SIGNIFICANCE OF PHYSICS ON IMPROVING STANDARD OF LIVING

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Abstract

Human beings have craved for physical comfort and improved standard of living since the advent of civilization through science and technology. Physics as one of the basic science subjects is a strong pillar on which these great records were made in that its knowledge, principles and various concepts were used in developing various equipment, machines, gadgets and so on as seen in science and technology. The feat attained is worthy to be examined critically to know and understand the roles and significance of physics. From the foregoing, this paper reviewed some important roles and positive impacts of physics in making life comfortable for man and recommendations were made on how to improve upon better understanding of physics towards enhancing high standard of living in our nation.

Key words: Significance, Physics, Improvement, Standard of Living

Background

Physics is a body of knowledge that is concerned with the study of matter in relation to energy, space, time, events and universal phenomena. It is one of the fundamental science subjects and it is found applicable in numerous fields of human endeavors. It plays many important roles in nation building like in improved health care (medicine), communication, education, food production (agricultural practices), transportation, production of energy, development of thermodynamics and its uses, war-fare, surveying work, electronics, radiation uses, navigation, engineering works, production and provision of various useful materials and very long lists of other useful scientific discoveries and their applications. Without mincing words, it is evident that the entire world is almost or totally under the control of Physics applications as it is seen or witnessed in our daily activities. Essentially it is clear and evident that technological know-how and its impact takes its root in physics as noticeable and embedded in various topics and concepts like mechanics, electromagnetism, modern physics, waves, sound, optics, solid states, astronomy, thermal-energy, thermodynamics and so on. Many of these applications are noticed in provision of energy, power generation, performance of useful work through the use of machines to overcome load, computer and information technology, manufacturing of air conditioning systems, refrigerator, fan, television an plasma, lighting, video, audio, home theatre, sound systems, pressing iron, disc player, radio, pumping machines, transformer, cables, cars, car engines and other accessories, transportation through trains, airplanes and ships, navigation systems. Furthermore, cell phones, global mobile system of communication, hybrid cars, solar powered systems, supersonic trains, fast moving jets, eye glasses, wares, packaging, household materials and equipments, agricultural materials and equipment in terms of planters, harvesters, ridgers, bulldozers, pharmaceutical related materials, containers and so on because the lists is inexhaustible.

Above inputs from physics and many others have prompted reviewer in developing interest in this presentation and in this regard, efforts was made to dwell so much on the roles of physics in various fields that aid development of nation's building which ultimately improved human existence in making life bearable, easier and comfortable roundabout. In addition to this, Nigerian government at different times have appreciated the roles played by science and technology, by extension the significance of

physics in nation's building as this is enshrined in educational policies. (NPE, 2014). In the light of this, this review work set out to re-emphasize, mention and lists various roles played by physics in our national development and at global level. In a simpler way, this work is aimed at enumerating various roles played by physics in nation building using various fields and areas of specializations where physics has been employed as a basis for achieving hallmark achievements. This presentation will serve as an eye opener to appreciate physics the more as against the public negative opinion that the subject is associated with weapons of mass destruction. It will also shed light on many breakthroughs which are made possible through knowledge of physics. Associated challenges militating against effective use of physics to proffer solutions to divers' problems will also be brought to limelight.

No doubt scientific discoveries through physics (in particular) and their applications have greatly and positively impacted human existence, lives and habits of many societies in the last few decades.

Significant Roles Played by Physics in Various Human Endeavor

Various roles played by physics in nation building are numerous; however some of these are discussed under various headings as follows:

Professional Roles

Education is the bedrock of development and the need to train personnel that will pass instructions to learners can never be underestimated. In the light of this, physics teachers that will prepare and handle effective teaching of students in the class, laboratory technologists that will handle laboratory class and demonstrate experiments and others trained and untrained individual in the school settings needs to be on ground to complement one another's efforts in ensuring that all is well in the school. Teachers, teacher-trainers and educationists employ new technologies like projector, slides, audio, video etc to aid their teaching by jettisoning old talk and chalk method which is now obsolete. These are products of physics. Adewoyin et al (2002) referred to the beauty of new technologies which are incorporated into education by describing them as opportunities for improving quality of teaching-learning process, reduction in training time and cost reduction, promoting interactivity and ultimately impact educational theory and practices. In essence, physics as a subject provides job for individuals and this provides them with livelihood to sustain them, their family and other dependants. They transact, spend their salaries, pay taxes which also contribute to the growth of gross domestic products of the nation.

Mobility of Man, goods and Services

Essentially, man needs to travel, move, relocate, search for useful things and so means of transportation is highly needed in this area. Transportation is means of getting to destinations which can be within and without cities, towns and even the remotest part of the world through the knowledge of physics. Cars, bicycles, motorcycles and other heavy duties vehicles are needed in this regard for effectiveness, time saving, and reduction in energy to be expended and for comfort reasons. On sea or through water, ships and other highly sophisticated vessels are needed to get across to various destinations of the earth. In air, helicopters, planes of various sizes are used. Thermodynamics plays a very important in petrol and diesel engines used by these objects, several pulleys, gears, screw and other machines are coupled together to function as a whole. Lubricants also lubricate moving parts to lessen friction, all these are made possible with the knowledge of physics.

Civil Engineering

Physics knowledge made it possible to effectively construct good roads and bridges than ever before, road must be adequately banked at bends to provide enough centripetal force for cars and other objects going round the corner. Principle of moments, gravity, weight, mass and forces

are applicable in construction of bridges to be durable and withstand the weight that pass through the bridge constructed. Road must be constructed and overlaid with bitumen in convex shape so as to drain away water and erosion otherwise the road will give-in in no distant time which might led to a waste of hard earned resources on the part of government. High rising structures are constructed using cranes, pulleys, wedges, scaffold, spirit level, inclined planes and other tools are provided using physics ideas and know-how.

Physics and Medicine

Physics has provided serene atmosphere in the field of medicine, for instance micro-organisms that transfer diseases and ailments to people must be checked and equipment like needles with other surgical tools which are re-useable are sterilized using physics knowledge. Fractures and dislocation are seen when x-ray pictures are taken, computed tomography, radiotherapy, thermometer etc are all products of physics. Heartbeat of patients are monitored using equipment which is interfaced with oscilloscope, pressure idea is embedded in the use of sphygmomanometer which measures blood pressure of human being. Optical fibre are employed to examine internal organs without surgery, radiation diagnosis and therapeutic use.

Physics in Agriculture

Agricultural machinery, tools and implements like plougher, harrower, ridgers, harvesters, are all products of physics. With little efforts of pressing buttons, hectic works on farmlands are easily done with little stress and within a little time as well. Bush clearing, ridging, ploughing, harvesting and many other farm operations are easily achieved using these tools which are made using physics knowledge. Akinsanmi (2001) opined that man is constantly looking for easier and more efficient means of achieving operations on farm. Oyewole (2004) also reported that with the employment of machinery, large sizes of farmland are cultivated easily thereby increasing food production for the populace as farmers now use machines instead of hand. This has also encouraged many more to go into farming thereby creating jobs for them. Incubators works on the principle of constant temperature using specialized thermometer and heater in an enclosure. Alabi (2002) explained that artificial incubators are useful in hatching more birds up to thousands instead of allowing hens to incubate their eggs. Cage and pens used for keeping birds and other farm animals are built through the use of physics ideas. Milking machine is now in use which replaces human hands for milk extraction and it is based on the principle of suction, flow of liquid, Bernoulli's principle etc are all products of physics. Dams are constructed using knowledge of physics to have large pool of water which is useful in irrigation during draught, fishing and aquatic life, recreation, electricity generation, provision of portable water for public use and so on. Artificial rain are also used to water farm land during dry season in an effort to provide food on table for human consumption. Silos or warehouse are also constructed with installation of heating and cooling devices for keeping farm products for a long period of time without decay or getting spoil. Atmospheric physics predicts weather for the farmers so as to determine when to plant crops for a better yield.

Physics and Communication

In the area of transmission and reception of information by organizations, governmental and non-governmental bodies, private establishments, individuals, banks, insurance companies and so on physics played a significant role. Information can come in form of written or spoken, diagrams, charts, numbers, figures, pictures etc, which are processed and disseminated through electronic components that are embedded in electronic circuits. Electronic components take its roots from physics electronics and serve its various purposes in gadgets like telephone box, telex, telegram, teleconference equipment, photocopier machine, printers, global system of mobile (GSM) communication, satellite, encoder

and decoder machines, television, television camera, computer, microphone, radio and many others. Duncan in 1994 submitted that, electrical signal in form of information registered and recorded through microphone or TV camera or in computer can be sent out from one place to another destination by radio wave or audio-frequency signals. The transmission of information is aided by electromagnetic waves as explained in physics. Artificial satellites are in space performing different functions based on the design that they have, those ones that carry information are communication satellites, and they carry telephones calls as well as television broadcasts for world coverage of major events. Ronald (1993) explained that, direct broadcast satellite (DBS) enables everyone across the world to have access to news and reports of happenings and make each home a low cost 'earth stations' through reception of direct TV programmes from geosynchronous satellite from the dish to decoder and finally on the screen. With all these physics products, man can send all forms of information from one end to various parts of the world without hitch.

Computer and Internet

In this era, millions of computer, android, tablets, palmtop, smart phones users throughout the world find it easy to communicate, access and share ideas because of inter-connectivity of their gadgets. Networks are provided through local or other means, it may be wired, wireless, broadband, dial-up, ad-hoc, VPN, router, access point and so on. Internet is the connection of many computer or other accessories which can be used to access information or share or relay information or messages round the world. Adewoyin et al (2002) defined it as large network of computers that deals with handling of information. This product has positively impacted the entire world positively and greatly in that information about anything is at one's fingertip once there is connectivity and availability of data. It is interesting to know that physics made this to be available for the benefit of mankind and it has transform teaching-learning, research work, e-learning, e-library, virtual meeting, virtual conference, sharing of ideas without face to face contact with users and many other applications. This idea has broken every barrier that exists in almost every fields and borders of nations around the globe.

Vehicle of Different Forms

Vehicles may be land moving type or space moving form. Earth moving form are cars, trucks, motorcycle, caterpillar and so on which the engine may come in form of petrol or diesel while the space type are rockets, space-shuttle, satellite launcher etc. Physics is at the centre stage of the engine that provide mechanical energy of movement to these vehicles specifically in terms of thermodynamic principles. The working fluid in petrol engines is petrol otherwise known as gas in some other countries of the world while diesel serves as working fluid in diesel engines. Heavy duty work is usually performed with the use of diesel and diesel engines have larger volumes than petrol type. The compression ratio of diesel engines are somewhat higher than that of petrol, hence diesel is used to power trailer, tractor, big generating plant, tractors, bulldozers etc. Physics in its thermodynamic principle give details explanation of the functions and roles performed by piston, valve, carburetor, rings, exhaust, jets, shafts, fly-wheel, kick-starter, induction coil, ignition, radiator, cooling fins, cylinder etc. Physics cannot be underrated in the development of vehicles. Likewise, physics knowledge made us to understand the simple idea behind launching space shuttle in that very great amount of thermal energy is provided at the base of the shuttle to overcome gravity of $10m/s^2$. An amount of force greater than acceleration due to gravity will make any object to escape from earth surface to the space.

Air-conditioning, Refrigeration, Heater and Thermostat

In the tropical region of the world where we found ourselves, temperature varies seasonally thereby making weather condition to be unbearable because of heat waves. Air-conditioning and refrigerator

were developed from physics knowledge to stem this problem. Thermodynamic principle was also employed in achieving this feat so that when ambient temperature is above normal body temperature, air-conditioning system can be turned on to bring comfort to the user. Same goes for the refrigerator which brings cooling by drinking cold drinks when temperature appears horrible. Performance of work is used in rating of how efficient these gadgets are working and it may be greater than 100% unlike the efficiency of heat engines that are used in vehicular engines that can never be up to 100% owing to friction in the moving parts and heat loss. In the cold regions of the world however where the weather is cold most time of the year, heaters and heating devices are developed through ideas and knowledge of physics to provide warmth needed so as for inhabitants in such areas will not freeze. In addition, thermostat is used to regulate temperature within the car or house so as not to over-heat the system that may lead to outbreak of fire. Physics and its knowledge are great and highly significant to man.

Energy and Power Generation

Energy is sourced through conventional and non-conventional means or through renewable and non-renewable methods. Conventional sources are from hdyro, geothermal, tides, wind, solar, fossil fuels etc while non-conventional type is majorly nuclear fuel. Renewable are not depleted over the time, for instance energy from dam (hydro), tides, wind, sun but non-renewable sources will run out of time (eg. Fossil fuels and nuclear fuels). Availability of energy is critical to the growth and development of any nation, it drives economy, provides jobs, it enhances fiscal policy and many other things. Energy crises could run down and ground any nation through high inflation, unemployment, increased crime, darkness and other attendant's negativities. In Nigeria, hydro stations and gas fired plants are the major means of energy generation, of course this is inadequate and obsolete. There is urgent need to improve on energy generation so as to improve and grow our economy through physics knowledge as in the case of other developed countries of the world. Concept of energy and power appears similar but they are not the same, energy is produce and when it is being dispensed it becomes power. By definition, energy is the capability to do work while power is the time rate of doing work. The element of time has been introduced as we can see. In all

generators, big or small, diesel or petrol, hydro or gas, wind or tidal, initial kinetic is needed to provide kinetic energy of rotation to drive the generator itself from where electrical energy will be induced as the coil rotates in the magnetic fields of the magnet. Faraday from his law of electromagnetic induction explained that, induction of electricity takes place from rotation of coil in the magnetic fields.

Machine and Instrumentations

Physics explained machines as the applications of mechanical energy, various forms of machines are developed to overcome greater load by applying little effort. Essentially this is achieved by increasing the mechanical advantage of the machine, though efficiency of machine can never be up to 100% as a result of friction in the moving parts but it is usually checked using lubricants. Some of the simple machines are pulley, gears, wheel and axle, wedge, inclined plane, screw and jack and so on. These simple forms are assembled to form complex machines that is helping and giving succor to man in the production of goods and services, provision of materials, in agricultural tools and equipment, fabrication, fabric production and other essential services needed by man. Spirit level used in checking vertical or horizontal arrangement of structures, compass that give exact coordinate of a location or point on earth surface, navigation instrument, altitude measurement, sea depth measurement, echo sounder, crane used in lifting heavy object to desire height and many more are developed from physics knowledge. Likewise measuring tapes, ranging pole for measuring both vertical and horizontal angles of land, construction of straight line between two points.

Physics and War-fare

Some individuals and even some societies have bad labeled physics as bad because of production of weapons of mass destruction such as atomic bomb. No doubt atomic bomb detonation is highly disastrous but it can also be used peacefully when it is confined to an enclosure. In nuclear plant, what takes place is exactly bomb detonation but a reaction under control. The reaction is self-sustaining when neutron is reproduced and the control is brought about in the presence of control-rods, moderator, cooling materials and other materials. Other weapons like missile in form of ballistic and intercontinental missiles are products of physics, anti-scud missile inclusive. Tanks, firearm, guns, grenades, bullet proof vest and doors are made from various materials. Air-plane too that manufactured with high precision to bomb location without missing the targets are there, likewise war-ship where several ammunitions are mounted to lunch offense and defense are from physics. Floating, upthrust and Archimedes' principle are simple logic behind the workings of submarine ships that can travel under water without notice.

Conclusion

Physics as a discipline, its knowledge, principles, laws and applications are show cased in this write-up especially in the manner by which these contributed to the growth and development of nations around the world, they way human lives are impacted positively and the comfort the entire world is deriving from it. Above significances are just a tip of the iceberg considering the numerous means by which the impacts of physics can be felt by man on the global scale. However, the listed impacts are sufficiently enough to establish the fact that physics is indispensable when issues that bothers on challenges that man is faced with is being discussed and the way physics have provided solutions to many of such if not all. No doubt physics is a body of knowledge that cannot be waive aside when we talk about human existence importantly in their day to day activities. By implication, it can be said that, human beings and living things may find it difficult to exists without the impacts of physics. Summarily, physics

is the bedrock of innovations in science and technological advancement. To a large extent, its significances have impacted human beings in all ramifications, hence efforts should be put in place such that factors that aids is better understanding be given utmost attention in order to develop our great nation.

Recommendations

The following recommendations were made in line with the significance and roles played by physics in enhancing high standard of living:

- Teaching and learning of should be given well deserve attention by all stakeholders from physics teachers, students, government, ministry of education, non-governmental and private organizations, parents' teachers association, teacher trainers, colleges of education, faculty of education etc.
- Curriculum developer should design a suitable practicable and workable physics curricula to meet the need of man towards enhancing high standard living.
- Ministry of Science and technology should wake-up to tap the opportunities embedded in physics to enhance better standard of living of human race.
- Workshops, seminars and conferences must be routinely organized for teachers and students to keep them abreast of happenings around the world.
- Laboratory and practical work should be well emphasized so as to concretize the theoretical aspect taught in the class.
- Workshops must be made available with well-equipped tools, machines, implement and materials for fabrication and manufacturing of local materials that can compare with standard or imported ones.
- Factories, industries and workshops where physics related knowledge are used should be visited by students in form of excursion and this should be made mandatory for them to broaden their knowledge in physics.
- Funds should be made available without restrictions to conduct various researches in physics by governmental, donors and other bodies.
- Government should as a matter of fact encourage any discovery made by providing incentives to such researcher(s).

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