STRENGTHENING THE STUDENTS' ACHIEVEMENT AND REDUCING ANXIETY IN MATHEMATICSTHROUGH KINESTHETIC TEACHING TECHNIQUE

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ABSTRACT: *The study determines the influence of the kinesthetic teaching technique on the students' achievement scores and anxiety in Mathematics particularly in Trigonometry. The kinesthetic teaching technique was compared to manipulative with students discourse technique which was claimed by many researchers to be a good teaching strategy. It was conducted to the junior high school of Misamis Oriental General Comprehensive High School, Cagayan de Oro City, Philippines. Results of the analysis revealed that the achievement scores of the students exposed to kinesthetic teaching technique were as good as those students exposed to manipulative with student-student discourse. Also the mathematics anxiety of the students were significantly lower as they exposed to kinesthetic teaching technique compared to the students exposed to manipulative with student discourse.*

Key word: Kinesthetic technique, mathematics achievement and anxiety

1. INTRODUCTION

The 21st century generations live in the era of accelerating change. Society is changing very fast so, students will have to develop a skills that can cope to the fast changing world of work after schooling.

Creativity is one of the skills that everyone must have to develop.On the part of the teachers,it is useful in developing an activities that can be incorporated in the teaching process which may result to a higher achievement. Higher mathematics achievement is the aim of all academic institutions for a global competitiveness.However, 21st century learners have diverse learning style. They do not engage in the learning process if the teachers used a pure lecture method. It calls for the teachers to have a varied teaching strategies that can make teaching-learning process productive and meaningful .

Trigonometry is one of the subjects which students have difficulty. At Misamis Oriental General Comprehensive High School, Trigonometry is usually taught using a lecture method with the aid of calculators,Trigonometric table and protractors. Most often, students' activities consist of purely answering the problems taken from books. The students have difficulty in understanding the concepts thus,affecting the academic achievement as well as the National Achievement Test (NAT) result which for many years were far below the standard [1]. The NAT is a Philippine-standardize test given at the end of the school year to determine the students' level of achievement. in The poor rating of Mathematics in NAT is alarming so a considerable action must be taken, partcularly on the teaching strategies.

Touval [2] in her article published in the National Counsel for Teachers in Mathematics entitled Teaching the perpendicular bisector A kinesthetic approach , stated that the kinesthetic approach of teaching has numerous pedagogical advantages and can be adapted to the teaching of mathematics. She said that the students exposed to the activity remembered the lessons throughout the year. The idea of Touval may be used in the classroom to see if it can help uplift the achievement of the students. The researcher consider it as an intervention for the experiemental group.

Taclay [3] introduced games in teaching Geometry and conducted a study on the effect of the method. In his study, he found out that achievement scores of the students who were exposed to mathematical games strategy was higher compared to the scores of the students taught using the chalk and talk method. He recommends the use of mathematical games strategy in presenting and discussing lessons in mathematics . Mathematical games also involve kinesthetic activities, thus it can be the basis for the implementation of the study but in thearea of Trigonometry.

Griss [4] believedthat kinesthetic learning construct memories connected to time, place and emotions, which are called episodic encoding. The students activate and integrate physical,emotional and cognitive responses to what they are learning, making it more meaningful.Some articles ofthe National Council for Teachers in Mathematics introduce a kinesthetic activities in teaching mathematics. Tu [5] in his article: A kinesthetic approach to horizontal shift, suggested a kinesthetic activity for the students inside the classroom that facilitates the understanding of a horizontal shift. He introduced an activity that required the students to walk in one big xy-plane drawn on the floor and locate the point assigned to him which coordinates are written on her back. The activity motivated the students to learn the concepts in Plane Trigonometry.

Hoffman and Snapp [6] stated that games can be used to illustrate mathematical ideas. They have proved that the use of a die game could make an understanding of the connection between relative frequency and probability easier for the students. Simpon [7] stated that game is a good motivation of the students in teaching mathematics for promoting healthy competition. Games in mathematics can stir the imagination and thinking of the students. Through mathematical games students can be critical and logical thinkers.

Kinesthetic activities in mathematics class may be introduce in a form of mathematical games or a mathematics trail.

Meanwhile,discourse is necessary in the learning process of the students to convey their ideas clearly. Communicating the classmates about the mathematics concepts may be the aid for

more retention and deep conceptualization especially when it happens in the environment and situation that the students can really express their thoughts without prejudice.Pagon and Polizon [8-9] in their study about discourse in their mathematics class revealed that discourse among students and teachers was effective strategy to stir the thinking of the students. Also it motivated the students to participate the class discussions which leads to the understanding on mathematical concepts that was introduced.The researchers concluded that students exposed to discourse strategy of teaching obtained a higher ahiecvement level in mathematics.

Martinez [10] stated that anxiety may be a greater barrier to mathematics learning than supposed deficiencies in school curricula or teachers preparation. Mathematics anxiety of the students may cause also the low achievement level of the students which the researcher wants to address in this study. Mamaclay [11] in her study on Math trail and manipulatives revealed that mathematics anxiety of the students was reduced as they were exposed to the math trail and manipulatives.

Parcutilo, *et al*. [12] in her study on the effect of quiz buddy, a pair assessment on students' performance in Calculus, mathematics anxiety and retention level found out that students' who were assessed with quiz buddies had decreased their level of test anxiety. The result may be interpreted that when the students has the company in doing the tasks gradually he will then develop the confidence and will be able to do the similar task again alone.Lomibao, *et al.* [13] in her study about the influence of mathematical communication on mathematics performance and mathematics anxiety revealed that the students' exposed to mathematical communication approach have significantly reduced their mathematics anxiety. Making a mathematical communication may be similar to the discourse use in the study. Ubalde, *et al*. [14] determined the effects of bridging the knowing-doing gap through zone of generativist on the grade six pupils' achievement and retention score and on their anxiety towards mathematics. She found out that the bridging of the zone of generativity had significantly lessened the pupils' anxiety towards mathematics. The bridging the knowing –doing gap may be similar to practical activities and approaches that are used during the mathematical game process.

In this view, the researchers incorporated the kinesthetic activites in teaching Trigonometry and see if its effect is comparable to using manipulative and student discourse.

2. Methodology

2.1 Research Design

The study applied pretest-posttest quasi-experimental control group design. The tests in achievement and anxiety self test were given to both control and experimental groups before and after the treatment respectively. The pretests for control and experimental groups were administered in the same day to avoid biases so with the posttests. Four groups were randomly selected and assigned as control and experimental groups. The scores of the pretests and posttests were used in the analysis of the data.

2.2 The Instrument

The study used two kinds of questionnaires: teacher–made achievement test in Mathematics with reliability coefficient of 0.82 and the Freedman's Mathematics Anxiety self- test [15]. with reliability coefficient of 0.64.

2.3 The experimentation process

At the start of the regular classes, the experimental and control groups were given orientations on how the class would be recited. For the experimental groups, lectures were given every Monday and Tuesday covering the topics good for the week based on the Department of Education National Competencies. After the lectures, the teacher gave instruction to the students on what materials to bring for the activities. Wednesdays, the students had their group activities outside the classroom appropriate to the topics. Thursdays similar activity was done by pair so that every student had the opportunity to play and master the game. The kinesthetic activities that were done outside and inside the classroom were locally named as Trigo-tripand cards game. Score sheet was given to the players for every activity so they could record their answers while playing the game and also record their score after the game. . The scores in the activities served as their quizzes to be used in giving grades but not included in the analysis of the data. Fridays, students were asked to write their reflections about how the activities helped them understand the mathematics concepts introduced , what they learned, what they did not learn and what they felt about the activities .

Meanwhile, the control groups had their class inside the classroom and were given also activities that could enhance learning by using board works, seat works, oral recitations, student-student discourse using manipulative and doing assignments by group and by individual. From Monday to Wednesday, they were given lecture discussions on the lessons such as definition of mathematical terms, concepts and processes covering the competencies for the week. During the first 15-20 minutes every day students had oral recitation and board works on the past lessons. Every body was encouraged to participate in the activities during and after the discussions. Thursdays the student-student discourse of the previous lessons was done by pair and in Fridays students were given a weekly quiz.

In the duration of the treatment, two mathematics teachers were asked to observe and to give comments on the activities following a check list on what to observe. The comments were compiled for the improvement of the study . The scores of the students during the pretests and posttesst in achievement test in trigonomrtry and anxiety self-test in mathematics were analysed usingANCOVA to determine the difference.

3.RESULTS AND DISCUSSION

Table 1 : Summary table of ANCOVA of the Mathematics Achievement test results.

Source of Var'n	df	SS'	MS'	F-ratio
Methods	1	17.14	17.14	1.14
Error within	103	1432.18	15.08	
Total	104	1449.32		

The table shows the analysis of covariance of the achievement scores in Trigonometry. With regards to the methods of teaching , the analysis yielded a computed F- ratio of 1.14 which was lesser than the critical value at 0.05 level of significance. The result allows the researcher not to reject the null hypothesis that there is no significant difference on the achievement scores of the students in Trigonometry as influenced by the two methods of teaching. It means that the performance of the students who were exposed to manipulative like Trigo-clock with student–student discourse was statistically comparable to the performance of the students who were exposed to kinesthetic activities. It implies that the two methods of teaching used in this study have the same influences on the students' achievements scores in mathematics. It implies further that using kinesthetic teaching technique in class was as good as using manipulative with student-student discourse.It can be noted that researchers like Touval [2], Taclay [3], Griss [4] and Simpon [15] claimed that activities which involve movement have a good effect on the academic performance of the students. Also Mamaclay [11] , Polizon [9] and Pagon [8] concluded in their research study that discourse have a positive effect inthe achievement of the students in Mathematics. The result of the study indicated that kinesthetic teaching technique and manipilative with student-student discourse had similar effect on the achievement of the studemts in mathematics.

Table 2:Summary table of ANCOVA of the Mathematics Anxiety Self-test results

Source of Var'n	df	SS'	MS'	Prob. value
Methods	1	1.23	1.23	0.028*
Error within	95	23.55	0.25	
Total	96	42.68		

**Significant at 0.05 level*

Table 2 shows the result of the analysis of covariance of the mathematics anxiety self-test of the control and experimental groups.The analysis yielded a computed F-ratio of 4.96 with a probability value of 0.028 that is lesser than the critical value at 0.05 level of significance. The result allows the researcher to reject the null hypothesis that there is a significant difference of the mathematics anxiety self-test of the students as influenced by the methods of teaching. The analysis revealed that students who were exposed to kenisthetic teaching technique had a lower mathematics anxiety as reflected in the mean of 2.88 for the control group and 2.60 for the experimental group during posttest.Itimplies further that using kinesthetic teaching technique had greater reduction of mathematics anxiety than those students doing the lesson inside the classroom.This means that lesson done through games could reduce fear in mathematics. The reduce of mathematics anxiety of the students who were exposed to kenisthetic technique may be attributed to the experiences of the students during the game process. Noted that during the game process, students could freely move, talk and discuss the strategies to be applied so that they win. They can even make an illustrattion and discuss among themselves the concepts needed in the game No. The result conforms with the result of the study of Mamaclay [11], Parcutilo, *et al.* [12], Lomibao, *et al.* [13], Ubalde, et al. [14], revealed that mathematics anxiety of the students was reduced as they were exposed to the different activities where in they can communicate to their classmates freely.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions were formulated: Kinesthetic teaching technique is effective to increase the mathematics achievement scores of the students. It can also reduced the students' anxiety towards mathematics. The researchers recommend that mathematics teachers may use kinesthetic teaching technique as an alternative teaching intervention to break the monotony of the class and also improve mathematics achievement of the students. It may be used also to reduce the mathematics anxiety of the students. Similar studies may be conducted with a wider scope using different population, settings and time.

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