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Research Paper

Collaborative Learning, Gender Groupings and Mathematics Performance

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ABSTRACT: *The study was conducted to find how students perform in class if they work in groups. It also wanted to find out which gender groupings will students be working comfortably and obtaining better results. Experimental research design was utilized where the subjects were randomly assigned. The subjects of this study was composed of 9 groups, three all-male groups, three all-female groups, and three mixed groups. Using ANOVA, data revealed that the subjects' formative tests mean score had no significant difference which implies that subjects if working by himself/herself obtained more or less similar results due to they were randomly assigned. While the collaborative learning where the subjects worked in different gender groups showed that there was a significant difference in their performance where all-female groups obtained the highest mean score followed by mixed groups implying that if subjects work with whom they are comfortable would have better results. In the Math achievement test which was taken individually posted that there is a significant difference in the mean scores obtained due to the level of improvement of their learning which could be attributed to whom they worked and learned the concepts with.*

Keywords - *Collaborative learning, Gender groupings, Math performance*

I. INTRODUCTION

"The development of learning in small groups in higher education has occurred, in part, because of strong evidence indicating that students working in small groups outperform their counterparts in a number of key areas. These include knowledge development, thinking skills, social skills, and course satisfaction" (Davidson, N., & Major, C. H., 2014).

Zurita, Nussbaum and Salinas (2005) pointed out that how the participating groups are composed, is one of the most important decisions to be made in a collaborative learning activity. These compositions produce different learning and social interaction results. The ability to change the group member composition in real time and dynamically enables the leveling up of learning results and improvements in the participants' social relationships. Changes in composition also facilitate the analysis of the best criteria to be used in a determined activity.

Some forms of group learning have become more mainstream than others, and these provide useful direction for faculty to consider as they weigh the options. The way children learn can affect how well they learn. There are studies which indicate that boys and girls have different styles for learning, and student success can be linked to learning styles (Hein & Budny, 1999).

Hall (2008) stated that boys' and girls' brains develop differently. While girls develop verbal/linguistic skills early, boys' brains concentrate on spatial and kinesthetic intelligences. Boys need more movement than girls while they learn which often results in discipline difficulties in the classroom.

Roschelle & Teasley (1991) stated that "collaboration may be described as the mutual commitment of members of a small group to coordinate their efforts in order to solve a problem. Furthermore, in such an environment students can acquire new skills, ideas and knowledge by working together to build solutions to educative problems" (as mentioned by Zurita et al., 2005).

Mathews (1992) found that high-ability students prefer cooperative learning in homogeneous ability groups than heterogeneous ability groups. This means that students who are academically more inclined prefer to form a group with those who are as equal or more academically inclined rather than being grouped with a student of lower ability (as mentioned by Samsudin, 2006).

It has been shown that male and female students interact with group members differently and that in mixed gender groups males tend to dominate (Guzzetti and Williams, 1996). Therefore it is proposed that using single gender groups will enable female students to more actively participate. This study will explore the effect that arranging cooperative learning groups by gender has on the performance of students and their level of active

engagement.

It is on this light why the researcher is motivated to pursue this study, to find out how the students will perform if they work in groups. Moreover wanting to find out at what kind of groupings they will be performing better.

Statement of the Problem

The study would like to find the effects of Collaborative Learning and Gender Groupings in the Mathematics Performance of Bachelor of Elementary Education (BEED) Students. Specifically, this study sought to answer the following questions; (1) What is the performance of the students in the following; a) Formative test, b) Collaborative learning activities, c) Achievement test? (2) Is there is a significant difference in the performance of the students in the following; a) Formative test, b) Collaborative learning activities, c) Achievement test?

Hypothesis

The study will be guided by the following null hypothesis: There is no significant difference in the students' formative test, collaborative learning activities and mathematics performance in the different gender groups.

Significance of the Study

This study is not to decide if the collaborative learning and gender groupings is the best approach to teaching. Instead, the results of this research can be utilized by educators to determine areas for improvement in making learning process in a classroom setting be more successful.

To the students, findings of this study will beneficial since they are the center of any classroom setting. They need to know when and how they can perform better in class. To the teachers, findings of this study will give them ideas to determine how they can make their teaching effective. To future researchers, findings of the study can be used to validate similar or related studies in the future.

Conceptual Framework

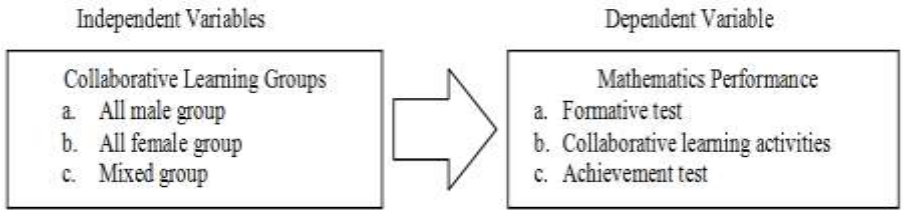

Fig 1. The Conceptual Framework of the Study

Scope and Limitation of the Study

This study was conducted in Eastern Samar State University College of Education during the second semester of School Year 2015 – 2016. The subjects of the study were third year Bachelor of Elementary Education (BEED) students who were enrolled in Math 321.

In interpreting the results of this study, there are several limitations to be considered. These limitations are related to the subjects, the length of the study, and the material used in the course. The subjects of the study were the third year BEED students with very small number of male students. The instruments used are prepared by the instructor. Another limitation of the study was the length of the experiment. A six – week implementation of study only was followed due to some class interruptions.

II. RELATED STUDIES

In a study of students with strong preferences to learning alone or learning in groups, Wallace (1993) found that those preferring to learn alone "evidenced statistically higher mean lesson-test scores than those who were identified as preferring to learn with peers." Wallace suggested the possibility that this result is due to a traditional structure in the classroom, and that the organizational pattern in the classroom had not matched a preference to working with peers. On the other hand, memory research indicates that children remember best by discussing what they have learned in groups, practicing and using what they have learned, and by teaching others (Madrazo & Motz, 2005).

Culbertson (2010) emphasized that females contributed to small mixed gender groups just as they would within the larger mixed gender classroom and that there is a notable difference in the approach each gender takes to learning physics and interacting with others. Male students are more likely to make predictions

quickly, avoid questions to which they do not know the answer, provide answers and look for concrete solutions. Female students, on the other hand, tend to raise questions about the content, do not present solutions right away, invite other members of the group to participate, and look to build consensus. It has also been shown that male and female students present their objections to a learning group in very different manners. Males tend to disagree more than females in a learning group. Males require the group members to give evidence to any statement that is made that contradicts their reasoning for a particular phenomenon, whereas female students tend to use an indirect approach by raising questions and stating possibilities to raise their objections (Guzzetti et al., 1996). Furthermore it has been shown that male students tend to ignore the female students' ideas and interrupt females as they try to explain their ideas.

As mentioned by Kowaliw, that there are also studies that show that this method is nonconductive to learning. Peterson, Janicki, and Swing (1981) came to the conclusion that students who receive help from their peers may or may not improve their performance. Harrison and Covington (1981) found that low achieving students are hindered by the fact that they may be holding their group back in a task. When comparing homogeneous male and homogeneous female pairs in cooperative tasks, researchers have come to many different conclusions. Some research has found that male pairs are more effective than female pairs in cooperative learning tasks. Webb (1991) found that male pairs accomplish tasks in the shortest amount of time possible and are very competitive in their tasks. Other research states that female pairs are more efficient in cooperative learning. Cohen (1994) found that the females work is more deliberate and consistent to make sure that the task is completed and that the fewest amount of mistakes are made.

The conclusion of researchers such as Webb (1991) is that homogeneous pairs outperform heterogeneous pairs. Although boys competed and girls cooperated, both types of pairs still achieved their goal of getting the computer task done effectively. This was not the case with heterogeneous pairs because male traits of competition and female traits of cooperation kept both children from working together.

In the study of Sonya R. Porter Draper (2004) "The Effects of Gender Grouping and Learning Style on Student Curiosity in Modular Technology Education Laboratories ", the overall scores for girl/girl groupings were higher than girl/boy and boy/boy groupings, and scores for girl/boy groupings were higher than boy/boy groupings. A one-way analysis of variance was conducted to evaluate whether the gender grouping means differed significantly from each other. According to the analyses, the F-tests revealed no significant differences in gender groupings. Kowaliw in his study "Homogeneous and Heterogeneous Gender Pairs, Controlling Behavior, And Achievement on a Cooperative Learning Task" his hypothesis, that homogeneous male and female pairs would complete the task before heterogeneous pairs, was incorrect, males took the longest to complete the task and researchers also disagree as to which type of gender pair works most productively. Culbertson, Condes & Bradford (2010) in their study "The Effect of Single Gender Cooperative Learning Groups in High School Physics Classes " indicated that the gender gap is reduced when single gender groups are used, without detriment to male students, and that students, on average, prefer single gender cooperative groups.

III. METHODOLOGY

Research Design

This study utilized the experimental research design. It will find out effects of collaborative learning by gender groupings in the mathematics performance of the subjects of this study which was composed of 9 groups, three groups are all male members, another three are all female groups, and the last three were mixed groups with two male and two female members for a total of 18 male and 18 female students.

Research Instrument

The study utilized teacher-made formative tests, collaborative learning activities and an achievement test. A dry-run was conducted and item analysis was done to validate the instrument. The final copy was subjected to face and content validation by a fellow math teacher.

Procedure

An approval to conduct the study was secured from the Dean of the College. Then, series of discussion followed by collaborative learning activities by gender groupings, formative tests and an achievement test were administered at the end of the study. The mean was used to find the average of the formative tests, cooperative learning activity outputs and achievement test. ANOVA was used in comparing the performance of the three collaborative learning groups in their formative tests, cooperative learning activity outputs and achievement test.

IV. RESULTS

Table 1 Formative Test, Collaborative Activity and Math Achievement Mean Scores of the Three Gender Groups

Groups	Formative Test		Collaborative Activity		Math Achievement	
	Mean	**Interpretation**	**Mean**	**Interpretation**	**Mean**	**Interpretation**
All male Group	27.00	Average	34.17	Average	41.67	Above Average
All female group	27.67	Average	42.42	Above	45.17	Above Average
Mixed group	27.33	Average	38.67	Average Above Average	43.17	Above Average

Table 1 presents the mean scores of the three gender groups in their formative tests, collaborative activity and math achievement. It shows that the all female group obtained the highest mean in their formative test at 27.67 and all male group obtaining the lowest mean at 27.00, however all mean scores are interpreted as average. This implies that students when working alone, more or less obtains similar scores in their individual formative tests.

The table also presents the mean scores of the three gender groups in their collaborative activities. The all female group posted the highest mean at 42.42 (above average), mixed group obtained a mean of 38.67 interpreted as above average and the all-male group garnering the lowest mean of 34.17 (average). The result implies that all female group are performing better than the all male group, while male students combined to work with female students are performing better as compared to if they are grouped with fellow male students.

It also reveals the mean scores of the three gender groups in their math achievement test. The all female group obtained the highest mean of 45.17 as compared to the mixed group garnering an average score of 43.17 and the all male group at a mean of 41.67 all has an above average performance. Though the means vary, the differences are negligible, all groups performed better at the end of the experiment. Final result of the experiment implies that collaborative learning and gender groupings may have affected the performance of the students in their achievement test.

Table 2 ANOVA of the Formative Test in the Three Gender Groups

Source of Variation	Sum of Squares	df	MSS	F	Tabular value	interpretation
Between Columns	18 910	2 33	9 27.58	0.32	3.29	Not Significant
Within Columns	928	35				
Total						

Table 2 is the ANOVA table presenting the formative test results in the three gender groups with the computed F value of 0.32 less than the tabular value of 3.29 revealing that there is no significant difference in their test results. The result is in consonance with the null hypothesis that there is no significant difference in the formative test in the three different gender groups. This result implies that if tests are taken individually the scores of the subjects will not differ significantly.

Table 3 ANOVA of the Collaborative Activity in the Three Gender Groups

Source of Variation	Sum of Squares	df	MSS	F	Tabular value	interpretation
Between Columns	2.67 125.33	2 33	1.33 3.8	3.35	3.29	Significant
Within Columns	128	35				
Total						

The ANOVA table presented in Table 3 shows the collaborative activity results in the three gender groups with the computed F value of 3.35 which is greater than the tabular value of 3.29 revealing that there is a significant difference in the results. The result opposes the null hypothesis that there is no significant difference in the collaborative learning activities in the three different gender groups. It implies that students working in different gender groups had great effect in their collaborative learning outputs.

Table 4 ANOVA of the Math Achievement in the Three Gender Groups

Source of Variation	Sum of Squares	Df	MSS	F	Tabular value	interpretation
Between Columns	169.55	2	84.77	21.55	3.29	Significant
Within Columns	67.46	33	2.04			
Total	237.01	35				

Table 4 is the ANOVA table presenting the math achievement test results in the three gender groups with the computed F value of 21.55 which is greater than the tabular value of 3.29 revealing that there is a significant difference in their test results, implying that the students, after having been exposed to collaborative learning, gender group activities, were significantly affected in their mathematics achievement. The result rejects the null hypothesis stating that there is no significant difference in the mathematics achievement in the three different gender groups.

V. FINDINGS ANDCONCLUSIONS

Based on the results, though the three gender groups obtained different means in their formative tests, the differences was very minimal, negligible enough to say that all students under study performs similarly when working individually. In the collaborative learning activities, the three gender groups obtained high differences in their mean, where the all-male groups performed very far from the all-female groups, which can be concluded that female students when grouped together turns out better results than all male students grouped together. The mean scores of the three gender groups in their Math achievement test given after the experimentation, tells that though the all-male group obtained the lowest mean, they still performed very well in their achievement test.

Based on statistics, the following conclusions were formulated; (1) there was no significant difference in the mean scores obtained by the three gender groups in their formative test, probably because the students under study have similar abilities when working individually; (2) there was a significant difference in the mean of the collaborative learning activities in the three gender groups, probably because performance of collaborative learning activities depends on who do we work with; and (3) the mean in the math achievement test of the three gender groups varies significantly due to the effect of the collaborative learning activities.

VI. RECOMMENDATIONS

Based on the findings of the study, the following suggestions are presented; (1) mathematics teachers should know their students before starting the course to enable the former to select and employ the appropriate teaching approach and strategy; (2) teachers should utilize collaborative learning and gender groupings as a teaching approach to ensure learning in the student; (3) school administrators should encourage professors to use other teaching approaches like collaborative learning and gender groupings making the students the center of the teaching-learning process; (4) school administrator should send instructors and professors to seminars on new trends in education, strategies and approaches; and (5) future researchers conduct a similar study.

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