

Using Peer Tutoring To Enhance Pre-Service Teachers Performance In Physics.

Valentina Osei-Himah

Science Department, Atebubu College of Education, Atebubu

Abstract

The study used peer tutoring to teach pre-service teachers to improve their performance in physics at Atebubu College of Education in Ghana. To achieve the purpose of the study an action research design was used. A total number of 140 were purposively selected. Quantitative data was collected from pre-service teachers using achievement test and questionnaire as the main research instruments. Through the analysis of the quantitative data using percentages, means, standard deviation, it was found that the pre-service teachers' performance in physics was enhanced as a result of the peer tutoring method adopted for the study. It was recommended that, Science tutors at the Colleges of Education are encouraged to adapt to the teaching and learning of scientific concepts through peer tutoring means as the findings of the study has shown that peer tutoring teaching and learning of physics help reduce students' forgetfulness and recitation of scientific concepts.

Keywords: Peer Tutoring; pre-service teachers; performance; Strategies; achievement

Introduction

Peer Tutoring Strategies have been found to tremendously enhance achievement (Jibrin and Zayum, 2012), enhance group learning and promote personal effort of science students (Adekoya & Olatoye, 2011, Adedeji, 2013). Peer-tutoring has also been demonstrated to be effective irrespective of student level or grade. Peer-tutoring is an instructional strategy that consists of student partnerships, linking high-achieving students with low-achieving students or those with comparable achievement, for structured reading and study sessions. According to Rohrbeck, Ginsburg-Block, Fantuzzo, and Miller (2003), peer-tutoring is "systematic, peer-mediated teaching strategies". Peer-tutoring and demonstration teaching strategies have been found to be a powerful tool for meeting both the academic and social needs of students in schools at all levels of education irrespective of gender, age and socio-economic background.

The use of peer tutoring is theoretically underpinned by Vygotsky's (1978) social construction of knowledge mediated by the use of language and concept of zone of proximal development (ZPD). In peer tutoring environments, both the teacher and the mentor have the ability to use popular language in combination with the technical language of science to discuss concepts of science at a social level. This is in contrast to the objectivist science teaching in which the teacher uses highly specialized language of science in precise and unchanging ways of describing the working of the "real world" with the attempt to transfer knowledge directly from the teacher's mind to students' mind (Windschitl, 2002). Under the latter case students are expected to internalize the right explanation of nature and the right way of solving problems and reproduce them in the precise language of the teacher during assessment of learning (Gillies & Ashman, 2003; Windschitl, 2002).

The philosophy behind Peer Tutoring Program is that tutoring peer to peer is a wonderful way for students to develop course mastery and learn new skills, too. The concept of learning through peer tutoring is based on a social constructivist view of learning that emphasizes the role of the students to generate learning where students coach peers through social interaction within their zones of proximal development (Vygotsky, 1978). Rather than applying a stimulus/response process, users are actively engaged in making meaning through cognitive accommodation and/or assimilation (Piaget, 1969). Vygotsky argued that learning comes

about through social negotiation within a cultural context, with language as the primary enabling tool. Students gain access to experience by mentors, who serve as facilitators rather than instructors, and the aim of learning is to solve real-world problems in an authentic environment. This is a very practical human environment for a peer mentor. Learners participate in exercises 'on-the-job,' similar to conventional apprenticeships, rather than receiving didactic instruction of abstract concepts. Students are best prepared to tackle unfamiliar issues and come up with ideas that are culturally acceptable, according to the statement. To become productive citizens within and beyond the school, students also need positive mindsets about self and school, along with social awareness and responsibility (Stafford-Brizard, 2016)

Statement of Problem

There are agitations for teachers to be dynamic with their instructional method to encourage the development of students' generic skills (Bennett, Dunne, & Carre, 1999). The available research does not indicate any research on the use of peer tutoring to teach Physics in the College of Education in Ghana. Hence, it was of interest to see if peer tutoring could be adopted as an alternative teaching and learning approach to the conventional method to aid students' performance in Physics as well as help learners fulfil untapped hidden potentials.

Purpose of the study

The study sought to investigate the use of peer tutoring to teach physics at the college level. It further assesses the level of pre-service teachers understanding of peer tutoring.

Research Question

1. What are the effects of peer tutoring on academic performance in Physics at the College of Education?

Methodology

The researcher adopted action research to carry out the investigation. This research was carried out within the context of the teacher's environment- that is, with the pre-service teachers and at the college in which the tutor works-on questions that deal with educational matters at hand (Alhassan, 2006).

Questionnaire and achievement test were the instruments used for the study. Mixed methods design is a procedure for collecting, analysing, interpreting and reporting data in research studies, using different methods to collect data (Creswell, 2014).

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. The instruments for the study were achievement test items and questionnaire.

A questionnaire of 20 items primarily in the area of Likert scale was employed from the research question stated. The pre-service teachers were to place a tick (\surd) in a box of their choice. The questionnaire which was used at the post-intervention stage consisted of 20 items which was sub-divided into four sections; A, B, C and D. A self-designed item questionnaire was used to collect data from students. Two forms of the achievement test consisting of ten (10) item each of pre-test and post-test was used for the study.

In order to ensure the validity of data collected, five colleague tutors from the science department scrutinized the questionnaire and test items for its ambiguity and items' non-contribution to the questionnaires' purpose. The suggestions offered were used for improvement of the instruments. This helped to improve the validity of the instrument. The research instruments were then pilot-tested with 30 pre-service teachers from Offinso College of Education in the Ashanti Region of Ghana. This is because the college was a co-educational institution and offered the same programmes as the actual study center. The purpose of the pilot testing was to determine the reliability of the research instruments. The reliability of the achievement test was determined with the KR20 coefficient of reliability. The KR20 reliability was calculated as 0.7 for both the pre-test and post-test. The Cronbach's alpha coefficient of reliability was used to establish the reliability of the questionnaire. It was established as 0.8.

For the purposes of the use of peer tutoring in teaching physics, the intervention process was structured as: pre-intervention, intervention and post-intervention stages.

Pre-intervention stage

To ensure that peer tutoring can be used to improve pre-service teachers' performance in physics, the pre-test items were administered to the pre-service teachers after which they were scored. The pre-intervention stage of the study lasted for one week which was the first week of the study.

Intervention stage

The intervention strategies adopted after the analysis of the pre-test were that the pre-service teachers were taken through the concept of physics through the use of peer-tutoring teaching strategy. The class was divided into two groups to be able to control the class. The group A and B which comprised 70 students each was divided into eight sub-groups, each sub-group comprising between 8-9 students and each group selected their leader. Each group was taught for two hours in each lesson. Students were always asked to read ahead about the topics. The tutor gives basic explanation of the topics and later thoroughly engage the students to teach themselves in the sub-groups while the tutor was also available to direct discussion and provide further explanation when necessary.

It took one week to implement the planned strategies which were adopted to enhance the pre-service teachers' understanding in physics through peer tutoring. At Atetebe College of Education, there are four periods of 60 minutes each for each class for the teaching and learning of science. The pre-service teachers from each group had four hours lessons in Measurement through peer tutoring. After the four hours of instruction at the intervention stage, the post-intervention activities were then implemented in the third week of the study.

Post-intervention stage

The post-intervention aimed at finding out the effectiveness of the use of peer tutor in teaching physics. After the interventional strategy in the third week of the study, the post-test was administered in the fourth week of the study. The pre-service teachers' responses to the post-test items were collected and scored. The purpose was to determine whether the pre-service teachers' understanding as well as their performance in physics has improved. After the post-test administration, the questionnaire was administered to the 140 pre-service teachers. The questionnaire was administered virtually. All the questionnaires were collected, scored, and analysed in the fifth week of the study. The questionnaire administration helped to ascertain pre-service teachers' knowledge and understanding of peer tutoring involved in the study towards the teaching after the intervention. Later in the sixth week of the study after the post-test and the administration of the questionnaire, a discussion was held with the science teachers, in one of the departmental meetings, on the findings of the interventional strategy adopted. This is because the study was an action research type and hence, the intervention needed to be implemented for the benefit of the pre-service teachers.

Results And Discussions

Table 1: Mean Rank of Pre-Service Teachers Knowledge on Peer Tutoring (N =140)

Item Number	A%	D%	Mean	SD
10	66.4	33.6	2.0	0.8
7	74.3	25.7	1.9	0.8
14	74.3	25.7	1.9	0.8
15	74.3	25.7	1.9	0.8
19	91.4	8.6	1.7	0.9
17	90.7	9.3	1.5	0.7
8	90.7	9.3	1.5	0.7
16	95.0	5.0	1.4	0.5
20	95.0	5.0	1.4	0.5
9	97.9	2.1	1.3	0.5

13	97.9	2.1	1.3	0.5
12	96.5	3.5	1.3	0.5
6	25.7	74.3	3.2	0.9
18	17.1	82.9	3.1	0.8
*11	10	90	3.4	0.8

Where A/% = the percentage of pre-service teachers who agreed to each statement

D/% = the percentage of pre-service teachers who disagreed to each statement

* = the item which was coded in the reverse order to all other items

The results in Table 1 show that most of the items were agreed upon. Under Item 10, 66.4% of the pre-service teachers with a high mean ($M = 3.4$, $SD = 0.8$) agreed to the statement: The use of peer tutoring for learning almost and always reduces the personal undue forgetfulness and recitation of mnemonics as well as acronyms during examination. It can be seen from Table 1 that 74.3% of the pre-service teachers with high mean ($M=1.9$, $SD= 0.8$) indicated their agreement to items 7, 14 and 15 respectively as “In a class the tutor might not be the most competent person”, “When using peer tutoring method to teach physics to a student my role will be as a facilitator of their learning” and “The use of peer tutoring method as an instructional technique is an effective strategy for students of all abilities”.

The results also show that 91% of the pre-service teachers who participated in the study with a mean ($M= 1.7$, $SD= 0.7$) indicated that they agreed with Item 19 which states: “Students will be exposed to some challenges in the teaching and learning of physics”. Under Item 17 and 8, 90.7% of the pre-service teachers with a mean ($M=1.5$, $SD= 0.7$) agreed respectively to the statement: “The study of physics at the college of education will help pre-service teachers to teach the concept very well”, “The use of peer tutoring will make the students feel more involved and to cooperate more on projects”. Another 95% of pre-service teachers with mean of ($M=1.4$, $SD= 0.5$) Agreed to Items 16 and 20 respectively which states that: “Physics is studied at all levels” and “The study of physics may create job opportunities for students”.

Further from the results in Table 1, under Items 9, 13 and 12, 97.9% of the pre-service teachers with a mean ($M= 1.3$, $SD= 0.6$) agreed respectively to the statement: “The use of peer tutoring would enable tutors to interact more with students to promote group discussion”, “I would be able to prepare my own lesson since I was taken through peer tutoring” and “I was more enthusiastic and motivated during the use of peer tutoring in teaching and learning physics”. From the results in Table 1, only three of the 15 items on the 20-item questionnaire were disagreed upon by the pre-service teachers. The three items were 6, 18 and 11. With respect to Item 6, 74.3% of the pre-service teachers who participated in the study with a high mean ($M = 3.2$, $SD = 0.9$) disagreed to the statement: “Physics teachers often use peer tutoring to teach physics concepts”. The results from Table 1 show that 82.9% of the pre-service teachers who participated in the study with a mean ($M=3.2$, $SD= 0.8$) disagree with Item 18 of the statement: “Students should collaborate only on difficult assignments”. It can be seen from Table 1 that 90.0% of the pre-service teachers with a mean of 3.4 ($SD = 0.8$) indicated a disagreement to Item 11, which states: “Teaching physics through peer tutoring hinder per-service teachers’ ability with learning tasks”.

From Table 1, the findings show that the Pre-service teachers ranked benefits they will obtain after college education from the teaching and learning physics through peer tutoring was high. This is because the pre-service teachers understood physics concepts on their own and that reduces the personal undue forgetfulness and recitation of mnemonics during examination. According to Piaget (1969), constructivism is a psychological theory of knowledge which argues that humans construct knowledge and meaning from their experiences. He proposed that individuals develop new information from their experiences through processes of accommodation and assimilation. In both cases, the theory of constructivism suggests that learners construct knowledge out of their experiences.

Conclusion and recommendation

The findings of this study confirm the study of Longareth, Godinho, Parr, and Wilson (2009) that, peer-tutoring enhances motivation, improved cognition, and social outcomes in learning, increased sense of responsibility for one’s own learning and improved meta-cognitive skills. Peer tutoring method of teaching

and learning of scientific concepts encourages students' involvement in class and cooperation among students, and hence could motivate students to learn science in schools and colleges. It is therefore recommended that, Science tutors at the Colleges of Education are encouraged to adapt to the teaching and learning of scientific concepts through peer tutoring means as the findings of the study has shown that peer tutoring teaching and learning of physics help reduce students' forgetfulness and recitation of scientific concepts.

Again, as the Colleges prepare the students to teach in Ghanaian Basic Schools where physics forms part of the Integrated Science curriculum, the use of peer tutoring will help the pre-service teachers to be able to teach the physics concept at the Basic School level.

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