance of this difference obtained a computed t-value of 3.16 which is greater than the critical t-value (at level of significance, $\alpha = 0.05$) of 2.57. This means that the research hypothesis which states that the posttests mean scores of the traditional group are larger than their pretest mean scores is accepted. Similarly, the difference among the pretest and posttest mean scores of the experimental group is 2.66 and the computed t-value for this difference is 5.05. Again, this is greater than the critical t-value (at $\alpha = 0.05$) of 2.57. This means that the research hypothesis which states that the posttests mean scores of the experimental group are larger than their pretest mean scores is accepted.

From the information obtained above (Table 1), the researchers infer that the improved mean scores of both the control (traditional) and experimental (Bodily-Kinesthetic) group are results of the respective teaching methods utilized by both groups. With respect to the performance/ mean gain of the two groups, there is a difference of 1.99, in favor of the experimental group. The difference of the two groups does not mean that the experimental group had achieved more than the control group or the other way around but it signifies that the treatment, which is integrating/relating every piece of Mathematics discussion to sports, is effective.

Table 2: t- test Score of the Pretest Scores of the Bodily-Kinesthetic and the Traditional Groups

Pre-Test Mean Scores		Critical t-value	Computed t-value	Interpretation at $\alpha = 0.05$
Bodily-Kinesthetic Group	Traditional Group			
4.67	5.33	2.23	0.39	Not Significant

Table 2 highlights the homogeneity of the two groups in terms of their performance in the pretest. The interpretation of the means of the two groups is not significant, meaning each group, which were the subject of the study, were identical in terms of their performance in Trigonometry.

Table 3: t-Test Score of the Mean Gain Scores of the Experimental and the Control Groups

Group	Number of Cases	Mean Gain Scores	Critical t-value	Computed t-value	Interpretation at $\alpha = 0.05$
Traditional	6	.67	2.23	2.78	Significant
Bodily-Kinesthetic	6	2.66			

Table 3 shows the differences of the mean gain scores of the two groups. The traditional group has a couple of points lesser than the control group. This may mean that the bodily-kinesthetic instruction was more effective than the traditional instruction. To verify this, a t-test for

independent samples at a level of significance, $\alpha = 0.05$, was done and obtained a t-value of 2.78. This is higher than the critical t-value of 2.23, so, the null hypothesis is not accepted and thus, the mean gain score of the experimental group is significantly higher than that of the traditional group and further imply that the bodily-kinesthetic method of instruction is more effective.

From the information obtained above, the researchers infer that the improved mean scores of the traditional and experimental group are results of the respective teaching methods utilized by both groups. However, Bodily-Kinesthetic teaching method is more effective than the traditional teaching method.

Discussion

Based on data gathered, the pretest mean scores of the traditional and Bodily-Kinesthetic groups were 5.33 and 4.67, respectively. The posttest mean scores of the traditional and Bodily-Kinesthetic groups were 6 and 7.33, respectively. Considering the mean score of the respondents in the pre-test and posttest of the control (traditional) and experimental group (Bodily-Kinesthetic), was revealed that both groups' scores increased and that there was a meaningful change between the pre-test and post-test scores of each group. The mean gain scores of the two groups were 1.33 and 3.33 respectively. Analyzing the mean gain between the two groups, obviously showed that the experimental group obtained higher mean gain compared to the control group. These results implied that integrating/relating every piece of Mathematics discussion to sports through bodily –kinesthetic teaching approach enhance the athletics students' mathematic performance.

Results in the t-test for independent samples at 0.05 level of significance, a computed t-value of 2.78 was obtained and it was significantly larger than the critical t-value of 2.23. This entails that there was a meaningful difference among the mean gain scores of the control group (traditional) and experimental (Bodily-Kinesthetic) group. Therefore, knowledge acquisition of the athletic students is faster when there is a synchrony of intelligence of learners and the teaching methods used by the teacher.

Study of Kharb, Samanta, Jindal, & Singh (2013) concluded students learning preference has significant relation to the teaching-learning process. Tulbure (2012) also pointed out the significant relation of teaching approaches and multiple intelligences of the learners. Teaching methods must be flexible enough to cater the multiple intelligences of the learners and individual differences. Recognizing learning abilities of each learner is very important to determine appropriate teaching methods to be used (Cassidy, 2004). Hence, results of this study are congruence to the findings of the researchers cited pointing out the matching of teaching methods and learners learning preference or multiple intelligences.

Conclusion

Based on the findings of this study, the researchers concluded that the bodily-kinesthetic method of instruction was more effective than traditional instruction because there was a meaningful difference among the mean gain scores of the control (traditional) and experimental (Bodily-Kinesthetic0 group. In addition, it can be deduced that knowledge acquisition in Trigonometry is faster using Bodily-Kinesthetic Teaching Method than using the traditional method. It further suggests that student-athlete is not to be singled-out as low performer considering the result of the study. Nzesei, M. (2015) research findings justified that individual have no common learning preference, so teachers must use multiple teaching techniques in teaching.

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