

Effects of Peer Tutoring on Pre-Service Teachers' Physics Performance in Colleges of Education, Ghana

Valentina Osei-Himah, Joseph Parker, and Anna M. Naah

ABSTRACT

At Atebubu College of Education, the study attempted to determine the impacts of peer tutoring on gender and senior High school background courses of pre-service teachers in physics. To achieve the purpose of the study an action research design was used and a total number of 140 (78 males and 62 females) who are offering primary Education program were purposively selected. The major research tools were accomplishment tests, which were used to collect quantitative data from pre-service teachers. Using the independent sample t-test and one-way ANOVA to analyse the quantitative data. It was found that the male students' performance in Physics ($M = 8.81$, $SD = 0.927$) does not significantly differ from that of the female students' ($M = 8.65$, $SD = 0.925$) as a result of the peer tutoring method adopted for the study. The results of the one-way ANOVA show that there are no differences in the mean score of the pre-service teachers' performance in Physics and their senior High School course background. It is therefore recommended among other things that the principals and head of science departments of Colleges of Education in Ghana should organise workshops, seminars and in-service training on how to utilize peer tutoring method effectively in teaching scientific concepts to pre-service teachers they training.

Keywords: Emotional and Behavioral Disorders, Exceptional Children, Evidence-Based, Instructional Strategy, Peer Tutoring

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I. INTRODUCTION

Educators are becoming more conscious of the relevance of how kids learn. Many of our traditional techniques of imparting information have been found to be unsuccessful in terms of students' capacity to grasp and recall key concepts. Some teaching strategies make learning passive rather than active. Traditional teaching approaches (lecture, laboratory, recitation) do not promote critical thinking, creativity, or collaborative problem-solving (Wood & Gentile, 2003).

In the classroom, peer tutoring can take several forms. Spencer (2006) looked at 38 studies that took place between 1972 and 2002 and employed some type of tutoring for adolescents with emotional or behavioural issues. She observed that "peer tutoring has been proved to be an effective educational technique" in "38 research papers." The most effective kind of peer tutoring was a reciprocal strategy in which students alternated between tutoring and tutee positions on a regular basis. Students have a deeper knowledge of the idea when they are obliged to articulate their thought process in a way that the other students can comprehend. It's not enough to pair kids and offer them a set of challenges to expect them to perform better. Walker (2007) had the Lowell High School administration and instructors choose six high-achieving students to serve as peer tutors in an after-school tutoring program. She opted to

use these kids' expertise to compensate for a lack of understanding of how urban students think about physics, as well as to build and deepen knowledge. Her findings suggest that working together on subjects presented in class benefited both tutors and tutees. Through an action research plan, Mesler (2009) paired a third-grade student who had been retained with a classmate. The retained student became a tutor for the struggling peer. By the end of the trial, both he and his tutee had shown considerable improvements in their test results. Mesler (2009) discovered that this strengthened the retained student's confidence, and that he improved with the additional arithmetic exercise.

Peers are more receptive to nonverbal clues than adult readers, according to Ajuba (2011), and pupils being tutored may give to show that they may not grasp what a tutor is attempting to say. Each student receives greater attention from the tutor and more time to talk while others listen in a peer tutoring session. This allows students to participate actively in the construction of their knowledge. Both Beasley's (1997) and Royal's (2007) findings point to an unusual mix of social and intellectual engagement occurring outside of the typical classroom setting. Another component of these studies is that students who use tutoring contact with peers with whom they may not otherwise interact. These initiatives, in particular, provided a space for students to socialize outside of their usual social networks, therefore

expanding the social networks of both tutors and tutees. The favourable reciprocal connection that appears to have developed between tutors and tutees may have helped both groups produce social capital. Furthermore, these tutoring environments appear to be a component of the curricular framework, which might impact social capital conversion.

The disparity in mean accomplishment scores between male and female pupils has been documented in several publications. Other research found that female students outperformed male students, although the difference was not statistically significant (Igbo, 2004; Chianson, 2008). It is now well acknowledged that there are more effective ways to learn than the old ones (Wood & Gentile, 2003). The definition of peer-tutoring used in this study is comparable to Boud *et al.*, (2001) concept of peer-tutoring or peer-learning. Peer tutoring is defined as students learning from and with one another in mutually beneficial methods that include the exchange of knowledge, ideas, and experiences among participants. As much as the learning itself, the emphasis is on the learning process, which includes the emotional support that learners offer to one another.

Peer tutoring improves motivation, cognition, and social outcomes in learning, as well as a sense of responsibility for one's own learning and enhanced meta-cognitive skills, according to Longareth *et al.* (2009). Boud, *et al.* (2001) found that students who objected to peer tutoring expressed unhappiness with the unequal task allocation. Several students claimed that the time spent peer tutoring comes at the expense of teaching the course subject. Smaller groups, according to Longareth *et al.* (2009), limit the chance for major conflict, provide less space for individuals to hide in the process, allow students to choose themes that interest them, and ensure that the instructor is there to help at all times. The National Teachers' Standards for Ghana aimed at ensuring that teachers move up from one rank to the other in their career; they empowered to engender effective learning among those they are expected to teach. Pre-service teachers are expected to identify their own training needs and take responsibility for addressing them through lifelong learning.

Peer tutoring is an educational strategy that involves high-level students collaborating with low-level or comparable-level students for structured reading and study sessions. Peer tutoring and demonstrative teaching tactics have proven to be effective in satisfying the academic and social requirements of students at all levels of education, regardless of gender, age, or socioeconomic status (Adekoya & Olatoye 2011). In comparison to teacher-student interactions in a school context, peer relationships frequently have fewer strict qualities. Peer tutoring has been shown to be effective in improving academic and social skills in both general education and special education children, including those who have been labelled as "at-risk" (Nazzal, 2002). Peer tutoring is a popular practice in educational contexts. Peer tutoring has been found to improve academic performance in reading, mathematics (Fuchs *et al.*, 2001), spelling, and other disciplines (Riggio *et al.*, 1989). Several systematic studies have used meta-analysis to empirically examine the effect of peer-tutoring. Many of these meta-analyses, however, are out of date. Cohen *et al.* (1982), for example, limited their meta-analytic assessment to material published before 1980. Recent meta-

analyses of peer-tutoring that use at least some of the current developments in technique are limited to certain groups, such as elementary school children (Rohrbeck *et al.*, 2003), or rely on adult tutors (teachers, adult volunteers, or college students) rather than peers (Elbaum *et al.*, 2000). Peer tutoring is an educational technique that involves students working together to educate their classmates, pairing high achievers with lesser achievers or students with similar skills. Higher-achieving students are paired with lower-achieving students in order for them to learn from one other via practice and reinforcement (Fuchs *et al.*, 2002).

The teacher serves as a facilitator in all peer tutoring exercises. Peer tutoring, according to science educators like Ayuba (2011), is an effective and strong instructional strategy that may be utilized to build academic and social abilities in both the tutor and the tutee (the learner). When a group is properly organized, each member helps, provides for, encourages, cooperates, shares, listens to, accommodates, and appreciates the other members of the group. It has been demonstrated (Okoli, 2012) that student achievement in science topics is gender-based. Gender is a sociological term that outlines men and women's sociological roles, cultural duties, and expectations in a specific society or cultural situation (Okorie, & Ezech, 2016). Gender is thus a social or cultural notion, referring to the distinct attitudes and roles that society gives to men and women.

At Ghana's College of Education, a few studies on the efficiency of peer tutoring in Physics have been conducted. As a result, it was intriguing to investigate if peer tutoring might be used as an alternate teaching and learning strategy to the standard way to assist students achieve untapped latent potentials in Physics. The research examines the impact of peer tutoring on students' performance in Physics at the college level.

II. RESEARCH QUESTIONS

1. Is there a statistical difference between male and female pre-service teachers' mean physics performance when they are taught utilizing peer tutoring?
2. Is there any statistical difference in the physics performance of pre-service teachers and their S.H.S. courses background after being taught using peer tutoring?

III. METHODOLOGY

The goal of the study was to see how peer tutoring affected pre-service teachers' physics performance, as well as their history in Senior High Secondary courses and gender. To conduct the inquiry, the researcher used action research. This study was conducted on topics related to physics educational issues in the context of the teacher's environment—that is, with pre-service teachers and at the college where the tutor works.

Achievement test was the instrument used for the study. The study focused on only level 200 pre-service teachers from Atebubu College of Education made up of 140 in total, 55.7% males and 44.3% females were used for the study.

Five science department colleague tutors reviewed the test items for their ambiguous purpose in order to verify the validity of the data acquired. The recommendations made were put to good use in improving the instruments.

The study tools were subsequently put through their paces with 30 pre-service teachers from another college of education in Ghana's Ashanti region.

This was due to the fact that the college was a co-educational institution that provided the same courses as the study center. The goal of the pilot testing was to see how reliable the research tools were. The KR20 coefficient of reliability was used to measure the accomplishment test's dependability. For both the pre-test and post-test, the KR20 dependability was determined to be 0.7. The intervention procedure for using peer tutoring to teach physics was divided into three stages: intervention, per-intervention, and post-intervention.

A. Pre-Intervention Stage

The pre-test items were given to the pre-service teachers and then graded to see how successful peer tutoring was on their physics performance. The study's pre-intervention stage lasted one week, which was the study's first week.

B. Intervention Stage

Following the analysis of the pre-test, the pre-service teachers were guided through the topic of physics using a peer-tutoring teaching technique. To keep control of the class, it was separated into two groups. Groups A and B, each of which had 70 students, were divided into eight sub-groups, each of which had between 8 and 9 pupils, and each group chose its own leader. Each instruction lasted two hours for each group. Students were constantly expected to read ahead on the topics they were studying. The tutor provides a basic introduction of the concepts before completely engaging the students in sub-groups to teach themselves, with the tutor present to lead discussion and provide more explanation as needed.

The intended tactics for improving pre-service teachers' grasp of physics through peer tutoring required one week to implement. At Atetebu College of Education, each class has four 60-minute sessions dedicated to scientific teaching and study. Each group of pre-service teachers received four hours of peer tutoring in Measurement. The post-intervention exercises were implemented in the third week of the trial after the four hours of intervention training.

C. Post-Intervention Stage

The goal of the post-intervention was to determine the effectiveness of using a peer tutor to teach physics. The post-test was given in the fourth week of the trial after the interventional approach was implemented in the third week. The responses of pre-service teachers to the post-test items were gathered and assessed. The goal was to see if pre-service teachers' comprehension of physics had improved, as well as their performance. After the post-test, in the sixth week of the trial, one of the departmental meetings was held with the science instructors to review the findings of the interventional method used. This was due to the fact that the study was an action research project, and the intervention had to be executed for the benefit of pre-service teachers.

IV. RESULTS AND DISCUSSIONS

An independent samples t-test for equality of means was conducted to compare the scores male and females (Table 1). It shows statistically insignificant difference, $t(138) = 1.032$, $p = 0.707$. This implies that the male students' performance in Physics ($M = 8.81$, $SD = 0.927$) does not significantly differ from that of the female students ($M = 8.65$, $SD = 0.925$).

TABLE I: INDEPENDENT SAMPLE T-TEST OF PRE-SERVICE TEACHERS' ACADEMIC PERFORMANCE IN PHYSICS

| Group | N | Mean | SD | T | Df | P-value |
|--------|----|------|-------|-------|-----|---------|
| Male | 78 | 8.81 | 0.927 | 1.032 | 138 | 0.707 |
| Female | 62 | 8.65 | 0.925 | | | |

N=140

Students' performance in science topics has been proven to be gender related (Okoli, 2012). Gender is a sociological term that outlines men and women's sociological roles, cultural duties, and expectations in a specific society or cultural situation (Okorie, & Ezech, 2016). Gender is thus a social or cultural notion, referring to the distinct attitudes and roles that society gives to men and women. The disparity in mean accomplishment scores between male and female pupils has been documented in several publications. Other research found that female students outperformed male students, although the difference was not statistically significant (Igbo, 2004; Chianson, 2008).

The research sought to investigate the students' performance in Physics with respect to their SHS courses' background. The research question was tested using one-way Analysis of Variance (ANOVA). The respondents had the highest mean ($M = 2.34$, $SD = 0.91$) for Business, followed by another high mean ($M = 2.24$, $SD = 0.95$) for General Arts, a mean ($M = 2.08$, $SD = 0.83$) for Science, a mean ($M = 2.00$, $SD = 0.92$) for Home Economics and the lowest mean ($M = 1.87$, $SD = 0.83$) for Visual Arts. This shows the entry behaviour of the primary Education programme at the college of Education in Atebubu College.

TABLE II: ONE-WAY ANOVA TEST FOR PRE-SERVICE TEACHERS' PERFORMANCE IN PHYSICS AND THEIR COURSE BACKGROUND

| | Sum of Squares | Df | Mean Square | F | Sig. |
|----------------|----------------|-----|-------------|-------|-------|
| Between Groups | 3.678 | 4 | 0.920 | 1.136 | 0.342 |
| Within Groups | 109.315 | 135 | 0.810 | | |
| Total | 112.993 | 139 | | | |

$P < 0.5$ significant level

Table II, the one-way Analysis of Variance (ANOVA), shows the mean difference among pre-service teachers' performance and their SHS course background. The result from the Table shows a significant mean difference $F(4, 135) = 1.136$, $p = 0.342$ between pre-service teachers' performance in physics and their SHS course background. In conclusion, the results of the one-way ANOVA show that there are no differences in the mean score of the pre-service teachers' performance in Physics and their SHS course background. The conclusions of this study have proved that there are better ways to learn than traditional approaches (Wood & Gentile, 2003). Educators are becoming more conscious of the relevance of how kids learn.

V. CONCLUSION AND RECOMMENDATION

There was no statistically significant difference between pre-service teachers' performance and their SHS course background or gender in this study. Pre-service teachers with any SHS course background can study physics in the college of Education, according to the study. Pre-service teachers in Ghanaian colleges of education were taught physics using a peer tutoring technique. The study, however, did not take into account the effects of peer tutoring methods on other scientific ideas learned in colleges of education, which are more practical in nature. Future study into the effects of peer tutoring methodologies on the teaching and learning of other scientific ideas is also advised.

Only pre-service teachers from Atebubu College of Education were used in the study, which limited the generalizability of the research findings to only Atebubu College of Education. It is thus advised that the use of peer tutoring in physics teaching and learning be expanded to include a larger number of Colleges of Education in Ghana so that future findings may be applied to all Colleges of Education in Ghana.

CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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