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Reality of Physics and Achievement of the Nigerian Vision 20:2020

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ABSTRACT

Physics in the third world countries is seen as been ostensible, hence, regarded as abstract subject with its applications far from human reached. This has deterred the achievement of various laudable visions in the country. The long term vision 20:2020 aimed at propelling the country to the league of the top 20th economies of the world by the year 2020 may not be achieved except physics is made real and apply within our environment. The paper encourages the use of multimedia, computer simulations as well as guided enquiry in the teaching of physics. However, the use of lecture time for deriving equations had been discouraged. This would prepare the right background for technological development needed to achieve the vision.

Key words: Reality, Physics, vision, technology and world 20th economy.

INTRODUCTION

Ordinarily, the word *Reality* refers to what we see, hear, touch, smell and feel. Reality in physics at a first approximation is not intrinsically different from its ordinary meaning. But more importantly for the physicist, *Reality* refers to aspects of the world that exist independently of how human beings recognize or perceive them. Everything surrounding us is made of matter and Physics explains matter as combinations of fundamental particles which are interacting through fundamental forces and exerting energy within the surrounding (Young and Freedman, 2004). Therefore, physics can be said to study nature. This hard-core view of *Reality* has guided and served physicists in the development of logical thinking, observation and experimental skill. The reality of Physics is primarily an intellectual mode of interaction with the world. Therefore, in Physics, *Reality* is what emerges from an intellectual analysis of human sense perceptions.

Visions are ideas or pictures in human's imagination. It is the ability to think about and plan the future with great imagination and intelligence. It also refers to the human sense of perception. Therefore, in achieving a vision the principles of physics surrounding that vision should be well understood.

One of the goals of physics is to seek the truth behind the appearances (Heisenberg, 1970). For instance, what makes the sky blue and the stars twinkle, why do diamonds sparkle and magnets attract, why are most visions not achievable? Exploring such questions is the equivalent of de-robing nature, for real life situation is quite different when we view it in its stark nudity. The exploration into the nature of things has also proved to be extremely fruitful, for the more we know about nature's inner workings and behavioral patterns, the more we are able to predict her

future course and inveigle her to our advantage. This is one of the primary reasons why physics is studied. However, people think and say, Physics is difficult and abstract (Ornek et al., 2008).

The ability to explore nature to the advantage of man's vision is fundamental to achieving such vision.

2.0 Vision 20:2020

The Nigeria Vision 20:2020 (NV20:2020) is Nigeria's long term development goal designed to propel the country to the league of the top 20 economies of the world by the year 2020. Attainment of the Vision would enable the country achieve a high standard of living for its citizens. The NV20: 2020 was developed by Nigerians for the Nigerian people and involved a process of thorough engagement with all stakeholders across all levels of government and society. The Vision is therefore, a rallying point for all Nigerians, regardless of ethnicity, political leaning, economic status, or religion with a common course of placing the country on a sustainable development path and transformation into a modern society better able to play a greater role in the comity of nations. The Vision emphasizes maximum use of available local content and suggests ways of overcoming the challenges of implementation. The NV20:2020 identifies sound economy, good governance and sustainable development as vehicles for transforming the economy and the lives of Nigerians.

2.1 Objectives of NV 20:2020

The two broad objectives are to:

- Make efficient use of human and natural resources to achieve rapid economic growth and;
- Translate the economic growth into equitable social development for all citizens.

The development aspirations cut across four sectors:

• Social - building a peaceful, equitable, harmonious and just society;
• Economic - developing a globally competitive economy;
• Institutional - having a stable and functional democracy; and
• Environmental – achieving a sustainable management of the nation's natural resources.

Nigeria has had a relatively long experience in development planning beginning from the Colonial Development Plan (1958-1968). Fixed medium-term development plans and National Rolling Plans were also developed and implemented without achieving anything. Other strategic efforts such as the Structural Adjustment Programme (SAP), the Millennium Development Goals (MDGs) which the country intends to achieve using National Economic Empowerment and Development Strategy (NEEDS) as machinery, and the 7-Point agenda of Late President Musa Yara'dua's administration were not effectively implemented and recorded modest success. The failure or underachievement of these strategic development initiatives had been attributed to lack of political will to see the development strategy through to the end. Nigeria therefore, adopted a long term approach to development planning and set for itself the goal of being among the 20 largest economies of the world by 2020. Hence, this vision Statement has been chosen:

"By 2020, Nigeria will have a large, strong, diversified, sustainable and competitive economy that effectively harnesses the talents and energies of its people and responsibly exploits its natural endowments to guarantee a high standard of living and quality of life to its citizens" (Abridged Version).

This is a laudable vision but it is likely to fail (as the previous ones) or the targeted year (2020) shifted forward, possibly indefinitely, except the citizenry gets to the point where *physics* is seen as being real, and not an abstract course.

3.0 Simple ways of making physics real

Physics is an area of science with great importance in the world today. Physics invokes some of our deepest fears and highest hopes for the future. For instance, nuclear weapon has the potential of destroying the entire universe; medical physics has the potential of destroying cancer cells; geophysics finds good application in war, exploration for natural resources (Okwueze, 2010) as well as mitigation of environmental hazards from escalation (Evans et al., 2012). In addition, the study of physics is an adventure into nature. It is not something far from us. It is the physics in our life that can help in achieving and sustaining the economy. Physics is challenging, sometime frustrating, occasionally painful, and often richly rewarding and satisfying. Nigeria will be among the first 20 world economies by 2020 if and only if we learn to use physics to solve practical problems and to gain insight into everyday phenomena. Above all, physics is a towering achievement of the human intellect in its quest to understand

our world and ourselves. Before we can become a *large, strong, diversified, sustainable and competitive economy that effectively harnesses the talents and energies of our people and responsibly exploits our natural endowments to guarantee a high standard of living and quality of life to the citizens*, we must first understand the real physics of the world around us.

The dominant public perception of physics is that it is tedious, abstract, and fundamentally irrelevant; the challenge to an institution of this nature (where teachers (trainers) are trained) is to convince the audience (public) that physics is rewarding, fun, useful, exciting, simple and most of all a *worthwhile* endeavor with full potential of transforming the economy (Xiao-Li, 2004). If we fail in this, and the public perception of physics does not change, there is no meaningful achievement we should be expecting from whatever vision the politicians and economic sector may conceive (whether long or short term). In this sense, making physics real at any level of teaching is the foundation for development of the economic sector.

3.1 Methods of teaching Physics

The lecture method is one of the most ancient of teaching methods. In the teaching of physics, it is typically used to demonstrate physical phenomena, to present derivations and to show examples of how to solve problems. The first of these uses of the lecture method is an important one, and is often neglected by teachers who feel compelled to cover more materials or who regard the demonstrations method as distraction. Good lecture demonstrations are absolutely indispensable tools for helping students to relate physical concepts to the real world. It also has the strength of being memorable since it presents physics in the real form.

By contrast, the use of lecture time to present derivations is typically ineffective. A derivation presented on the chalkboard is less useful to the students than the same derivation presented in the textbook, where it can be traced through repeatedly at the students' leisure. The fact is that instructors tend to present derivations in lecture because they doubt that their students read the book. While this is indeed a valid concern, it would seem that using the lecture to reiterate the contents of the book is ultimately counterproductive; it merely helps to *ensure* that the students would not read the book.

The least effective use of lecture time is for presenting the solutions to physics problems. The essential difficulty here is that physics problem-solving is a skill that has to be learned by repeated practice. In learning a skill, it can be useful to first watch an expert exercising that skill, but that is by no means the most important part of the learning process. If it were, the millions who watch professional sports would themselves naturally develop into top-notch players; avid movie-goers would inexorably turn into accomplished actors (who really want to direct); the poor souls who watch televised court proceedings would slowly but surely mutate into highly paid defense attorneys and all church goers would undoubtedly become good preachers. Of course, none of these evolutions really take place. In the same way, students who watch their instructor (an expert problem-solver) work out a solution on the board may be impressed by the instructor's prowess, but they will augment their own problem-solving skills only marginally. The disappointing problem-solving performances of physicists who have had such conventional instruction are evidence of teaching physics in abstract (Halloun and Hestenes, 1985).

3.1.1 Use of multimedia

Teaching physics using an impressive array of experiments, gadgets, props, computer animation, short videos, diagrams, pictures and classic TV science series and other audio-visual aids can help in reducing the abstract nature of physics (Fadaei et al., 2013). Some researches show the students in the multimedia activities outperformed the students who did not experience the multimedia activities in a final course examination and across identical discussion questions (Sadaghiani, 2012). Unfortunately, a lot of people think that physics is all about making measurements, solving equations, and figuring out numbers. This does not appeal to most of the public and students as well.

3.1.2 Simplify equations and laws

If what you say does not make sense to your audience, they will go away with the feeling that physics is a subject that is too hard for them and should be left to the rocket scientists. But it is not. Anyone can do physics. The use of textbook phrases like 'for every action, there is an equal and opposite reaction' should be avoided for beginners. Instead, it will look real to beginners if we say if you are pushing on something, that thing has to be pushing back on you. Thereafter, the right statement of the law can be presented to the learners.

Also, getting into equations and mathematics should be discouraged. For a typical second grader who is just learning how to subtract, F=ma is a bit too much. Instead, you can say that 'how hard you have to push on something to make it start moving has to do with how heavy it is and how much you want it speed up.' This is saying exactly the same thing as F=ma, except that it is in a language that they can understand.

3.3 Demonstration based learning

The Physics van is based on the idea of demonstration based learning. We should teach ideas about physics by using real experiments that people can see. If people can see an example of what a teacher is saying, it will be much more real. Making use of your personal experiences will make more sense: when explaining that a closed circuit is needed for electricity to flow or a light bulb will only light up if all the wires are connected. Many of these require no more equipment than what students can find around houses. These should be incorporated into what you are teaching. Even better is to let the students try the activities themselves. Allowing students to get their hands dirty so to speak, is a surefire way to keep them interested in what the instructor is saying.

3.4 Making physics fun

Most students nowadays have much shorter attention spans because of their age. If you just stand up and talk, they are not going to pay attention nor be excited about what you are saying. To make physics real, the teacher should be interested in the subject. If students see that the teacher is interested, then they are more likely to get interested themselves. Also use experiments/activities that appeal to students interests.

Every one is a born Physicist. Physics teachers should learn to design cartoons manuscript showing the physics in the play ground, in the kitchen etc. Stick figures can be used to demonstrate walking in a straight line, the seesaw, the swing, the kite etc; this is what it takes to make physics real. Students are so eager to learn that lots of different approaches will work. Come up with something that works for you and with your resources. Make sure that you understand what you are talking about and get interested yourself. If a teacher is not interested in what he is doing, the students won't be either. So good luck, and have some fun with physics.

3.5 A Lecture model with active learning

Research shows that lectures become more useful when students are moved to become active participants in the lecture (Arons, 1997). In this case, it is assumed that students have read the required material from the textbook before class and do a lecture demonstration or two as appropriate. Thereafter, the students are given exercises to work out. Students spend several minutes working out these exercises, which are chosen to be specific to the topic at hand: it may involve tasks such as drawing free-body diagrams, writing down (but not necessarily solving) the key equations for a group of related but distinct situations, or making graphs of different types of motion. While this is going on, the lecturer (teacher) walks round the classroom inspecting the students' work. The students are instructed to confer with their neighbors to compare their responses and to resolve any discrepancies. Finally, discuss with the students the correct way to tackle the exercise, being careful to point out common errors to the students.

According to Arons (1997) this technique has several merits. First, the students have something constructive to do during the lecture; it is a sure-fire cure for the stupor that grips students' midway through a conventional lecture. Second, students are forced to discuss physics with their peers and to defend their ideas. Third, students get immediate feedback as to whether or not they understand a concept that has been presented in class, and any points of confusion can be corrected at an early stage in the students' comprehension of the concept. Lastly the instructor can learn a great deal about her or his students' understanding of the material.

Employing "active learning" in the lecture keeps students engaged in the lecture (McDermott, 1996). More importantly, it yields substantially better students' performance on examination than does the conventional (traditional) lecturing method which presents physics as being abstract. An assumption built into the material is that it is more important for the students to learn a few topics deeply and to build a sense of how physics leads to "sense-making" about the physical world than to cover a large number of topics superficially. However, traditional classes consist of lecture and recitation sections. No doubt, active learning forces the lecturer to cover less material. The challenge is to choose between the material that is worthy of discussion during the lecture and the easier material that the students can learn adequately on their own from the textbook.

4.0 The role of physics in the achievement of NV 20:2020

As stated earlier, Nigeria vision 20:2020 (NV20:2020) is the intent of Federal Republic of Nigeria to become one of the top twenty economies in the world by the year 2020, with a growth target of at least $900 billion in GDP and a per capita income of $4,000 per annum.

However, an unbiased in-depth examination of the situation of things in Nigeria clearly shows that the NV20:2020 may not be achievable by the end of this century unless Nigeria goes through a rebirth.

Science and Technology is the engine of innovation and economic growth and development. Throughout history, advances in science and technology have been the key sources of productivity, innovation and economic growth. But for more than 30 years, we have neglected Science and Technology in this country, especially the power sector, which is very vital to economic development. However, the Federal Government has put measures in place to transform the power sector, just the way the telecom sector has been transformed. This is a welcome development because once we fix the energy and infrastructure challenges, the Nigerian economy will grow and generate employment.

The provision of regular supply of electricity will in no small measure help in developing the economy of the nation and also move us towards the fulfillment of the vision 20:2020. This is because small, medium and large-scale industries will produce at their full capacity, more jobs will be created, goods that were hitherto imported will be produced within the country (which will lead to a huge saving in our foreign exchange), exports will increase, etc. As the unemployment rate drops, the security situation in the country will improve. The list of benefits is endless! And this can only come about by concentrating more on one particular sector of the economy.

From this, it is obvious that the achievement of NV20:2020 will only be possible if the study of physics is made real. We are fully aware that the power sector is mainly populated by physicists. The issue of active learning earlier discussed plays a key role here, because we are not only talking about the abstract learning of physics but being able to apply it in our everyday lives. We can only do that when students understand what they have been taught to the point that they can create new innovations, instead of waiting for government to do everything.

CONCLUSION

This paper reviews the reality and applications of physics to our day to day activities. Several works reviewed show that Physics can easily be understood by everyone and finds useful application in our daily lives. Everyone applies its principle in order to achieve success but most people do not realize it. Every time we play on a swing set, play football, bounce a ball, or ride in a car, walk, talk, cut in the kitchen etc we are seeing physics. But the traditional method of teaching it makes the course too abstract, hence, irrelevant to your audience (society). Making physics real will not only help the students to see what instructors are saying better but it will also help to decrease the distance between the students and what they are learning as well as helping policy makers to consider the dynamic role of the reality of physics in achieving set goals. It is obvious that the achievement of NV20:2020 will only be possible if the study of physics is made real. The issue of active learning earlier discussed plays a key role here, because students will be able to harness knowledge gained from real physics to explore the country's natural endowments as they apply physics to their daily lives. We can only do that when students understand what they have been taught to the point that they can create new innovations, instead of waiting for government to do everything.

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