

A Comparative Study of Achievement Test Scores of Boys and Girls Taught through Cooperative Learning Strategy

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Abstract

This study sought to determine the effects of Students Teams – Achievements Divisions, cooperative learning teaching strategy on students' mathematics achievement in sequence and series topic by gender (sex). A quasi – experimental study was carried out on two form three classes in Komenda Edina Eguafu Abrem Municipality (KEEAM) in the Central Region of Ghana. The sample size was 97 comprising of 44 boys and 53 girls. One class ($n_1 = 47$) was assigned as an experimental group and the other ($n_2 = 50$) was assigned as a control group. A simple random sample technique was used to select the two schools that formed the study. The two groups were pretested prior to the implementation of the intervention. At the end of the study, posttest was given. Data collected were analysed using the t- test to compare the performance of boys and girls in the experimental group. The results indicated that there was no gender difference in students' mathematics achievement after being taught sequence and series through cooperative learning.

Keywords: Cooperative learning, Achievement, Gender

1.0 Introduction

Mathematics is a subject found in every school curriculum in almost every country, and has penetrated all sectors of our society. The power and importance of mathematics have continued to receive extensive coverage. Hence in Ghana, from the basic level through the secondary school to the teacher colleges of education, learning of mathematics is compulsory. Students in such institutions take an external examination paper in mathematics. Unfortunately, student's performance in this important subject over the years has not been encouraging at the primary and secondary levels of education in Ghana. For example, in 2011 nearly a quarter of the total candidates who wrote the 2011 WASSCE failed in mathematics. The statistics made available to the Daily Graphic by WAEC indicated that 64,665 candidates representing 43.92 % had A1 to C6 in mathematics while 47831 candidates representing 32.48% scored D7 to E8 (Daily Graphic, October, 2011). The results from the trends in International mathematics and science study (TIMSS) in 2007 at the Junior high school (JHS) level also shows the poor mathematics performance in the country. In the aforementioned study, Ghana's eighth grades were ranked 46th among 47 countries that participated (Anamuah- Mensah, Mereku & Ghartey- Ampiah, 2008). Even with such students' dismal performance in the subject, female students have had lower achievement as compared to male.

Amoo (2002) reports that poor learning interest and assimilation of mathematics ideas , concepts, principles and processes and teachers failure to use appropriate and stimulating teaching methods are responsible to students' poor performance in mathematics. Enu (2013) assert that the desire to improve students' performance had led to proliferation of handout in the country.

The existing research has different findings on whether there are gender differences in mathematics learning. Some researchers think males have superiority in mathematics learning (Maeoby & Carol, 1974; Brandell, Leder & Nystrom, 2007); others believe that males and females have their respective advantages (Hyde, Fennema, & Lamonj, 1990). Nevertheless, the apparent consensus is that gender is an important factor in mathematics learning (Zhang, 2006). Therefore in Ghana, the government and other stakeholders in the educational sector have introduced several interventions and programmes in order to remove the gender gap in

mathematics. For example; Science, Technology and Mathematics Education (STME) camp. The programme which is an annual event is aimed at supporting girls to gain practical exposures to various sciences, mathematics and technology – related careers. It is also expected to whip up girls interest in science and mathematics.

Also in 2007 the Ministry of Education (MOE) in collaboration with the Teacher Education Division (TED), reviewed the mathematics curriculum with introduction of new mathematics curriculum in September 2007 which showed a paradigm shift in the teaching and learning of mathematics from conventional method of instruction into cooperative teaching method. Although, cooperative learning strategy as an instructional method appears to be promising, the effect of group work on the choices and achievement of girls in mathematics has rarely been test empirically in the country.

Gillies and Boyle (2010) indicates that cooperative learning does not enhance academic performance. In the view of Foster (1993) cooperative learning is appropriate for students with cooperative nature and that all students do not stand to benefit from cooperative learning method. Based on these mixed findings and taking into account the recognition of cooperative learning in instructional practice, there is a need to conduct further empirical studies to investigate whether there is gender difference between students' taught mathematics through STAD, cooperative learning strategy where much work has not been done in Ghana and contribute to the theoretical understanding and practical implications of cooperative learning.

1.1 Objective of the study

To determine whether there are gender difference in mathematics achievement among students taught through cooperative learning methods specifically Students Team –Achievement Divisions method.

1.2 Hypothesis of the study

The following hypothesis was formulated for testing at 5% level of significance

H_{01} : There is no significant difference between the mean achievement score of males and females in the experimental group.

2.0 Review of related Literature

Gender issues have long been a topic of educational research, particularly in the area of mathematics. Girls remain substantially under-represented in mathematics, science and technology. Past studies have shown that males outnumber females in terms of the amount of mathematics studied, achievement in mathematics and mathematics related careers. For example, the study by Kaiser-Messmer (1994) done in Germany, showed that boys performed better than girls and a study by Fennema (2000) showed that gender differences existed in learning complex mathematical task in middle and secondary schools in America.

Although this problem is recognized its complexity is widely underestimated and causes are not well understood. Several reasons have been cited in the literature for females' limited pursuit of mathematics. For example, female students report less confidence in their mathematical abilities than their male counterpart (Norton & Rennie, 1998; Leder, 1996). Also the stereotyping of mathematics as a male domain have an impact on females' interest in pursuing mathematics (Ethington, 1992; Norton & Rennie, 1998). However, the causes of gender differences fall into two camps. Some researchers believe that gender difference in mathematics can be mainly attributed to physical, mental and other factors(Geary, Sauzts & Liu, 2000); others suggest that external factors like social and culture factors are dominant causes of the gender differences (Fan & Li, 2008). International mathematics education committee (as cited in Li, 2001) proposed a basic conclusion: Women have no obstacles in participating in mathematics in physical and mental aspects. That is the gender differences in mathematics learning is mainly caused by social and cultural factors, particularly school education which plays an important role in children's gender socialization.

Many researchers have focused on the learning environment in order to explain gender inequality in educational choices and achievement. These includes: research into the role of teachers (Hyde, Fennema & Lamonj, 1990), the nature of the subject as a possible explanation of gender differences in performance (Hyde et al, 1990). However, relatively few studies focus on the instructional process. Traditionally, the Ghanaian teacher has virtually, if not completely, relied on whole – class instruction in mathematics classroom. Ampiah, Akyeampong and Leliveld (2004) reported that both pre-service and in – service programmes in mathematics predominantly reflected teacher-centred approach to learning. Montagu (as cited in Johnson & Johnson, 2004) observed that without the cooperation of its members society cannot survive, and the society of man has survived because the cooperativeness of its members made its possible. Cooperative learning, due to its ancient pedigree and positive outcomes, has been a focus of research in the past. Different researchers have defined cooperative learning in different ways. Cooperative learning is an arrangement in which students work in mixed ability

groups and are rewarded on the basis of the success of the group as a whole (Woolfolk,2001). Students encourage and support each other, assume responsibility for their own and each other's learning, employ group related social skills and evaluate group's progress.

Johnson and Johnson (1991) assert that to achieve success in learning mathematics, students should be given the opportunity to communicate mathematically, reasoning mathematically, develop self- confidence to solve mathematics problems and one of the ways this can be done is through cooperative learning. Studies have shown that the integration of cooperative learning in educational settings leads to the development of more autonomous thinkers with greater levels of understanding and a tendency to remember information longer (Balfakih, 2003). Motivational perspectives, social cohesion perspectives and cognitive perspective form the foundation for the practice of cooperative learning in the classroom. The motivational perspective assumes that cooperative efforts are based on group rewards or goal structure (Slavin, 1995). From a motivational perspective cooperative learning activities when properly carried out, create a situation in which individual group members can achieve their goals if and only if each member is successful. Therefore, the members of the group are motivated to help group mates in order to meet their goals. The theoretical rationale for these group rewards is that if students value the success of the group, they will help and encourage one another to achieve much contrast to the situation in the traditional, competitive classroom (Slavin, 1996).

Another theoretical perspective somewhat related to the motivational view point holds that the effects of cooperation learning on achievement are strongly mediated by cohesiveness of the group, in the sense that student will help one another learn because they care about one another and want one another to succeed. This is similar to the motivational perspective in that it emphasizes primarily motivational rather than cognitive explanations for the instructional effectiveness of cooperative learning. However, motivational theorists hold that students help the group-mates learn at least in part because it is in their own interest to do so. Social cohesion theorist, in contrast, emphasizes the idea that students help their group-mates learn because they care about the group (Slavin, 1996).

Cognitive perspective is the major alternative to the motivationalist and social cohesiveness perspective on cooperative learning, since both focus primarily on group norms and interpersonal influence. Cognitivists try to look inside the mind to explore how thinking and learning take place. According to Slavin (1996), cognitive perspective holds that interaction among students will in themselves increase student's achievement for reason which has to do with mental processing of information rather than motivations. All the three perspectives of cooperative learning have sound rational and empirical supports for their probity. However, each perspective requires a set of favourable conditions for its implication. For example , according to Slavin (1996) motivational and social cohesion effects require extrinsic and intrinsic motivation along with long time social interaction in the classroom to appear while developmental and cognitive elaboration perspective are complementary not contradictory.

Active participation instead of passive listening in class distinguished cooperative learning from traditional method of instruction. Cooperative learning is grounded in the belief that learning is most effective when students are actively involved in sharing ideas and work cooperatively to complete academic task.

3.0 Methodology

Since the classes existed as intact groups, the study used quasi- experimental paradigm. This involved pre-test and post-test of non-randomized, control and experimental groups (Martyn, 2008). The essence of the pretest was to help establish the baseline performance of the groups and possibly differentiate between the groups before the intervention. The class with the apparent weaker pretest performance became the experimental group with the control group being the other group with relatively better pretest performance. The sample consisted of two intact classes of third years students from two schools selected through Simple random sampling technique from KEEAM. The sample size consisted of 97 from three students. Of these, 47 were in the experimental group while 50 others were in the control group. The study was carried out for four weeks using STAD, cooperative learning model.

3.1 Instrumentation

In this study, a mathematics achievement test (MAT) was used to measure the students' mastery of the topic sequence and series. The test consisted of 20 multiple choice questions, each with four options and only one correct answer. The achievement test was constructed based on the Senior High School core mathematics syllabus and the text book. Its reliability was found to be 0.8 using Kuder –Richardson 21. The 0.8 was found to be reliable based on McMillan and Schumacher (2006) criterion of a minimum of 0.70.

4.0 Result

The hypothesis sought to find out if “there is any difference between the mean achievement score of males and females taught sequence and series through cooperative learning strategy”. In answering this question, an analysis of males and females on pre and posttest mean scores was carried out. Table 1 shows the pretest scores of the males and females in the experimental group.

Table 1: Independent sample t-test of the pretest MAT scores of males and females in the experimental group

Gender	N	mean	SD	t – value	df	p-value
Male	23	12.53	2.48	2.744	45	0.009
Female	24	10.38	2.86			

The results indicate that there was statistically significant difference in achievement scores for males ($M = 12.52$, $SD = 2.48$) and females ($M = 10.38$, $SD = 2.86$); $t(45) = 2.744$, $p = 0.009$. This result therefore confirms the findings of the study conducted by some researchers. Hyde, Fennema and Lemonj (1990) found that boys in general perform better than girls in mathematics. Fox and Cohn (1980) also found males performed significantly better than females on the mathematics section of the scholastic aptitude test.

Table 2 shows the posttest achievement mean scores of males and females in the experimental group after the intervention.

Table 2: Independent sample t-test of the posttest MAT scores of males and females in the experimental group

Gender	N	mean	SD	t – value	df	p-value
Male	23	13.84	2.34	-1.340	45	0.197
Female	24	14.79	2.12			

Table 2 shows no significant difference between males ($M = 13.84$, $SD = 2.34$) and females ($M = 14.79$, $SD = 2.12$); $t(45) = 1.340$, $p = 0.197$. Since $0.197 > 0.05$. There was no evidence to suggest that significant difference existed between males and females.

However, the result indicates that females achieved higher mean score in the post test mathematics achievement test than the males. The closeness of these means seems to suggest that males and females, to some extent may be performing at the same level. It is also evident from the standard deviation of males (2.34) and that of the females (2.12) that the variance in the performance of the males does not differ that much from the performance of the females.

4.1 Discussion

The result of this study indicates that achievement was not affected by sex. All students irrespective of their sex benefited in about the same margin from the use of cooperative learning strategy. This perhaps may be the reason why no significant difference was found in the achievement between males and female students taught extensively by STAD cooperative learning strategy. This therefore means that cooperative learning help in bridging the gender gap in students’ mathematics achievement. This finding is in agreement with the work of Ajaja and Eravwoke (2010) who found that no significant difference existed between the posttest achievement test scores of male and female students in the cooperative classroom.

5.0 Conclusion

Based on the findings it was concluded that there are no gender difference in students’ mathematics achievement when students are taught through STAD cooperative learning strategy.

6.0 References

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