PRACTICAL APPROACH IN THE TEACHING OF PHYSICS COMPONENT OF THE BASIC SCIENCE COURSE: PANACEA FOR MOTIVATING STUDENTS' INTEREST IN PHYSICS.

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Abstract
Despite the fact that physics is the bedrock of development in science and technology, there still exists low enrolment and poor performance among students in physics as a result of lack of practical approach to basic physics concept. This paper identified practical approaches in teaching machines and friction in Basic science. This is because aspects of Physics taught at the basic level were taught using lecture method rather than by practical approach. Hence learners develop negative attitude to the subject and do not opt for Physics at the senior secondary level. It concluded that better performance in Basic Science could enhance same in Physics and other related fields if practical approach is adopted. Also students' participation during lesson would be enhanced and physics teachers should be resourceful.
Keyword: practical approached, motivational enrolment, performance etc.

Introduction

Physics is a very vital subject in Nigeria Secondary School curriculum based on its potential at enhancing the acquisition of relevant technology for advancement and development. It is a branch of science which is concerned with fundamental idea about nature and attempts to establish simple relationship between different quantities as precise as possible (Otuka 1985). Musa (1985) opines that physics deals with matter in relation to energy. The importance of physics can be felt in so many area of human endeavor. Roentygen (1985) said that x-rays is used in the treatment of tumors and cancers and is also used to examine metals for defects and fractures. Lamba (1995) stated that ultra-sonography is used for the diagnosing of abdominals disease. While Droppler ultrasound instrument is widely used for pregnancy test. There is no area of discovery today that does not require the knowledge and principles of physics. From the above information it is clear that for any Country to develop technologically the good quality of physics education is necessary.

The National Education Scheme designed for secondary school physics (1985) stated the objectives of studying physics to includes

1. To provide basic literacy in physics for functional living in the society
2. To acquire essential scientific skills and attitude for preparation for the technological application of physics. Thus, for National development in physics, basic concepts and principles are indispensable.

The teaching of physics in secondary school is intended to produce young scientists who would be able to design technological devices that would make day to day activities easier and living more comfortable. Ajayi (2008) stated a disturbing trend in the decreasing enrolment of physics student in senior secondary examination especially NECO examination. Onwiodukit (1996) attributed this to insufficient equipment, poor attitudes of students thinking that physics is too abstract and difficult subject to study, poor understanding of scientific concepts and insufficient number of competent teachers.

Oguniyi (1995) and Oladirin (1998), observed that poor enrolment was due to lack of good background and understanding of Physics related concepts. The attendance consequence of this low enrolment in physics leads to low enrolment in engineering, Medicine, pharmacy and other related discipline in Nigeria Universities, College of Education, and Polytechnics. Therefore, poor enrolment and performance in physics will negatively affect the production of manpower required to man crucial areas.

Recent research reports by Ajayi (2007) and Adebayo (2012) revealed that the low enrolment of physics students in external examination and their performance is very appalling. Hence there is need to review such factors that affect the students' enrollment into Physics.

This paper reviews the problem facing the teaching and learning of physics component of the Basic Science syllabus taught at Junior Secondary School level and practical approach as ways of overcoming these problems.

Reasons why students lose interest in studying of Physics

A careful study and analyses of enrolment in external physics examination i.e (WACE, NECO and JAMB) reveal that there is fundamental problem militating against teaching and learning of physics education the problems are as follows:

1. **The teaching methods:** the teaching methods by physics teachers have a long way in enhancing effectives learning by the student. The traditional method of teaching science (physics inclusive) in schools involves "chalk and talk" activities which is fully teacher-centered. In that case, the students are passive "robots" in the classroom who regard the teacher as the repertoire of knowledge. The other method which can make student to have interest in physics are inquiry method, collaborative teaching, discovery method that make students to construct their own idea and understanding of concepts of the study. Otuka (1995) noted that science teachers shy away from activity oriented instructional methods that are more effective and stick to inadequate traditional method of teaching. Maduabum (1986) and Ajayi (2008), said that, the practical activities that could enhance creative thinking in the learner are given "lip service in Nigeria schools".
2. **Teacher quality:** the teacher is a facilitator, who is to impact the concept student are expected learn. Research studies by Olarenwaju (1986) and Otuka (1995), revealed that most teachers teaching physics are ignorant of the curriculum content of the subject. Therefore student taught by such incompetent teacher would be invariably shallow in physics concepts and principles. In another perspectives, some physics teachers who are masters of their subject lack the technical know-how of imparting the concepts to the students. One thing is to be well granted in conceptual understanding of the subjects. Another is to be well acquainted with best method to pass the concept across to the learner for proper comprehension. A professional teacher would be desirable in this regard Omolayo, (2009) said that in most secondary schools in Nigeria today, physics in taught by graduate in fields of science such as B.SC Physics, engineering, B.Tech Technology, HND etc. This set of people lack the skills involved in the teaching since they were not trained on the job.
3. Negative Attitude of student toward physics: Majority of the student in the senior secondary school in Nigeria perceived physics as a very difficult subject (Soyibo, 1986). The impression cuts across the gender and that parent do not help the situation through their comments and reaction; they frighten or scare their children and wards away from physics. Adebayo (2008), included the fear of the mathematics skills involved, harsh teacher-student relationship, unreadiness to study, preconceived bad information that physics is the most difficult subject and poor method of teaching. These impressions greatly affect student readiness and interest to the study of physics.
4. Teaching materials: The importance of instructional materials in the teaching-learning process cannot be over-emphasized. Certainly no effective physics teaching can exist without learning materials, equipment and practical activities. It is therefore necessary that physics laboratories must be adequately stocked with the necessary facilities for effective teaching and learning of physics. However, educational researchers reported that most secondary schools in Nigeria have no physics laboratory and the few that have they are ill equipped Madualum and Akuezulo, (1985). These afore mentioned problems in my opinion could be overcome through practical approach to the teaching and learning of physics components at the Junior Secondary School level.

Practical approach in the teaching and learning physics concepts in classrooms

Below is an outline on how to teach the concepts of simple machine and friction to students using practical approach.

Concept: simple Machine

As contained in the junior secondary syllabus, the performance objective in teaching this concept is that student will be able to:

1. Collect and identify common simple machines
2. Identify component in any given simple lever machine
3. List common uses of levers

A machine is a device whereby a comparatively small force applied is used to overcome a large one. Simple machine is simple a device that can assist us in doing some work. The material required in constructing simple machine are usually available locally and are less expensive such as the one found in most homes and technical workshops. Materials needed: claw hammer, kitchen knife, nutcracker, a pair of scissors, wheel barrow, sugar tongs, bottle opener, wooden plank, nails, cement block, a bundle of water leaf.

Methodology

1. The teacher stands in front of the class with the material display and pose a challenge to the student thus
   i. Who can lift me up? "I want to be lifted up" using play way method. He/she subject himself/herself to student attempts. The students are not likely to be successful in lifting up the teacher, hopefully.
   ii. The teacher now places the plank of cement block and stand on the short arm, saying "let someone lift up the teacher. This is expected to attract applause.
   iii. The student are then made to identify the arrangement as a simple machine and also guide to identify the load (L) fulcrum (F) and effort (E).
2. Using the hammer, drive a nail far into the wood plank provide
   i. Use your hand to remove the nail from the wood. What do you observe? Try again. Are you successful? Why
   ii. Now use the claw hammer to remove the nail. What have you noticed/ have you notice the ease with which the nail is removed using the claw hammer? The claw hammer is a simple machine it helps us to do the work faster and easier.
3. Choose any two machine or three of the materials provided and show how simple machine can make – work easier. (a) kitchen knife with a bundle of water leaf (b) wheel barrow and coca-cola drinks and a bottle opener. These forms of simple machine are called levers. Levers exist in three classes or order as shown below

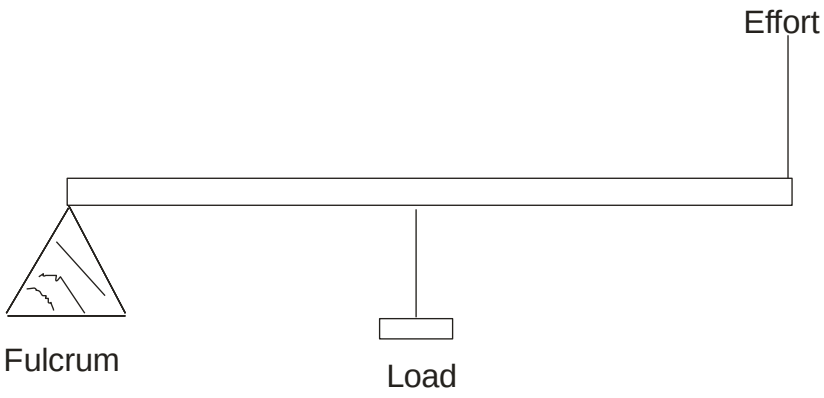
First Order Lever

The distinguishing features of the first order lever are that (I) the fulcrum (F) is in between the effort and the load (L) (ii) the Load is closer to the Fulcrum than the effort. This is shown below.

Base on the activities carried out earlier, and their experience in the home, ask the student to mention some example of this order of lever, their example may include digger, shovel, a pair of scissors, pliers etc.

Second order lever

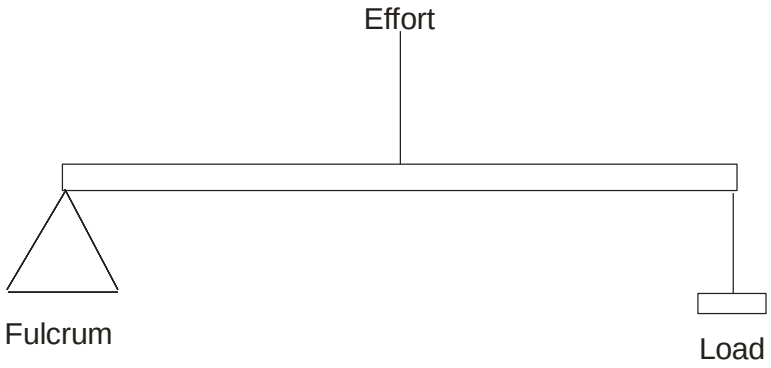
Show the students wheel barrow and guide them to see how this form of lever is different from those of the first order. In this second order, the load is between the fulcrum and the effort. Moreover, the effort cuts vertically upward as different from the first order where the efforts act vertically downward.



Examples include a pair of nutcrackers, moved truck etc.

Third order lever

In the order lever, the effort is between fulcrum and the load example includes, sugar tongs, forceps etc.



Further Activities

To carry out further activities, the following materials are required

(a) Pulleys, include plane, screw jacks, a bag of rice, wheel and ankle, a wedge, 50kg weight etc.

(b) A chart or picture of someone lifting up a car with deflated tyres using a screw jack and a loader moving bags of rice into pick up vehicle using planes.

1. Allow the students to try to move heavy material using inclined planes at different angels to the ground. Let the students discus their experience and draw conclusions that the smaller the angles between the plank and the ground the easier the work.
2. Let the children try to lift up a 50kg weight directly above their head and narrate their experiences.
3. Using pulley demonstrate how this can be done easily. This can be used to move object up storey building.

Concept: Friction

The performance objectives of teaching this to a junior secondary school is that student should be able to:-

1. Define and give some instance and application of friction in everyday life.
2. Produce and reduce friction effect
3. List useful and harmful effect of friction in everyday life.

Note: There are simple two types of force: that which aids motion and that which discourages (opposed) motion. The force that opposes motion when two bodies are in contact is called friction.

Methodology

The student could be involved in the following observations and activities.

i. Observe the soles of their shoes
ii. Observe a used tyre
iii. Try to work on a slippery surface with flat sole and compare to walking on a rough surface.
iv. Attempt to cut something with kitchen knife after washing clothes immediately
v. Pound okro and pepper, respectively.
vi. Rub two slice of dry or toasted bread.
vii. Rub a sand paper against a rough metal.
viii. Rub the palms of your hands together and immediately and immediately touch your checks with them.
ix. Rub a pebble against a cement floor.
x. Strike a match.
xi. Strike the sharp edge of a cutlass against a stone or cement floor and note the results. In each of the activities the student discusses their experience. They should be guided to identify the merits and demerits of friction as follows.

Merit of friction

i. As we walk, frictional force exists between the sole of our shoes and the ground. This is what makes walking possible, without this force we would have been falling anytime we try to walk on slippery ground. Frictional force between the sole of our shoes and the ground is reduced. That is why it is difficult to walk on slippery surfaces.
ii. Frictional force exists between the vehicle tyres and the ground. This force is useful when vehicle negotiate bend, without it the vehicle would skid off the road.
iii. Frictional force exists between brakes and the wheels of vehicles when brakes are applied. This helps the vehicle to stop. Wore out tyres have low friction force existing between them and the ground. That is why it is not advisable to use worn out tyres on the high way.
iv. In handling things, mostly frictional force is involved, for example in cutting using machete, knife axe or other tools, without friction, the handles of there tools will slip off our hands anytime we

want to cut something. Even in writing with a pen without friction between our finger and the pen, it would be difficult to write.

v. Without friction exists between our buttock and our seat we would be sliding off each time we move our body on the seat.
vi. When nails are driven into the wall or into the woods, it is frictional force that enables the nails to stay put without coming out easily.
vii. Sharpening of matches and knifes are possible due to friction.
viii. Friction is required primarily for the working of a bicycle.

Demerits of friction

1. Friction is a nuisance in the following areas. It causes the wearing out in the following area.
   i. Vehicle tyres get worn out because of friction.
   ii. Break pat worn out due to friction
   iii. Metal joint get worn out as the two surface, rub against one another
   iv. A duster get finished because of friction
   v. Machetes and knives get reduced in width due to repeated filing during friction.
2. It causes loss of energy thereby reducing the efficiency of machines.

Method of reducing friction

1. The use of lubricants like oil, gear oil and graphite
2. The use of ball or roller bearing
3. By streaming the body shapes of moving objects

The Result of Practical Approach to Basic Concepts Physics in Junior Secondary School

The two motivational concepts discussed above will bring to the understanding of the students, what is machine, usefulness of machine, the simple machine at home and in school, how to distinguish between loads, effort and fulcrum in a simple lever and the different type of machine. Also frictional force was also discussed, it was made to know that frictional forces exist everywhere, the merit, demerit and how to control or reduce friction was also mention. This practical motivational concept bring out the best in the students as they realized that physics is practical not abstract as it is assumed. If this method of teaching is practiced by our teacher in all the topics, there will be high level of students' enrolment by our students and good performance in physics external examination by our students.

Recommendations

The aim of any teacher is to guide the learner or student to understand and recall a concept so as to apply it in real life situation or recall these concepts easily during examination. The following recommendations are listed to motivate student in choice of physics subject right from junior secondary school.

1. Basic Science teachers should practicalize the teaching of physics concepts.
2. Basic Science laboratories should be provided in junior secondary school and well equipped with physics related infrastructural materials.
3. Student participating during lesson should be enhanced.
4. Physics teachers should use resources from their immediate environments this help the student in the understanding of concepts.

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