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Practices of Co-operative and Enquiry Learning in Physics Lessons in the Colleges of Education in Ghana

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Abstract

This research was conducted to investigate the practices of co-operative and enquiry learning in physics lessons in the selected colleges of education in Ghana. Purposive sampling technique was used to select the district, science colleges, the three (3) physics tutors and ninety (90) teacher trainees offering science as elective in Central and Western Regions of Ghana for the study. Data Collection was facilitated through the administration of questionnaire. The quantitative data entry and analysis was done by using the SPSS software package. The data was edited, coded and analysed into frequencies, percentages, with interpretations. The findings indicated that Cooperative and enquiry learning encourage students to construct their own meaning by talking, listening, making enquiries, writing, reading, and reflecting on content, ideas, issues and concerns. It was recognized that students learn in different ways and have different learning styles and personalised/individualised responses were encouraged. This calls for tutor(s) resourcefulness and method of teaching on the part of the Physics tutors. The study recommended that all physics tutors in colleges of education should be encourage to use cooperative and enquiry learning to engage students to engage students in learning activities.

Keywords

Practices, Co-operative Learning, Enquiry Learning, Physics Lessons, Colleges of Education, Ghana

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1. Introduction and Background

Science is an integral part of human society [1]. Its impact is felt in every sphere of human life, so much that it is intricately linked with a nation's development. Science as a field of study has done a lot for mankind. For instance, life has been made a lot easier for humans as a result of the advancements in science. Through science, humans have been able to better understand their environment and this has enabled them to manipulate the conditions of their environment to suit their own benefit. Science has also made it possible for human to acquire their desired needs easily. It has reduced human needs to the barest minimum. Science is a dynamic human activity concerned with understanding the workings of the world [2]. This understanding helps humans to know more about the universe. Without the applications of science, it would have been impossible for humans to explore the other planets of the universe. Also, the awareness of the existence, of other planets would not have been realized

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without science

Science has helped to develop the individual and the economy as a whole as it is postulated by many scholars that science education over the years has been a tool that services societal demands and expectation. Science has kept faith with the rapid changes in technology. As such the subject should be taught and learnt from the basic levels to the higher levels and needs to be taught with requisite materials and pedagogical skills. It is a fact that one of the importance of good education is to enable individuals contribute their quota to the development of society and also seek improvements in their daily lives. Through science the world has become a global village. That is, Technology has also made our world smaller [3]. It has completely changed the way we communicate with each other and how we organize work and also brought effective transportation system. Therefore, it has become easy for one to move from one community to another or cross from one continent to another. The focus of the study of science is to understand the natural world. Science is the pursuit of knowledge and understanding of the natural and social world following a systematic methodology based on evidence [4]. Science knowledge is acquired through observation, experimentation and evaluation of information. The information is gained in relation with other established bodies of knowledge, gathering and recording of knowledge to find answers to the questions and challenges that life poses every day [4].

At this level in education it is necessary to go more deeply into the various branches of science for a more thorough understanding of each. The scientific knowledge available is so vast that an attempt to understand every bit of it is impossible. It is reasonable however to learn a little of some part. This may be done by studying physics and practicing the techniques used by a physicist. According to About.com, physics is the study of matter, energy and the way they interact. Physics is one of the key disciplines of science. The boundary between physics and the other key disciplines are not rigid or fixed. For example, medical physics obviously involves human biology as well as physics. Understanding natural phenomena has always been a central aim of physics. Physics deals with energy and matter and their interactions. It is sometimes referred to as the science of measurement and its knowledge has contributed greatly to the production of instruments and devices of tremendous benefits to the human race. The knowledge of Physics plays a very significant role in the development of any nation. The importance of Physics cannot be over emphasized as it forms the basis for technological advancement of any nation. Physics plays a vital role in the development of any society [5]. Empirical studies from the field of Physics Education Research (PER) have outlined essential suggestions about physics curriculum which are generally accepted and believed to widen the knowledge and increase the horizon of understanding of physics by learners [6]. Among the essential suggestions are: (1) the method of teaching physics should be guided by learner-centred instead of the traditional lecture method used in teaching the subject. This was recommended due to the fact that learning efficiency and effectiveness take place during explanation, experimentation and discussion; (2) there should be interaction between the physics teacher and the students. In this case, it is believed that if genuine and helpful interaction exists between the teacher and students and among students, the students will be able to inform teachers what they find difficult in physics thereby reducing the difficulties they (students) encounter [7]. These features are essential because it is believed that if they are dully and critically followed and applied in any given situation and at any given time, teachers will be able to make physics easy to be comprehended by learners [7].

The desire to pursue physics at higher levels (beyond secondary education) is influenced by the success rate and foundation a student receives in physics at the high school. Findings on a Comparison study of students' reasons/views for choosing/not choosing physics between undergraduate female non-physics and female physics students at University of Cape Coast by [8] revealed a wide range of reasons which accounted for students' negative response to physics in Ghana. Prominent among these factors were teacher factor, poor performance, perceived difficulty nature of physics and unknown career opportunities in the subject. Most of the students reported that there is a reduced interest in the subject at the Senior High School (SHS) level because the subject was poorly presented to them. Interestingly, physics teachers who participated in the study admitted that poor tuition is one of the many reasons accounting for the low interest level among students [8]. Basically, students usually performed very poorly in physics in all level of education, trainee teachers in colleges of education studying physics are also facing the same difficulties [9]. Many researchers have equally supported the view that students performed poorly in physics [7, 10].

One major reason for this poor performance might not be separated from the abstract nature of the course as observed by [7]. The teaching of physics in schools, mostly in colleges of education in Ghana has not been encouraging at all due to how it is being taught in class and the abstract nature of the subject. The physics syllabus embodies a wide range of activities such as projects, experiment, demonstrations and scientific enquiry skill [11]. All these objectives are achieved by the teacher through giving innovative and appropriate instructions to the physics students. The physics teacher is therefore required to design teaching sequences with

appropriate teaching pedagogies that has the potential to develop students' interest in the subject and their abilities to properly respond to situations they may encounter in their world of life that their knowledge in physics may be of benefit. Students learn in different ways and have different learning styles and personalised/individualized responses were encouraged [12]. This calls for tutor(s) resourcefulness and method of teaching on the part of the Physics tutors [12]. There is a wide range of instructional techniques for science teaching and learning. It includes co-operative and enquiry learning techniques. The co-operative and enquiry learning techniques involves students in lessons to make learning meaningful and help students to share ideas together. The prime objective of teaching science is to develop such skills in a student which helps him/her to know the facts, principles of science, its applications, identify the objects and to make concepts clear and understanding. The need of the study is to find out the extent of the effects use of cooperative and enquiry learning in teaching physics lessons in the colleges of education in Ghana. The problem around this study is that most of the teachers teaching science, mostly physics in colleges of education use lecture method to teach and do not involve students in learner-centred teaching and practical lessons with the use of appropriate teaching learning materials. Integrated science methodology, candidates did not have in-depth understanding of the use of equipment and materials in the laboratories to solve scientific problems [13]. This study therefore aims to find out how the use of co-operative and enquiry learning techniques will be effective on students' performance in physics lessons in colleges of education in Ghana. The purpose of this study was to ascertain the extent to which physics tutors in the colleges of education in Ghana implement co-operative and enquiry learning techniques in physics lessons. The research was guided by this question- What extent do co-operative and enquiry learning techniques encourage performance of students in physics lessons?

2. Review of the Literature on Co-operative and Enquiry Learning

Recently, encouraging students to work or co-operate with each other in constructing their own understanding has been a highly valued principle of effective teaching in science [14]. The popularity of co-operative learning rose rapidly during the early 1980s as the use of individualistic 'mastery learning' declined [14]. Educators realised that the motivational and mediating impact of peer-peer interactions was the missing part of the individualised mastery instruction. Therefore, educators viewed co-operative learning to be a more efficient way of meeting the range of needs of students in a science classroom. Theoretical foundations of co-operative learning have been strongly affected by Vygotsky's ideas about learning. A study on effective teaching in science indicates that learners do not construct knowledge in isolation but through social interaction with their peers and thus, the interactions among learners affect each other's learning [14]. This implies that working with other students is a critical component of the process of knowledge construction. Therefore, Social constructivists view learning as a social process. It does not take place only within an individual, nor is it a passive development of behaviors that are shaped by external forces. Meaningful learning occurs when individuals are engaged in social activities [15]. Consequently, the main idea of learning in science has been a social constructivist perspective. Social constructivist views put a great emphasis on language and communication. Inter-subjectivity is a shared understanding among individuals whose interaction is based on common interests and assumptions that form the ground for their communication [15]. Communications and interactions entail socially agreed-upon ideas of the world and the social patterns and rules of language use. Knowledge is derived from interactions between people and their environments and resides within cultures [15]. This suggests that students need to communicate with each other and their teacher in order to articulate their prior knowledge about a concept and their explorations made in an investigation, to elucidate their thinking and to correct their misconceptions. Students can meet these aims in co-operative learning groups. Co-operative learning groups promote community aspects of the classroom and the role of discussion with peers in helping students to learn science. This offers many benefits for students for their learning and growth. For example, peer-peer discussions in co-operative learning groups can promote meaningful learning by helping learners to help each other to incorporate new experiences and information into their existing cognitive structures in a non-arbitrary and non-verbatim way [14]. Therefore, it is believed that co-operative learning can foster the development of deep understanding [16].

In co-operative learning groups, learners can moderate each other's learning in ways that are distinctively different from the teacher's way of teaching [17]. As students are at similar developmental levels, they can sometimes be more effective than adults in helping individuals to construct meaning. In other words, since they generally use similar words and terms while speaking, peers can understand each other's talk and explanations more easily. For example, a peer may help a confused student by rewording the teacher's explanation. Co-operative learning improves students' thinking and helps

them construct their own understanding of science content by strengthening and extending their knowledge of the topic. The sharing of ideas allows students to explore, refine, and question new ideas [18], which brings about learner-centred approach, providing an environment free of some of the social pressures of teaching science with the teacher. Students may have the chance to reveal their existing ideas and explain them, ask questions to challenge each other's ideas and provide interactions for creating relations among concepts. Such discussions may create a pool of students' ideas and productive arguments over disagreements. As a result, the exchange of ideas among students in small groups may bring about the development of difficult conceptions. In addition, they can provide cognitive conflict that can promote reconstruction of new knowledge.

Furthermore, effective co-operative learning groups can provide an opportunity for students to give and receive feedback from other students regarding their understanding [19]. Consequently, students can learn from each other and develop a shared understanding of the topics they are learning. Sharing different experiences promote a group's problem solving and creativity skills among learner [14]. Moreover, seeing that others' views can enrich and help their thinking, this encourages students to tolerate alternative points of view from each other. In addition, members in group benefit from each other's existing competencies and skills. For example, a student who already knows how to handle a microscope, a balance or other science laboratory tools can help other members' knowledge construction and skill development.

Overall, because of these benefits, numerous studies in very diverse school settings and across a wide range of content areas have reported that co-operative learning can positively increase students' achievement and develop their skills and attitudes towards the subject being studied [14]. For example, [14] reported that students with poor achievement taught by using a group investigation method throughout a year-long course in social studies achieved average gains nearly two and a half times those of the lower achievement students taught by the whole-class method. In fact, they scored more highly than the higher achieving students taught with whole-class method. These can be explained by the fact that the shared responsibility and interaction produce more positive feelings toward tasks and others, generate better inter-group relationships and result in better self-images for students [19]. However, co-operative learning requires teachers to carefully plan tasks and to closely monitor students' access to power and authority within the group, which can vary according to a myriad of factors including gender, race, personality and socio-economic status. Without careful planning and monitoring, despite its wide advantages, co-operative learning can be of little help to the learner, as it can isolate and restrict a group member's access to the materials, ideas and peer assistance [19]. As a result of this there is the need encouraging students' attitudes in the teaching and learning of physics.

Physics is considered as the most problematic area within the realm of science, and it traditionally attracts fewer students than chemistry and biology. Physics is perceived as a difficult course for students from secondary school to university and also for adults in graduate education. In developed countries, it has been found that goals of science are never fully realised, that student success in physics is lower than chemistry and biology, that students do not like science lectures and that most have no preference for science, particularly physics [20, 21]. It is well known that both high school and college students find physics difficult, and as a scientific discipline it is avoided because of its negative reputation. Over the years, students' achievement in physics has prompted educational researchers to continuously make relentless efforts at identifying mitigating factors that might account for the observed poor performance. Some research studies suggest that factors inside and outside the classroom affect students' achievement and interest. A research on The condition of secondary school physics education in the Philippines: Recent developments and remaining challenges for substantive improvements published in the Australian Educational Researcher by [22] asserts that the key factor in what comes out at the end of schooling is what goes on in the classroom. Teaching methods are crucial factors that affect the academic achievement of students, and no matter how well-developed and comprehensive a curriculum is, its success is dependent on the quality of the teachers implementing it [23]. Some research has revealed the reason associated with students' attitudes towards physics courses and methods of teaching [24, 25]. They have highlighted that they take pleasure in physics course if the students know how to plan and implement the strategies of solution to the questions through teaching methods. Students' attitude and interests could play a substantial role among pupils studying science [25]. Several studies have revealed that students' positive attitudes towards science highly correlate with their achievement in science.

Achievement, motivation and interest of students are influenced by their positive and negative attitudes. In classroom, it is found that students who had positive attitudes towards science had positive attitudes towards their science teacher, science curriculum and science-classroom climate. Students' attitude toward science is more likely to influence the success in science courses than success in influencing attitude. Students' attitudes towards physics should consider their attitudes towards the learning environment. Research

has demonstrated that, the attitudes toward science change with exposure to science, but that the direction of change may be related to the quality of that exposure, the learning environment, and teaching method [24]. Results were obtained in the study conducted by [20] after exposing students to a self-learning device.

If students have negative attitudes towards science, they also do not like physics courses and physics teachers. Based on this premise, numerous studies have been conducted to determine the factors that affect the students' attitudes in science. From these studies, some basic factors can be listed, including: teaching-learning approaches, the type of science courses taken, methods of studying, motivation, attitudes, science teachers and their attitudes, self-adequacy, cognitive styles of students, influence of peers, social implications of science and achievement [24, 25]. Studies have revealed the influence of methods of instruction on students' attitudes towards science. These studies on attitudes generally explore how attitudes influence success. Attitudes, whether positive or negative, affect learning in science mostly physics aspect. However, it is well known that a negative attitude towards a certain subject makes learning or future-learning difficult. Therefore, helping students develop positive attitudes towards physics courses should be considered an important step in science education.

Moreover, research has shown that conventional teaching and traditional teaching methods have negative effects on the ability of learning physics for the majority of the students [26]. Conclusions from research show that in order to increase the level of attitude and success in physics education, new teaching methods and technology need to be implemented into physics education [27, 28]. In this regard, cooperative learning is best on attitudes and achievement of students in a developmental science course; the result was that attitude becomes more positive after instruction. Therefore, it is reasonable to claim that the usage of cooperative learning is more useful than conventional methods for physics learning. cooperative learning is a primary objective in learning science with the use of TLMs. By involving students in lesson, a student needs to be active participant in the lesson, make decisions and solve problems using appropriate strategies. Students' success in achieving their goals will encourage them to develop positive attitudes towards physics and other problem-solving activities.

Several teaching methods can be used in physics teaching; cooperative learning is one approach. cooperative learning involves students actively in the lesson. Students participate in lessons to share ideas and find solutions to problems with the help of teaching learning materials. cooperative learning is also an action which covers a wide range of mental abilities by learners finding solutions to problem and sharing ideas. Students should realize what and why they are doing, and know the strengths of these strategies, in order to understand the strategies completely and be able to select appropriate ones [29]. Therefore, the investigation of students' attitudes, behaviours, problem solving, knowledge and skills becomes important with the use of cooperative learning. There is the need to encourage student's enquiry in the learning of physics.

In recent years, there has been a growing movement to integrate enquiry into science education [30, 31]. The importance of enquiry grew from Dewey's ideas. Citizens in a democratic society should be enquirers with regard to the nature of their physical and social environments and be active participants in the construction of society [14]. They should ask questions and have the resources to find answers to these questions, independent of external authority. Since there is a shared, collaborative aspect to life in a democratic society, students also need to develop a capacity for communal enquiry into the nature of the world. Therefore, formal education needs to give students the skills and dispositions to formulate questions that are personally significant and meaningful to them. Enquiry can be explained as 'the process of defining and investigating problems, formulating hypotheses, designing experiments, gathering data and drawing conclusions about problems' [32]. A potential result in enquiry-based teaching enables students to gain insights into the nature of scientific enquiry [33] and understand how and why to apply the scientific method at the same time as they come to understand the subject. Having science process skills acquired, means preparing future scientists and having scientific literacy acquired, explicitly enabling students to use science information in daily life [34]. They can also understand what science is like and what scientists do.

Engaging in enquiry can also help students develop a wide range of skills, such as psychomotor and academic or intellectual skills. Psychomotor skills involve doing something physical, like gathering and setting up apparatus, making observations and measurements, recording data and drawing graphs while academic or intellectual skills include analysing data, making comparisons, evaluating results, preparing reports and communicating results to the others or the teachers. Furthermore, students' attitudes and dispositions such as curiosity, inquisitiveness, and independence of mind, freedom from external authority, and a personal search for meaning about the world can also improve.

An enquiry-based science lesson is a student-centered method of teaching which provides students with the opportunity to ask questions and follow instructions to arrive at new knowledge, and provide students in a science class the opportunity to think and reason critically [35]. A study on

effect of inquiry lab teaching method on the development of scientific skills through the teaching of Biology in Pakistan by [35] revealed that there was a statistical significant difference in the mean performance of the students who were taught some scientific skills in Biology with the enquiry laboratory teaching method and students who were taught the same scientific skills with the traditional teaching method in the posttest. This shows that the acquisition and performance of students in the science process skills were enhanced through enquiry-based science teaching which is a learner-centred based. The use of an activity-based lesson such as teaching Physics by enquiry will help improve the performance of students in Physics thereby making them to have interest and understand physics concepts easily.

Therefore, it would appear that enquiry-based learning can prepare students to be lifetime learners rather than classroom-only learners [32, 31]. In order to implement enquiry-based teaching successfully in science, teachers should fulfill some important conditions [32]. First of all, teachers should allow students to have 'freedom' to seek out desired information. Students must be allowed to try out their ideas and invent ways of accounting for what they see and can ask their own questions [36, 32, 37]. Furthermore, teachers should encourage students to discuss and talk to one another about the topic being taught during the class [32]. Discussion can provide opportunities for students to clarify and share their own understandings, test out their understandings, ask questions and challenge the views of other students and the teacher, and use the new ideas with confidence [38]. Moreover, findings on Teaching secondary school science: Strategies for developing scientific literacy by [32] suggest that teachers' asking and 'telling' should be at a minimum level because classrooms where the teacher is always the questioner and students the respondents, do not easily promote student enquiry and participation. Instead, they encourage student passivity and dependence. Therefore, teachers need to use less question-answer dialogue but organise more class time for student questions, student individual and group reports and whole class and small group discussions. However, there are issues in this approach which need to be addressed: classroom management, time, teacher doubts about students' ability to originate a feasible research project and distrust that students will follow through to the end of the investigation [14]. Also teachers who have low levels of understanding of subject matter knowledge may not wish their students to ask questions because they may not know how to respond, and this becomes difficult for these teachers to move away from a position of student control through questions.

The second condition for implementing enquiry-based teaching is that teachers should provide a 'responsive environment', which can be a classroom, a laboratory or the outdoors on a field trip [14]. It is not enough to supply only a sterile classroom or lecture hall for students. Instead students need a range of resources including books, a laboratory with enough equipment/materials, library, and computers [36] [32]. For example, using ICT facilities makes student enquiry easier, quicker and a richer process than doing the equivalent using a textbook [39]. If students are guided in their search of knowledge from the internet, they can obtain important gains from it in their enquiry process. Through using the Internet, students can explore information in a variety of ways and access the updated scientific information about a particular topic that has not been covered in textbooks [39]. This can enable students to ask their own questions to professional scientists and to use the same or slightly modified data and tools used by professional scientists around the world.

The third condition suggested that teachers should provide 'focus', which means that enquiry is a purposeful activity, a search for particular meaning in some event, object or condition that raises questions in the inquirer's mind [14]. It is stimulated by confrontation with a problem, knowledge is generated from enquiry [19]. The final condition that teachers should fulfill is to provide 'low pressure'. This indicates that students will gain their reinforcements directly from the success of their own ideas in adding meaning to the environment [14]. In order to provide 'low pressure' to students, teachers should be positive and flexible to encourage students further [19].

Furthermore, there is also need for a positive and supportive learning environment in order to foster student enquiry and to encourage students to ask their own questions [37]. In non-threatening and trusting classroom environments, students can show their willingness to seek understanding and express their curiosity. On the contrary, in such classrooms where the conditions are not supportive and encouraging, students may not put forward questions. The teachers' role in encouraging student enquiry is often dependent on the creation of a co-operative social environment, where students learn how best to negotiate and solve conflicts necessary for problem solving [36]. In addition, teachers should also 'guide students in methods of data collection and analysis, help them frame testable hypotheses, and decide what would constitute a reasonable test of a hypothesis'.

They should ask open-ended, higher level questions to their students to encourage them to find out answers to the problems at hand and reveal their own ideas and thoughts [40, 37]. To summarise, enquiry-based teaching is helpful for students to construct their own meaning and understanding and to gain some important skills that they can use throughout their lives. Therefore, teachers should encourage enquiry-based learning among students and create

opportunities for them to conduct enquiry about a particular problem or issue.

Recently, there has been much emphasis on participatory lesson activities because there is a general agreement that effective learning requires students to be active in the learning process [41]. Active teaching and learning involves the use of strategies which maximize opportunities for interaction between teachers and students, and amongst the students themselves, as well as between students and materials and the topic at hand. In addition, researchers believe that the more students are involved in the learning process, the more they learn the topic and likely to develop a sense of ownership in relation to the learning [31, 9]. Ideas can only be formed in students' minds by their own active efforts and cannot be created by another person. This suggests that students are not simply passive recipients of information from the teacher, computer, textbooks, or any other source of information during the learning process as advocated by traditional teaching and learning methods which are teacher–centred. Instead they have to grapple with an idea in their own minds until it becomes meaningful to them.

Active learning approaches can empower students to make good decisions and take an active role in their own learning, increase their motivation to learn, foster and value the diverse voices of students [31]. Passive learning is a traditional instructional style that involves teachers lecturing and students taking notes. The primary activity of passive learning is passive listening. Critics of passive listening say that students are just retaining information until the next test, instead of beyond the classroom. Different methods and strategies have been suggested for involving students in lessons and engaging them in active learning [31, 32]. One of these methods, which are embraced in this study, is the learner-centred approach with the use of TLMs (it talks much on learner-centred with activity base). These approaches advocate the constructivist classroom practices and help students make deeper, more meaningful knowledge constructions in the classroom and their environments. This posits that when tutors encourage full participation of students in a lesson, it increased their performance in the learning activities [42].

3. Methodology

The research method chosen for this study was quantitative. The population for this study included all the three (3) tutors teaching physics and ninety (90) students in the three Colleges of education, in the central and western regions of Ghana, namely Fosu College of Education, Komenda College of Education and Sefwi Wiawso College of Education offering science in the respective college. Purposive sampling techniques was used to select the districts, colleges and respondents for the study. Data Collection was facilitated through the administration of questionnaire. All tutors and students were sampled to answer questionnaire items on co-operative and enquiry learning encourage performance of students in physics lessons in a classroom setting. Questionnaire was created by the researchers to suit the nature of the research question. The questionnaire set to answer the research question contained twenty-eight (28) items- nine (9) items for tutors and nineteen (19) items for students. The quantitative data entry and analysis was done by using the SPSS software package. The data was edited, coded and analysed into frequencies, percentages, with interpretations.

4. Findings and Discussions

4.1. Physics Tutors' Practices of Co-operative and Enquiry Learning

This section answer research question: *How does co-operative and enquiry learning encourage students' learning performance in physics?* on the questionnaire by physics tutors involved in the study. Table 1: shows responses of the questionnaire by selected physics tutors from the three colleges of education. The analysed questionnaire outcomes were done using percentages on the said concept discussed. The questionnaire responses are presented in the Table 1.

Table 1. Encouraging students learning performance in physics through co-operative and enquiry learning.

No	Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
1	Involving students in lessons helps them to participate in lessons	0(0)	0(0)	0(0)	2(66.7%)	1(33.3%)
2	Involving students in lessons encourage them to be active.	0(0)	0(0)	0(0)	1(33.3%)	2(66.7%)
3	Involving students in enquiry helps them to find solutions to problem themselves.	0(0)	0(0)	0(0)	2(66.7%)	1(33.3%)
4	Involving students in practical lessons encourage them to co-operate with colleagues in class.	0(0)	0(0)	0(0)	2(66.7%)	1(33.3%)
5	Students' participate well in lessons delivery when allowed to share ideas	0(0)	0(0)	0(0)	2(66.7%)	1(33.3%)
6	Involving students in groups encourages them to co-operate in sharing ideas.	0(0)	0(0)	0(0)	1(33.3%)	2(66.7%)
7	Involving students in practical lessons helps them to make enquiry.	0(0)	0(0)	0(0)	2(66.7%)	1(33.3%)
8	Students are able to ask questions when they learn together	0(0)	0(0)	0(0)	1(33.3%)	2(66.7%)
9	Students are active in class when making enquiry.	0(0)	0(0)	0(0)	2(66.7%)	1(33.3%)

SD – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; SA – Strongly Agree. Figures in brackets are percentages'

Responses from the physics tutors from the questionnaire shown in Table 1 reveal that all the three tutors which constitute 100% who participated in the study agreed and strongly agreed with statements 1 to 9 that encouraging co-operative and enquiry learning by students helps them to increase their performances in science. The responses showed that physics tutors accept that co-operative and enquiry learning promote active learning, participation, sharing of ideas among students during learning and finding solutions for themselves. Enquiry-oriented instructions are effective to student performance [9]. Basically enquiry promote scientific literacy and understanding of scientific processes, develop critical thinking and skills [44]. Knowledge is derived from interactions between people and their environments and resides within cultures [15]. Co-operative learning can foster the development of deep understanding [16]. All these indicate clearly that tutors believe that involving students in co-operative and enquiries during physics lessons encourage them to perform better.

4.2. Students Learning Performance in Physics Through Co-operative and Enquiry Learning

This section answers the research question- *How does co-operative and enquiry learning encourage students' learning performance in physics?* by the students using nineteen (19) questionnaire items. Statements were placed in the questionnaire to elicit the second year science students' views on the research question. The data collected were presented based on the questionnaires formulated from the research question for the study. Questionnaires containing five point Likert scales (1= Strongly disagree (SD), 2= Disagree (D), 3= Neutral (N), 4= Agree (A), 5= Strongly agree (SA). Data in Table 2 below shows the frequency and percentage responses given from the research question

Table 2. Encouraging students learning performance in physics through co-operative and enquiry learning.

No	Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
1	Learning physics alone in class is difficult for me	0(0)	0(0)	0(0)	70(78.8)	20(22.2)
2	Learning physics in groups help me to share ideas with friends.	0(0)	0(0)	0(0)	55(61.1)	35(38.9)
3	Physics lessons are understood when tutor uses lecturing method	83(92.2)	7(7.8)	0(0)	0(0)	0(0)
4	Physics lessons are understood when tutor involves students in activities	0(0)	0(0)	0(0)	62(68.9)	28(31.1)
5	Making enquiry in physics lessons encourage students to participate	0(0)	0(0)	0(0)	61(67.8)	29(32.2)
6	Sharing ideas with friends during physics lessons encourage students to participate effectively	0(0)	0(0)	0(0)	67(74.4)	23(25.6)
7	Learning in groups in class brings about co-operative learning	0(0)	0(0)	0(0)	60(66.7)	30(33.3)
8	Discussion as in Co-operative learning helps students to share ideas together.	0(0)	0(0)	0(0)	69(76.7)	21(23.3)
9	Brainstorming as in Co-operative learning helps students to perform better in class.	0(0)	0(0)	0(0)	73(81.1)	17(18.9)
10	Making enquiries as in co-operative learning encourages students to find solutions for themselves	0(0)	0(0)	0(0)	55(61.1)	35(38.9)
11	Doing practical work in physics lessons help students to make enquiries	0(0)	0(0)	0(0)	52(57.8)	38(42.2)
12	Making enquiries help students to co-operate with each other.	0(0)	0(0)	0(0)	47(52.2)	43(47.8)
13	Making enquiry in physics lesson encourages students to participate effectively	0(0)	0(0)	0(0)	59(65.6)	31(34.4)
14	Making enquiry in physics practical work help students to perform better in class	0(0)	0(0)	0(0)	72(80.0)	18(20.0)
15	Making enquiry during practical work helps students to co-operate well with friends	0(0)	0(0)	0(0)	66(73.3)	24(26.7)
16	Making enquiries in physics practical work help students to understand physics better	0(0)	0(0)	0(0)	68(75.6)	22(24.4)
17	Making enquiries and co-operating with friends makes students active in class.	0(0)	0(0)	0(0)	69(76.7)	21(23.3)
18	I learn to work with students who are different from me.	0(0)	0(0)	0(0)	70(77.8)	20(22.2)
19	I enjoy the material more when I work with other students.	0(0)	0(0)	0(0)	70(77.8)	20(22.2)

SD – Strongly Disagree; D – Disagree; N – Neutral; A – Agree; SA – Strongly Agree. Figures in bracket are percentages

The responses indicate that total percentage (100%) of the students agreed and strongly agreed to the statements set from research question 1, apart from statement 3 which shows that all the students (100%) either strongly disagreed or disagreed with the statement "*Physics lessons are understood when tutor uses lecturing method"*. Statements 1, 2, 4 to 19 are highly accepted by the students; they agree and strongly agree to these statements. This shows that when tutors in colleges of education involve their students in co-operative and enquiry learning, it helps and encourages them to learn better. A research on effective teaching in science: A review of literature and published in Journal of Turkish Science Education [14] holds the view that encouraging students to work or co-operate with each other in constructing their own understanding has been a highly valued principle of effective teaching in science. Co-operative learning can foster the development of deep understanding [36]. Enquiry-based science lesson is a student-centered method of teaching which provides students with the opportunity to ask questions and follow instructions to arrive at new knowledge, and provide students in a science class the opportunity to think and reason critically [35]. Teachers should provide 'focus', which means that enquiry is a purposeful activity, a search for particular meaning in some

event, object or condition that raises questions in the inquirer's mind [14]. This indicates that there is emergence of co-operative and enquiry learning which makes students active participants in lessons and increases their performance. This implies that physics tutors should be able to engage their students in co-operative and enquiry learning to share ideas and improve their performance.

5. Conclusions and Recommendations

The study pointed out that students learning together in groups encourage them to share ideas. Students' learning through performing activities makes them active in class and helps them find solutions to problems themselves. Cooperative and enquiry learning encourage students to construct their own meaning by talking, listening, making enquiries, writing, reading, and reflecting on content, ideas, issues and concerns.

Physics tutors are fond of using lecturing approach for teaching physics, it is recommended that all physics tutors in colleges of education should be encourage to use cooperative and enquiry learning to engage students to engage students in learning activities. It was seen that attitude of physics students did not help in the learning of physics. Based on this, it is also recommended that science colleges of education counselors should admonish physics students to have positive attitude towards the study of physics so that as they progress on the educational ladder, they would appreciate the need to learn physics.

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