International Journal of Modern Physics and Applications
Vol. 5, No. 2, 2019, pp. 17-25
http://www.aiscience.org/journal/ijmpa
ISSN: 2381-6945 (Print); ISSN: 2381-6953 (Online)

Assessing Learner-Centred Approach and Teaching and Learning Materials in Physics Lessons in the Colleges of Education in Ghana

Victor Antwi[1], Simon Abedi Opare[2, *], Georgina Asinam Fianoo[3], Frank Osei Manu[2], Joana Danquah[4]

[1]Department of Science Education, University of Education, Winneba, Ghana
[2]Department of Science Education, Enchi College of Education, Enchi, Ghana
[3]Department of Science Education, Presbyterian College of Education, Akropong, Ghana
[4]Department of Science Education, Seventh Day Adventist College of Education, Asokore, Koforidua, Ghana

Abstract

The research was conducted to investigate into the use of learner-centred approach and teaching and learning materials (TLMs) in physics lessons in Colleges of Education in Ghana. Quantitative and qualitative (mixed method) survey was used in the study. A purposive sampling was used to select the three (3) science colleges in Central and Western Regions in Ghana. The population for the study contained ninety (90) physics students and three (3) physics tutors who teach those physics from the three selected colleges of education. A questionnaire and interview (semi-structured interview) were used as instruments for the study. SPSS was used to analyse the quantitative data which was coded, edited and analysed to determine the frequency and percentages of responses and the qualitative information was analysed using the interpretative technique based on the themes/items. Twelve (12) selected items set for questionnaires were answered by physics students and five (5) interview items/themes were set for physics tutors to give their responses after they taught the lesson. It was found that physics tutors in colleges of educations were using lecture method to teach physics without involving their students in lesson and this contributed to the poor performance of physics students in physics lessons. It was verified that majority of the science colleges do not have sufficient TLMs and resources for practical lessons. The research showed that using learner-centred approach and TLMs to teach physics encouraged students' participation and active in lessons which improved their performance in class. It was recommended that tutors teaching physics in colleges of education in Ghana should be encouraged to use learner-centred approach and TLMs in their lessons.

Keywords

Learner-Centred Approach, Teaching and Learning Materials (TLMs), Assess, Students' Performance, Physics Lessons, Colleges of Education, Ghana

Received: March 30, 2019 / Accepted: May 30, 2019 / Published online: June 11, 2019

1. Introduction and Background

Science deals with human nature and has become part of our lives and it is clear to see. It is for this reason that we apply science in everything that we do in our life. The knowledge of science encourages us to appreciate the natural world. For example, natural phenomenon like earthquake cannot be predicted but can be explained. Science plays an important role in this technological and computer age. It forms the

* Corresponding author
E-mail address: bordohlity@yahoo.co.uk (S. A. Opare)

bases of many subject areas. Science is divided into two categories, which are natural science and the applied science. The applied science deals with the practical use of the knowledge acquired in natural science. Some of the applied sciences are Engineering, Medicine, Pharmacy, Agriculture, Electronics, I.C.T and Material Science. Natural science is a branch of science that deals with the physical world. The subjects that make up natural science are chemistry, physics, biology, geology, astronomy and meteorology. The knowledge acquired from these subjects of science helps in the development of skills and enhances knowledge thereby leading to improved creativity which in a way tends to bring new ideas, artifacts and inventions into existence.

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. Rapid changes in technology are brought about by science. For this reasons science should be studied at the lower level of education to the highest level and should be taught with appropriate TLMs 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 [1]. 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.

We have arrived at a point in our history when there must be a major increase in the capability of all persons to cope with the scientific and technological culture that is shaping their lives and the lives of their children. Science and technology has taken over the world and to be ignorant about it is intolerable. This is true because no country achieves an industrialized status without paying attention to science and technology. Society, its culture and its value system have a strong influence on scientific development. Science and technology do not exist independently of society [2]. Society always moves with science and hold science more important than any other aspect. Every society in history has developed science based on its needs, interests, hopes and dreams.

It is a plan for every government especially those in the developing countries to make science and technology education a major objective of their national education policy and make every effort to achieve it. Energy forms the basis of all human activities. Without energy, modern life will cease to exist. In the past, the only source of energy to man to run his obsolete machines was the power generated from steam (vapour from boiling water). Today as technology advances, more energy sources have been made available to humans and this include solar energy, wind energy, hydroelectric power, geothermal energy and biomass/biogas energy, all these comes under the study of physics as a subject in science. Modern life requires general scientific literacy for every Ghanaian citizen [3], a requirement that will create a scientific culture in line with the country's strategic program of achieving scientific and technological literacy within the shortest possible time. Scientific culture should therefore become common property of every citizen in a country because it is the antithesis to superstition and the catalyst that will help us toward faster development.

In an effort to address such peculiar needs in order to improve upon the quality of science and technology in Ghana, the government in his national educational document; Vision 2020 has laid much emphasis on science education. One of the basic objectives of Vision 2020 is to develop adequate science and technology capabilities and to provide infrastructure which will enable industries and other sectors of the economy to provide the basic needs of the society [4]. This implies that studying science helps us to understand our environment and the natural world. Science is the pursuit of knowledge and understanding of the natural and social world following a systematic methodology based on evidence [5]. Enquiring science knowledge involves going through experimentation or practical work, observation and evaluation of information. The information is acquired in relation with other established bodies of knowledge, collecting and recording of knowledge to find answers to the questions and challenges that life poses every day.

Science as an integral part of human society. 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 [6]. 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. A conference paper presented on the topic "Towards the optimal utilization and management of resources for the effective teaching and learning of physics in schools" affirmed that science is a dynamic human activity concerned with understanding the workings of the world [7]. This encourages us to be familiar with the world and understand it. 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 without science

There is the need to understand more about the various branches of science for a more thorough understanding of

each. The knowledge of science is so broad that finding ways to understand it makes it unfeasible. Learning a bit of it makes it realistic. 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. Physics has always aim of giving understanding to our natural world. 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 [8]. 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 [9]. 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 with the use of teaching learning materials. The teaching of Physics without teaching learning materials will certainly result to poor performance in the course. 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 [10]. 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 [10].

Learning physics as a subject or branch of science is to help students to acquire skills through experimentation/practical to give clear and easy understanding of natural phenomenon. The purpose of the study is to find out whether the use of learner-centred approach and TLMs will improve students' performance in physics in colleges of education in Ghana. This research is to answer the research question: *To what extent will the use of learner-centred instructional approach and TLMs help in the improvement of students' performance in physics in colleges of education in Ghana?*

2. Literature Review on Learner-Centred Instructional Approach and TLMs in Learning

Student being active in classroom activities during lessons bring about effective learning and increases learners interest. Researchers believe that the more students are involved in the learning process, the more they learn the topic [11, 12]. learner-centred learning has, in theory, promoted and brought about greater student participation and involvement learning and teaching process [13].

The learner-centred approach (involving activity, practical work or experiment) is one of such methods considered for the teaching and learning of science at the colleges of education level in Ghana. The learner-centred of teaching places the student at the centre of the teaching and learning process where the student is made to interact with TLMs to discover scientific concepts, facts, or principles with or without any teacher support but teacher being a facilitator. The materials used by the students in learner-centred lessons are either provided by the teacher or the students [14]. In a learner-centred lesson, the teacher introduces the topic and distributes the TLMs as well as the instructions for the activity/experiment for the students to carry out the activity on their own to discover a new scientific concept or idea. The teacher then acts as a co-learner or a facilitator showing interest in the students' activity [15].

The learner-centred due to its nature has been given several names one of which is Inquiry Science. Training of teachers to teach science (Physics) by inquiry, the instructors for the program acted as co-learners by monitoring the learners involved in the activities and where necessary gave direction to them [16]. This is a characteristic feature of learner-centred of science teaching where the students are placed at the center of the teaching and learning process to form scientific concepts with little or no interference of the science teacher.

Students existing ideas prior to the teaching and learning of any new knowledge lay the foundation for the construction of the new knowledge. The students learn the new knowledge by creating a linkage between the new and the existing knowledge or restructuring the new and the existing knowledge [17, 18]. The learner-centred is said to make use of the linkage and reconstruction of the new and existing knowledge, hence, one of the reasons for the use of learner-centred at the colleges of education level is that it takes advantage of students' making use of TLMs during physics

lesson and sharing ideas among peers through inquiry [5]. The learner-centred approach of science teaching gives students sufficient time to carry out the activity in discovering the new knowledge [17]. Hence, teaching and learning of science should be carried out in such a way that students will have enough time to explore, observe, collect, sort, test ideas, measure, record, draw, interview, survey, compute, and to skillfully handle scientific implements [17]. This enhances students' retention of scientific concepts, and hence, the students' performance on such concepts.

Meaning can only be formed in students' minds by their own active efforts [19] and cannot be created by someone else for students. Students struggle with a thought in their mind in other to make meaningful to them. Students having the opportunity to exchange views and share personal experiences produces the 'cognitive conflict' that is fundamental to intellectual development. For students to overcome the cognitive conflict, they need the chance to work with each other to share ideas, perform experiments, investigate, ask questions, assess and find solutions for themselves [20]. These all imply that they need to participate in learning process mostly with the use of teaching learning materials (TLMs).

In order for students to comprehend new ideas or concepts and construct their own knowledge, they need to see clear examples of what the new ideas or skills represent [11]. Furthermore, in learning new materials or skills, students should be given extensive opportunity to manipulate the environment [20]. Students' cognitive structures will grow only when they initiate their own learning experiences, and students have experience through handling and manipulating with teaching learning materials in performing activities or experimenting (practical's). Teachers should involve students in different tasks where students can engage in cognitive processing activities of organising, reviewing, rehearsing, summarising, comparing, and contrasting with other students, or with the teacher or working alone.

Uses of TLMs therefore provide appropriate introduction and learning of new and complex concepts. They also help in motivating the students to learning thus increasing their participation and concentration. The use of instructional sources would make discovered facts glued firmly to the memory of students. A well-planned and imaginative use of visual aids in lessons should supplement inadequacy of books as well as students interest by giving them something practical to see and do, and at the same time helping to train them to think things out themselves [21].

Teachers use the skills and work on a problem using TLMs whilst discussing the problem. This activity or modeling skills is necessary because when an idea or skill is modeled for students in different ways, they understand the concept better and become meaningful to them, as such devices help students to integrate new information into their existing knowledge structures. As a result, such organization can facilitate retrieval, help students see the relationships among ideas and how they are connected, speed up comprehension, and improve note-taking [22].

The TLMs to be used by teachers and students should follow the laid down procedure since the TLMs are to be utilized for their benefit. There should be regular stock taking and updating of the inventory on some of them provided by the school. Available TLMs should be known and conditions under which they can be utilized should also be spelt out to avoid unnecessary damages and cause accident.

Physics is an experimental subject and the teaching and learning of it needs a lot of teaching learning materials (TLMs) like bar magnet, spring balance, ammeter, voltmeter, thermometer, resistor, galvanometer, rheostat, measuring cylinder, stop watch, pendulum bob, etc, to involve students in practical/experiments for them to understand simple concepts.

Practical work can provide a good opportunity for students to apply their newly acquired knowledge or skills and gain first-hand experience of phenomena talked about in theory [23]. When students engage in practical work, they can test, rethink and reconstruct their ideas and thoughts. For these reasons, many studies reported that practical work improved students' learning and understanding [24]. Such positive outcomes may be as a result of students' gaining ownership over the concepts they learn as they 'discover' the knowledge themselves during practical work. In relation to practical work, simulations can be used to replace laboratory work when laboratory work cannot be done in schools [24, 25]. So, they can help students understand invisible conceptual worlds of science through animation, which can lead to more abstract understanding of scientific concepts [26, 27]. Students can understand not only just what happens, but also how and why. Using simulations in teaching science lessons improves students' higher order skills like application and analysis, and thus, helps them to understand the concept of the topic better.

Poor achievement of student may not be separated from unavailability and inadequate use of TLMs for teaching, as well as instructional materials [28]. Laboratory apparatus and equipment (example, bar magnet, spring balance, ammeter, voltmeter etc) found in physics laboratory which are used for practical work is the 'heart' of science learning and where not found or insufficient, students' academic achievement will be very low or poor. Inadequate laboratory equipment and facilities lead to students' poor performance in physics.

Community resources is also very important to the teaching and learning of science; the result of this study indicating students not going to excursion is not good for effective learning of physics [29]. Community service was beneficial to students' learning because of its connection to their prior science. Basically what student learnt in classroom in theory becomes meaningful to students when they experience this in the community through excursion to see real things. Poor achievement of students in physics could be linked to the way students learn some concepts; many of these concepts look abstract since they have not seen or come across such concepts in action before [30].

The utmost significance in studying how best education TLMs can be utilized is in the endeavour not only for schools to be efficient but also in the process allow for higher enrolment of students and provide greater opportunities for all. Studies show that three main challenges of educational development are improving access to learning, improving effectiveness of education and training systems and mobilizing the TLMs for both [31].

Active learning techniques 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 and reduce disciplinary problems [12]. Researchers believe that this is a result of a sense of ownership and personal involvement that active learning creates. In active learning contexts, students see their work as important because they feel important and their ideas and findings are valued. Students' active participation also requires a positive, supportive learning environment in which they feel free to ask their own questions, express their ideas and thoughts and receive support and encouragement [32]. When students realise that their ideas and thoughts are valued and treated with respect by the group members, when they actively involve themselves in group activities, they feel more confident, and thus, participate more in the activities. Instructors engage students in active, collaborative discovery, which increases students' responsibility for learning and gives students the ability to shape their learning experience [33]. Different ways have been recommended to involve learners in lessons that will encourage them to be active in class.

In short, student participation is necessary for their learning. Active participation can increase students' learning, understanding and motivation to learn. With the use of TLMs, Teachers should make sure that students are mentally active in the lessons and create opportunities for them to participate in the lessons. Involving students in learner-centred learning using TLMs will remove the abstract nature of physics and improve performances of students' in physics lessons.

3. Methodology

The research methods for this study are combination of quantitative and qualitative survey (mixed method). Both methods were used to test the consistency of findings obtained through different instrument used. Quantitative ratings contained five point Likert type scale, reading SD-Strongly Disagree; D- Disagree); N-Neutral); A-Agree; and SA-Strongly Agree.

The target population for the study consisted of thirty (30) physics students and one (1) physics tutor each from the three (3) selected Colleges of Education (making 3 physics tutors and 90 physics students) in Western and Central Region of Ghana, namely Komenda College, Foso College and Sefwi Wiawso College of Education. A purposive sampling technique was employed to select the colleges, respondents and districts for the study. There were thirty eight (38) public colleges of education in Ghana as at that time the research was conducted but now forty six (46).

Questionnaire and interview (semi-structured interview) were used to collect data for the study. All the three (3) selected physics tutors were interviewed and the selected ninety (90) physics students answered questionnaire items to find out how effective they used TLMs and Learner-centred approach in teaching and learning. The combination of questionnaire and interview were formed by the researcher to suit the nature of the research question. The questionnaire contained twelve (12) selected items. The analysis of quantitative data and entry was done using SPSS software package. The data was coded, edited and analysed into frequencies, percentages with interpretations. The semi-structured interview contained five (5) items/themes which were set related to nature of the research question. The qualitative information was analysed using interpretative technique/discussions based on the items/themes arrived during the interview of tutors after the lesson was taught.

4. Findings and Discussions

The researchers blended the discussion with the presentation of results. The research question was answered from the statements on the questionnaire by the students involved in the study. Percentages were used to analysed and answer questionnaire outcomes. The questionnaire responses are presented in the Table 1.

Table 1. Using learner-centred instructional approach and TLMs to help improve students' performance in physics in colleges of education in Ghana.

No	Statement	SD (%)	D (%)	N (%)	A (%)	SA (%)
1	Students enjoy learning physics when tutor centres the lesson among them	0(0)	0(0)	0(0)	68(75.6)	22(24.4)
2	Students enjoy physics lessons when tutor uses TLMs to teach	0(0)	0(0)	0(0)	71(78.9)	19(21.1)
3	Students participate well in class when tutor allows students to share ideas with the use of TLMs.	0(0)	0(0)	0(0)	67(74.4)	23(25.6)
4	Students perform better in physics class when tutors involve them in activities using TLMs	0(0)	0(0)	0(0)	76(84.4)	14(15.6)
5	Learning physics using TLMs makes it easy to understand physics concepts.	0(0)	0(0)	0(0)	59(65.6)	31(34.4)
6	Learning physics among colleagues encourage students to share ideas in class	0(0)	0(0)	0(0)	67(74.4)	23(25.6)
7	Learning physics among colleagues encourage students to increase their performance in class	0(0)	0(0)	0(0)	53(58.9)	37(41.1)
8	Tutor using learner-centred with TLMs to teach physics makes students active in class	0(0)	0(0)	0(0)	39(43.3)	51(56.7)
9	Physics practical/experiment helps students to make use of real materials to find solutions to problems.	0(0)	0(0)	0(0)	21(23.3)	69(76.7)
10	Learning physics in groups helps students to share ideas	0(0)	0(0)	0(0)	24(26.7)	66(73.3)
11	Learning physics in groups helps students to ask questions among ourselves	0(0)	0(0)	0(0)	13(14.4)	77(85.6)
12	Students perform better in physics class when tutors involve them in lessons.	0(0)	0(0)	0(0)	9(10.0)	81(90.0)

D (Strongly Disagree); D (Disagree); N (Neutral); A (Agree); and SA (Strongly Agree). Figures in bracket are in percentages.

Responses of the science students from the questionnaire shown in Table 1 revealed that all the students which constitute 100% who participated in the study agreed and strongly agreed to statements 1 to 12 that the use of TLMs and learner-centred approach in learning physics helps them to improve their performance in lessons. Students using TLMs to learn physics, which is interacting with materials to make enquiries, sharing ideas to co-operate with each other to find answers encourages them to participate in lessons. This focused on making learners active, contributing and performing activities in physics class using learner-centred teaching with TLMs. Notably class activities, instructional content, and teaching method are selected to facilitate active learning, encourage independent thoughts and critical thinking, stimulate interest and promote positive attitude towards science [34]. Again, the author made assertion that student-centred lesson leads to better retention, better problem solving, better application of knowledge, and better motivation for further learning and an effective teacher is therefore able to adopt an eclectic approach to initiate quality science learning [34]. Basically, practical work can provide a good opportunity for students to apply their newly acquired knowledge or skills and gain first-hand experience of phenomena talked about in theory [23]. This implies that physics tutors in colleges of education should teach their students using TLMs and learner-centred approach which engages learners in activities and gives chance to learners to do their own learning without tutors interfering. This encourages learners to actively participate in lessons and improve their performances. [28]

The interview done by the researchers were analysed using the interpretative technique and discussion to find out tutors view on the use of learner-centred approach and TLMs in teaching physics lessons. The research question was answered from the statements from the interview by the selected tutors involved in the study. The interview containing five (5) items were represented as interview 1, interview 2, interview 3, interview 4 and interview 5 set for physics tutors to give their responses after teaching the lesson. The selected tutors were interviewed with the same questions and their views/responses taken were analysed to find out if there will be consistency in relation to the analysed questionnaire answered by the students.

These were the interview responses from the three physics tutors in the three selected college of education.

Interview one (1) represents the first question/item/theme set by the researcher and the responses giving by the selected tutors. The question was; *which teaching approaches do you usually used in teaching physics lessons and why?* Response from a tutor in Komenda College said, "*lecture method is mostly used in my lesson presentations. This because TLMs are not available in the college to be used for practical lessons in physics"*. A Tutor from Fosu College answered that "*most of my teachings is lecturing, lecturing because the time period for covering all the topics in the syllabus is not enough to complete it. I involve students in practical lessons only in few lessons*". Tutor from Sefwi Wiawso College also responded that "*the college does not have enough TLMs for experimentation/practical lessons in physics, so lecturing approach is more preferred than any other approach that will involve students in it*". These responses from the physics tutors indicated that most physics tutors in colleges of education used lecturing method in teaching their students, and this has contributed to the poor performance of students in physics.

Interview question two (2); *how do you see the attitudes and performance of students when you use this approach mentioned in interview 1 in teaching your students?* A Tutor from Komenda college said "*students interest in my teachings were very stumpy and less than 50% of his physics students perform poorly in his lessons and end of term exams*". A physics tutor in Fosu College responded that "*most of my physics students do not show interest,*

participation in my lessons and do not perform well in my lessons. Due to that, students were not serious and do not pay attention in class". A physics tutor in Sefwi Wiawso College said that "*about 75% to 80% of my students do not contribute to my lessons when I asked questions in class. Some of them do not even attend my lectures most of time; this has made my students perform badly in class and term exams*. From these responses giving by the physics tutors showed that the approach they used in teaching physics lessons does not help their students to improve their performance.

The third interview question says; *what were the input and performance of students when you used learner-centred approach to teach the lesson?* A physics tutor in Komenda College said that; "*involving my students in the lesson, students participated a lot during the lesson, they were able to work with each other to find solutions for themselves as I acted as facilitator during the lesson"*. A tutor from Foso College said; "*when I centred the lesson on students, allowing them to work for themselves with the materials, my students were able to ask questions and answer questions during the lesson. Students were much interested in the lesson because they were able to contribute in the lesson"*. A tutor from Sefwi Wiawso said; "*when I used learner-centred approach to teach my lesson, learners actively participated well in the lesson. They were able to find solutions for themselves and answered every question that was asked during and after lesson*". From the tutors responds on the use of learner-centred, it indicated that learner-centred approach is a method that allow learners to participate a lot in a lesson, cooperate with each other, can ask questions from each other and from their tutor which brought good relationship between them as tutors act as facilitators/instructors and arouse learners interest in the lesson.

The fourth interview question says; *what were the input and performance of students towards the use of TLMs in the lesson?* Komenda college physics tutor said; "*when I used the TLMs in my lesson, it permitted the students to work with the materials and were happy using materials in their learning to solve problems. Students performed very well in finding answers to the problem*". A tutor from Foso College said that; "*learners using TLMs in the lesson made them active in class working with the materials themselves. There was cooperation between the learners and me, and learners were able to answer every question I asked after the lesson*". A Sefwi Wiawso physics tutor also said; "*involving learners in my lesson using TLMs made learners participate actively in the lesson because some materials were new to them and wanted to work with it to find the outcome. This made learners understood the lesson and improved their performance during the lesson*". From the responses giving by the three physics tutors, authenticate that students learning with TLMs made them active participant in lesson, had firsthand experience with the materials, aroused their interest in lessons and improve their performances in class.

The fifth interview question also says; *why should learner-centred approach and TLMs be used as teaching approach for physics lessons?* Tutor from Komenda College said that; "*using TLMs in teaching create active participation in lesson by working with the materials, make students work with each other to find solutions through cooperation. It made all my students participate well in the lesson. I think this teaching approach should be encouraged by physics tutors to use in their lessons*". Foso College physics tutor said; "*when I centred my lesson on students by involving them in the lesson and allowing them to work with TLMs to find answers, learners were able to find solutions to the problem themselves, cooperated with each other to find answers. Their participation increased and improved their performance during the lesson. The approach is best for physics tutors and should be encouraged to apply in their lessons*". A tutor from Sefwi Wiawso College also said that; "*learner-centred approach encourages my students to learn for themselves as they perform an experiment using the TLMs. The materials used for learning encouraged them to participate actively in the lesson, work with each other to find solutions and improve their learning performance in the lesson. Physics tutors should be encouraged and motivated to use this approach in their lessons*".

In conclusion from the interviews verified that; learner-centred approach and TLMs in teaching physics encouraged learners to participate actively in lesson, aroused the interest of students, brought about cooperation between learners, learners and tutors, and also improved learners' performances in lesson, this support the assertion that, effective learning requires students to be active in the learning process [35]. Learner-centred teachers articulate what we expect our students to learn, design educational experiences to advance their learning, and provide opportunities for them to demonstrate their success in achieving those expectations [36]. From the interview responses and questionnaires from physics tutors and students showed that there was a consistency between their responses. This indicated that the use of learner-centred approach and TLMs in teaching physics help to improve students' performance in physics lesson.

5. Conclusions and Recommendations

Despite the use of learner-centred approach and TLMs having positive effects on the teaching and learning process,

data in this study have exposed that physics tutors in the colleges of education use more of the lecture method in their teaching than any other method/approach. The study also verify that, physics tutors were not found of using TLMs in their teaching by involving students in activities/experiment in all the three colleges.

The use of Learner-centred teaching and TLMs perform such functions as the extension of the range of experience available to learners, supplement and complement the tutor's verbal explanations thereby making learning experience richer and providing the tutor with interest into a wide variety of learning activities. TLMs supplement, clarify, vitalize, emphasize instruction and enhance learning in the process of transmitting knowledge, ideas, skills and attitude. Learner-centred 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.

There is therefore the need to involve the students in more learner-centred activities with the use of TLMs. Students should disabuse their minds that physics is difficult and that physics is abstract and difficult to understand. The ability of the tutor to make use of TLMs and learner-centred approach in teaching makes lesson more effective and improve students' achievement and performance. Tutors in colleges should attempt to use learner-centred approach and TLMs to teach physics. Colleges of education should provide appropriate TLMs for teaching physics lessons which will make physics more interesting and practical subject. It is also recommended that science students should be encourage and motivated to have positive attitude towards the study of physics to improve their performance on the educational ladder.

References

[1] Brown, K. (2014). *Our shrinking world*. Oregon: University of Oregon.

[2] Cheng, F. (2016). *Society has prime impact on science*. Retrieved from *http://www.straitstimes.com/forum/letters-in-print/society-has-prime-impact-on-science.*

[3] Teaching Syllabus for Integrated Science (SHS), (2016*). Curriculum Research and Development Division (CRDD)*, Ghana Education Service. Accra, Ghana.

[4] Anamuah- Mensah, J. (1998). Science Education as a tool for national development: the missing framework. A paper prepared for presentation at Eastern Washington University, USA.

[5] Pies, W. R., (2010). *Psychiatry remains a science, whether or not you like.* Retrieved from http://www.psychiatrictimes.com/bipolar-disorder/psychiatry-remains-science-whether-or-not-you-dsm5.

[6] Owolabi, T., (2004). A diagnosis of students' difficulties in physics. *Educational Perspectives*, *7*, 15-20.

[7] Ogunleye, A. O., (2000). Towards the optimal utilization and management of resources for the effective teaching and learning of physics in schools. Proceedings of the 41st Annual Conference of the Science Teachers Association of Nigeria. University of Lagos.

[8] Sani, A. (2012). Role of Physics education for technological development for employment and self- productivity in Nigeria. *Journal of Educational and Social Research, vol 2*.

[9] Buabeng, I., Ossei-Anto, T. A., & Ampiah, J. G. (2014). An investigation into physics teaching in senior high schools. *World Journal of Education, 4* (5), 40-43.

[10] Adeyemo, S. (2010). Teaching/learning physics in Nigerian secondary school: The curriculum transformation, issues, problems and prospects. *International Journal of Educational Research and Technology, 1* (1), 99-111.

[11] Trowbridge, L. W., Bybee, R. W.,& Powell, J. C. (2000). *Teaching secondary school science*. Upper Saddle River, NJ: Prentice Halls.

[12] Deboer, G. E. (2002). Student-centred teaching in a standards-based world: Finding a sensible balance. *Science & Education, 11,* 405-417.

[13] Taras, M. (2002). Using assessment for learning and learning from assessment. *Assessment and Evaluation in Higher Education*, *27* (6), 501-510.

[14] Ministry of Education, Youth, and Sports. (2006). Methods of teaching integrated science [Course: PFC 214]. Accra: Teacher Education Division.

[15] Khan, M.., & Iqbal, M. Z. (2011). Effect of inquiry lab teaching method on the development of scientific skills through the teaching of Biology in Pakistan. Language in India. *Strength for Today and Bright Hope for Tomorrow*, *11*, 169-178.

[16] McBride, J. W., Bhatti, M. I., Hannan, M. A., & Feinberg, M. (2004). Using an inquiry approach to teach science to secondary school science teachers. *Physics Education*, *39* (5), 1-6.

[17] American Association for the Advancement of Science (AAAS), (1990). *Effective learning and teaching: Principles of learning of teaching science, mathematics, and technology*. Retrieved from *www.project2061.org/publications/sfaa/online/chap13.htm*

[18] Adu-Gyamfi, K. (2013). Using the activity method to enhance students' performance in energy transformation. *International Journal of Research Studies in Educational Technology*. *3* (1), 87-97.

[19] Sunal, W. D. (2004). *Learning meaning through conceptual reconstruction-a learning/teaching strategy for secondary students*. Alabama: University of Alabama.

[20] Crow, L. M., & Nelson, P. L. (2016). The Effects of Using Academic Role-Playing in a Teacher Education Service-Learning Course. *International Journal of Role-Playing*, 5, 26-34.

[21] Konyango, B. O. (2011*). Impact of resource utilization on the performance of physics in kcse in public secondary schools in ugunja/ugenya*. districts, Kenya.

[22] Cimer, A. (2007). Effective teaching in science: A review of literature. *Journal of Turkish Science Education, 4* (1), 20-24.

[23] Amos, S. & Boohan, R. (2002). *Aspects of teaching secondary science*. Routledge Falmer: London.

[24] Dawe, S. (2003). *Practical work*: *The universal panacea*? Retrieved from http://www.bishops.ntc.nf.ca/rriche/ed6620/practical.html

[25] Peat, M. & Fernandez, A. (2000). The role of information technology in biology education: An Australian perspective. *Journal of Biological Education, 34* (2), 69-73.

[26] Hopkins, D. (2015). *Improving the Quality of Education for All: A Handbook of Staff Development Activities* (2nd Ed.). New York, NY, Routledge Publishers.

[27] Hwang, F., & Esquembre, F. (2003). Easy Java simulations: An interactive science learning tool, interactive multimedia electronic. *Journal of Computer-Enhanced Learning*. 5 (2).

[28] Oladejo, M. A, Olosunde, G. R., Ojebisi, A. O., & Isola, O. M. (2011). Instructional materials and students' academic achievement in physics: some policy implications. *European Journal of Humanities and Social Sciences*, *2* (1).

[29] Akanbi, A. O. (2003). An investigation into students' performance in senior secondary school physics. *Journal of Teacher education trends. 1* (1), 58-64.

[30] Besty, L. N. (2012). The application of community service learning in science education. *Asia- Pacific Forum on Science Learning and Teaching*, *13* (2), 1-15.

[31] Boahene, F. A. (2015). Generation and Management of Funds in Public Schools, A Case Study of Yaa Asantewaa Girls' Senior High School. Published Master of Business Administration (Finance Option) Kwame Nkrumah University of Science and Technology.

[32] Antwi, V., Opare, A. S., Fianoo, E. G., & Quaye, O. M (2019). Practices of Co-operative and Enquiry Learning in Physics Lessons in the Colleges of Education in Ghana. *International Journal of Modern Physics and Applications, 5* (1), 1-10.

[33] Brown J. K. (2008). Student-centered instruction: Involving students in their own education. *Music Educators Journal*, *94*, 30–35.

[34] Erinosho, S. Y. (2008). *Teaching science in secondary schools: A methodology handbook.* Lagos: African Cultural Institute.

[35] Abell, S. K. & Lederman, N. G. (Eds.) (2007). *Handbook of research on science education*. Mahwah, N. J: Lawrence Earlbaun.

[36] Anderson, L., Balsamo, A., Bucher, S., Carnicke, S., Chrystal, S., Fliegel, R., Garner, J., & Hollins, E. (2006*). Learner-centered teaching and education at USC: A resource for faculty*. Carolina: University of South Carolina.