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**The Place of Idealism in Scientific –Technological
Advancement in Nigeria**

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Abstract

Idealism, a School of Thought which emphasizes a kind of philosophy that described ultimate reality as 'thought' or 'mind' has fallen under the sledge hammer of some philosophers, especially the empiricists because, the empiricists believe that Idealism has no practical or empirical basis. Due to the current emphasis on the acquisition of scientific and technological knowledge in Nigeria, there has been the coming together of the wits on how best to achieve the said objective. This paper is aimed at contributing its quota by daring to propose Idealism as inevitability in the acquisition of

scientific and technological knowledge. Against this backdrop, this paper examines the role of Idealism in Scientific Technological Advancement in Nigeria. While trying to do this, this writer critically examined the epistemological position of the Idealists, bringing out the inadequacies. Then proceeded to bring out the plausible roles Idealism would probably play in the acquisition of scientific and technological knowledge.

Introduction

When in 1960, Nigeria attained her independence; little did she know that there was more to independence than mere political independence. It later dawned on her that independence in all its ramifications includes social, economic as well as political self-dependence; and that there must be need for a scientific, technological break-through before a country can boldly say that she is independent on any other nation. This consciousness has made Nigeria to see that the country also joins the queue of scientific and technological advancement. To make this “dream” a reality, the Federal Government in 1973, organized a conference of reputable educational experts who came up with recommendations that gave rise to a New National Policy on Education. Embedded in the policy is the new National Education System. The five main National objectives of Nigeria as stated in the second National Development plan and endorsed as the necessary foundation for the National Policy on Education are the building of:

- 1) A free and democratic society;
- 2) A just and egalitarian society;
- 3) A united, strong and self-reliant nation;
- 4) A great and dynamic economy;
- 5) A land of bright and full opportunities for all citizens.

Federal Ministry of Education, 2004

To achieve these laudable objectives, a new education system, the 6-3-3-4 system (now 9 – 3 – 4 system) was introduced. The system emphasizes scientific and technological development in Nigeria. The system lays emphasis on functional education. This is aimed at making the individual an effective and self-reliant person. It is directed at the reconstruction and development of Nigeria. The 9 – 3 - 4 system stands thus: Nine years of Basic Education – comprising of six years of primary school and three years of

Junior Secondary School (JSS); three years of senior secondary school (SSS), and four years of tertiary education. This system emphasizes science based subjects as well as vocational/technical subjects in the secondary school curriculum. This is a great departure from the old education system which emphasized the Arts related courses.

The National Policy on Education has categorically stated that a greater proportion of education expenditure would be devoted to science and technology; and universities and other levels of the education system would be required to pay greater attention to the development of scientific orientation. The ration of Science to Liberal Arts students in the universities has been fixed at 60: 40. To achieve this scientific and technological advancement, different schools of thought have come up with proposals on how best to achieve this objective. Notable among the schools of thought is 'Idealism'.

Callahan (1977) defines Idealism as "a system of philosophy that describes ultimate reality as thought or spirit". Idealists hold that the entire universe is an expression of intelligence and will. The ultimate substance must be "Mind". In the act of knowing, one thinks the thoughts and purposes of this absolute, eternal, spiritual reality. One cannot have knowledge in and of oneself alone.

The word "Idealism" is derived from the Greek word 'Idea' which simply means something seen or the look of something. The Encyclopedia of Philosophy defines Idealism as "the view that mind and spiritual values are fundamental in the world as a whole" (Edward, 1967). Plato used the word as a technical term of his philosophy to mean a universe (such as something "white"). Plato went further to explain that an idea or form is apprehended by the intellect, does not exist in time and cannot come into existence or cease to exist as temporal things do and hence more real than they are. Idealism is a view that reality is mental rather than material.

It has been argued that the best way of achieving the objectives of the 9 – 3 – 4 system is by relying on experience. That is there should be emphasis on research work that would take the form of data collection, experimentation, et cetera. The bone of contention is that Idealism is the bedrock of Liberal Arts Education and that it has no significant relationship with the sciences; and that it should not be brought to bear in the scientific and technological advancement. This paper therefore argues that Idealism plays significant role in the Scientific and Technological advancement. The paper further highlights

the importance of Idealism in the teaching and learning of science based courses in the Senior Secondary Schools in Nigeria.

Methodology

This article has a theoretical standpoint. The instruments used include traditional philosophical methods of analysis, historical analysis and logical analysis.

Idealism and the Theory of Knowledge

In the “Phaedo”, Plato claimed that there is a “world of Ideas”, an objective ‘real’ world beyond physical world. Plato opined that unlike the material world, which is accessible to the individuals through the senses like sight, touch, feelings, hearing, taste, et cetera, the ‘real’ world of Ideas is accessible to the individuals through the intellect. He declares, “This idea or essence could be discovered ‘seperated’ only through critical examination ...Thus, ideas exist, and other things participate in them and derive their names from them” (Perkinson, 1980).

Plato, contributing his quota to Idealism as a philosophy, seems to believe that reality and existence could be found in a world which is beyond this physical world of sensory organs. He suggested that this world of ideas which is the real world, acts upon the physical world. He further argued that knowledge about the world of Ideas could only be acquired through the intellect only, by way of critical reflection. Plato has not been able to actually explain how the world of Ideas acts upon the physical world, and he also seems to hold to the rational and intuitive knowledge as the only authentic knowledge. This appears to be too narrow, because, scientific knowledge has proved its usefulness in some cases. However, one may agree with Plato that rational knowledge, that is, knowledge acquired through reason and rational thinking precedes scientific knowledge - in most cases – especially when it involves experimental tests.

Bishop Berkeley contended that there is no such entity as a physical world or matter in the sense of independently existing objects. Instead, all that we ordinarily call physical objects are actually collections of ideas in a ‘mind’. A table is the set of perceptions that one has when he touches, looks et cetera; but, this is not to say that things are really different from what they appear to be. According to Popkin (1981), Berkeley insisted that “all that we can ever know about objects is merely the ideas we have of them. The appearances we

experience are the very objects, and the appearances are sensations or perceptions of a thinking being.” Berkeley like Plato seems to uphold the philosophical position of the Idealists that existence in the physical world is the impression that mind makes on the sensory organs. He then suggests that the attainment of the knowledge about objects depends on the thinking ability of the individuals. Berkeley seems to make a point by arguing that rational thinking precedes experience in the acquisition of knowledge.

Descartes’s epistemology appears to give credence to the idealists’ views that rational knowledge is indubitable in the teaching and learning of science and technical courses. In his characteristic method of doubt, Descartes opined that all knowledge obtained through sense experiences should be doubted in the first instance, because, according to him there are sense illusions. Proposing an alternative method of acquiring knowledge, Descartes upheld that true knowledge is gotten through “clear” and “distinct” perception. To explain the method of rightly conducting the reason and seeking for truth in the sciences, Descartes explored the mathematical philosophy of nature. It is believed that he taught men how to think and also raised men’s ‘reason’ as the ultimate authority. For Perkinson (1980), Fontenelle seems to have expressed it well:

He (Descartes) in my opinion, it is to whom we are indebted for this new method of reasoning, a method far more valuable than his actual philosophy a good deal of which judged by his own rules, is either doubtful or definitely unsound.

Majority of the science and technical courses employ mathematics in arriving at conclusions. There is mathematics in Physics, Chemistry, Biology, Agricultural Science, Pharmacy, et cetera. The study of mathematics requires rational thought. It involves reasoning and thinking. It involves intuition. Descartes in his epistemology also derived Physics from metaphysics. Metaphysics is a branch of philosophy which deals with existence and reality beyond the physical world. This is the world of ideas.

Physics is a group of sciences which deal with matter and energy, e.g. heat, light and sound. The study of physics involves some natural laws. An example is Newton’s law of gravity which appeared to have blended with nature. This law of gravity is prominent in physics, but, the physicists are yet to explain beyond doubts what is responsible for the pulling of objects to the

earth, how objects are pulled, et cetera. This appears to be metaphysical in nature. Yet it looks tenable in physics.

Arnauld (1980) displayed some form of Cartesianism when he wrote:

We are accustomed to use reason as an instrument for acquiring the sciences, but we ought to use the sciences as an instrument for perfecting the reason: accuracy of mind is infinitely more important than any speculative knowledge acquired from the truest and most established sciences. A wise man engages in science not to employ his mind, but to exercise it.

Arnauld like Descartes appears to be skeptical about the knowledge acquired by sense experience. He presents the mind as the active rather than passive agent responsible for the acquisition of knowledge – including science. Arnauld seems to emphasize the training of the mind. For him, scientific knowledge is the manifestation of the mind's ability to formulate ideas, pass rational judgments and place things in relation to one another by carefully arranging them. He went further to say that a scientist who neglects this viewpoint fails to see that the study of the speculative sciences, for example, geometry, astronomy, physics, to mention a few, is little better than ignorance.

One is tempted to agree with Arnauld in the aspect of dependence on rational or mental involvement in the attainment of scientific knowledge. For example, if one looks at “hypothesis” which of course is very important in the attainment of scientific knowledge, it is based on probability. Hypothesis is an idea put forward as a starting point for reasoning or explanation. It is an educational guess. It is a conjectural statement or a tentative proposition of various explanations for the cause of a problem. It is a working instrument of theory, (Edwards, 1967). Yet, it appears that no scientific knowledge could be accepted as factual without hypothesis; and hypothesis is an “idea” – probably from the mind. It involves rational and intuitive knowledge.

According to Akinpelu (1984), in the Idealists' epistemology is the importance of the role of the mind and intelligence of the individual in the process of “knowing”. For the idealists, the genuine knowledge is to be found in the spiritual (mental) domain because the physical world of everyday experience is a shadow of the real and original world of ideas. Obi (1980), opined that the idealists claim that it is impossible for one to have knowledge

of a thing without first having a mental construction that is an idea of what that thing is.

Idealism, Science and Technology

Science could be described as “a systematic and controlled extension of common sense” (Conaut, 1968). Common sense is “a series of concepts and conceptual schemes satisfactory for the practical uses of mankind” (ibid). The implication therefore, is that science and technology depend on theory building in the development of techniques. A theory is a set of inter-related constructs or concepts, definitions and proposition that present a systematic view of phenomena by specifying relations among variables with the purpose of explaining and predicting the phenomena. What is note-worthy is that ‘theory’ upon which science and technology seems to build their foundation is also a concept that is an idea.

Science and technology, though knowledge obtained by observation and testing of facts, appear to be idealistic in nature. Conaut, described how engineers at the time of Galileo knew many facts about pumps which no physicist could explain. According to him,

before physics was able to make any important practical contribution to the construction of pumps, it had first to develop an explanation for the facts already known or implicitly assumed in the engineering operation of the period. Once an adequate theory was developed, then the flow of knowledge began to run from pure to applied science rather than the reverse. (ibid)

Conaut appears to have seen the inevitability of theories in any scientific and technological advancement and also the place of Idealism in the scheme of things hence he went further to suggest that: “in the development of testing techniques, tools, machines, etc., there is always a move on the intuition of early idealists philosophers” (Ibid). What Conaut seems to be saying is that the mind is always in a high charged action way and is always looking for connection, for unseen likeness in these circumstances. It is the highly inquiring mind which at the moment seized the chance and turns about what was an accident into something providential.

Being inquisitive is the nature of the inquiring mind. For any scientific or technological discovery to take place, there seem to be the need for a highly

active and inquiring mind. Idealism may be likened to imagination. To imagine according to Bronowski (1978), means “to make images and to move them about inside one’s head in new arrangement.” Bronowski rightly pointed out that before any scientific discovery the scientist engages his mind, that is, the rational intellect. The scientist who propounds a scientific theory makes a choice – an imaginative choice which out strips the facts. The creative activity of the scientist or technologist lives in the process of induction understood as the making of hypothetical theories. Every induction is a speculation and it guesses at a unity which the facts presents, but do not strictly imply. An example is the periodic table of Mendehell and the theory of atomic structure which was created to explain it (ibid).

Presenting an article on “creativity and Education”, Dixon (1972), reiterated the inevitability of the Idealists’ world in any creative process. In his explanation of the ‘creative process’, he wrote: “... all one knows is that it is the product of some innately given power related in some intimate but obscure way to our unconscious mind.” For Dixon, the creative (imaginative) thinking is a matter of the mind playing round a topic of ideas and allowing the unconscious to make necessary connections between them which give rise to inspiration. Although Dixon admitted his inability to explain how the function takes place in the mind, because, to him it is ‘mysterious’, the fact still remain that any scientific creativeness involves an imaginative leap to a new observable perspective.

According to Berkson (1970), some well known experimentalists who believe in scientific method of approach to problem solving, also acknowledge the importance of effective thinking in scientific inquires. These are Darwin and Dewey. For Darwin as well as Dewey, ‘effective thinking’ depends on having a store of ideas, Dewey maintained that “our ability to suggest hypotheses for solution depends on a combination of imaginative power and abundant knowledge”. (ibid). For Dewey, the essentials of thinking include the maintenance of a state of doubt and the conduct of “systematic and protracted inquiry” (ibid). Dewey claimed that most of the time, the only recourse for most experimentalists is a choice of alternative conceptions or proposals.

Peirce (1970), an experimentalist, still holds that an ‘idea’ has a dual function:

- It prescribes a plan for an action to be performed and

- makes a prediction of a result which is likely to follow.

Peirce is probably saying that an idea, which of course results from thought action, constitutes a process of making inferences from present existences to probable future happenings which involve the use of observable representation of such idea. The experimental method which forms the basis for science and technical education appears to be a controlled procedure in which the inferences are drawn by use of 'reason' and observation.

Education (Science and Technical) and Idealism

The mind (intellect) is the active agent which selects, organizes, synthesizes and then conceptualizes what is known. The mind is functional. It is a special activity of an organism that selects and organizes experiences to resolve problems. For the child to reason properly, the mind ought to be developed.

Advocating what may be referred to as inquiry-centred, curriculum, Dewey (1916), a pragmatist writes:

Processes of instruction are unified in the degree in which they centre in the production of good habits thinking. While we may speak, without error of the method of thought, the important thing is that thinking is the method of an educative experience.

Dewey seems to suggest that a teaching-learning process which cannot be organized into the existing experiences of the learner is mere words which do the function of calling out mechanical reaction and regurgitations.

Brown (1968) observes that for advancement in science and technological education, the acquisition of knowledge should serve as a kind of "bridge for the mind in its passage from doubt to discovery". This should be in form of inquiry and discovery. The process of inquiry and discovery should be rationally or logically inclined. 'Inquiry' should precede 'acquiring', and the teaching of any science, technical or vocational subjects like physics, chemistry, electronics, woodwork, et cetera should not be seen as an end to education, but, an essential ingredient in keeping the educative process alive and going.

To encourage self-reliance in science and technological development or advancement, students ought to encounter challenging problems sufficiently

tough and troublesome to cause them to “stop and think”. Science involves experience and/or experimentation. This appears to involve the discernment of the connection between what one tries to do and what happens in consequence. This discernment seems to involve some element of thought or reflection.

Experience seems to be reflective, but, some types of experience requires more reflection than others. Hence, at the rudimentary stage of science education, like at the primary and junior secondary levels simple trial and error experiences may suffice. This involves mere hunting and picking until one finds something which works; and one may continue with whatever, it is until it fails and then look for something to do. Admittedly, this method proves satisfactory only in relatively routine and trivial matters which do not require much precision, sophistication or intelligence.

At the senior secondary school and tertiary levels where the quality of experience or experimentation moves up in the value scale, science and technical education appear to demand an increasing amount of care, deliberation and thought. When an experience is of such quality that it makes one to hesitate, or stop and ‘intentionally’ try to discover specific connection of elements, Dewey calls this “a reflective experience par excellence or thinking. (Ibid). It is interesting to note that Dewey, an experimentalist, has a great deal to say about ‘thinking’, which appears to be the idealists’ way of philosophizing. Dewey equates thinking with what makes experience intelligent – what restructures experience by discovering connection. For him, thoughtful behaviour is acting with an end in view. Thoughtful behaviour which involves reflective action, accepts responsibility for the consequences flowing from present action (ibid).

Again, Dewey equates thinking with the process of inquiry. Thinking, according to Dewey, is a matter of looking into things or investigating. In reflective thinking, “acquiring is always secondary and instrumental to the act of inquiring”. Admittedly, acquired knowledge sometimes appears to be the raw material of thinking, but, thinking seems to spring from situations that are uncertain, undefined or problematic, and it is an act of seeking or a quest for something that is unknown or not yet concrete or not substantial. And this is what is involved in science and technical education. Moreover, thinking according to Dewey, is always hypothetical. However, unlike idealism, the

results are never held dogmatically as final. Rather, for Dewey, thinking is a continuous process.

To draw up a connection between experimentation and thinking in science and technical education in order to encourage scientific and technological advancement, Dewey's method of approach to "thinking in education" appears to be of relevance at this point. The description of the method can be made as follows:

1. **State of Experience** - The initial state of thinking is experience. A pupil experiences something by acting upon it, doing something with it. He notes the interaction of his actions, the material acted upon and the resulting consequence. So, to arouse thought rather than mere acquisition of words, the probable first approach to any subject in school – especially science, vocational and technical subjects like biology, chemistry, agricultural science, welding, et cetera should be unacademic or unscholastic as possible. For Dewey, methods which may be permanently successful in formal education, "give the learners something to do not something to learn; and the doing is of such a nature as to demand thinking ..."
2. **Problem** – This situation involves something that is to be done which is new, uncertain or problematic. This problem should be genuine. That is, the question should naturally suggest itself within some situation of personal experience, rather than being a problem only for the purposes of conveying instructions in some school topic. It should arouse thought, observation and also engage experimentation outside school. It should be the pupil's problem rather than the teacher's or text-book's problem.
3. **Formulation of Ideas** - An aspect that is important in thinking is an idea, a guess or an initial hypothesis. This is the creative or idea stage of thinking. According to Dewey (1916), "Ideas ... whether they be humble guesses or dignified theories, are anticipations of possible solutions. They are anticipations of some continuity or connection of an activity and a consequence which has not yet shown itself." At this stage of thinking in education, what is suggested cuts across what is actually experienced. Suggestions predict possible results rather than facts. This is an invasion of the unknown. Thought in this case appears to be creative. It involves inventiveness.

4. **Observation and Collection of Data** - Dewey believes that it is necessary to have data available to deal with difficulties which arise. In fact, during the thinking process, materials like actions, facts, events, et cetera are very important in science and technical education. Memory, critical observation, thoughtful reading, communication – by way of discussion or dialogue may serve as avenues for the supply of data. At any rate, there should be less reliance on others for data. The student should be given materials that he has to adapt and critically apply to the question in hand for himself.
5. **Reasoned Idea (Hypothesis)** - After observations and collection of data, there is need for the formulation of testable hypothesis. Ideas by way of projection, invention, devising et cetera are important in science and technical education. Bradbury (1969) saw beneath all the varied activities of science the simple theme: Observe, Think, Experiment. Bradbury opined that the thinking stage may be either imaginative (in the formulation of hypothesis) or critical (in the testing of hypothesis). There is the act of mind involved in scientific discovery and proof. The generative act in discovery is ‘having an idea’ or proposing a hypothesis. One can put oneself in the right frame of mind for having ideas, but, the process itself seems to be outside logic hence, hypotheses have to be tested, that is criticized. This is to see if the consequences correspond to reality.
6. **Experimentation/Testing** - The hypothesis or ideas are tested by acting upon them. Dewey’s view is that the learner should be given opportunity to test his ideas by application to make their meaning clear and to discover for himself their validity. Functional education can only be truly sustained by given the student opportunity to come up with his/her ideas and to put the ideas to test.
7. **Conclusion, Report of Results** – If the tested hypothesis effect certain changes in the science world it is accepted as valid. Nigerian Scientists should be encouraged not to shy away from faithfully reporting the results of experimental testing, whether favourable or not. Learners are advised to stop and think, consider the facts of the case and come up with a plan of action brought about by intelligence. This constitutes “thinking” in a reflective experience.

Conclusion

The powers that men – including Nigerians – have over nature and themselves lie in their command of imaginary experience. For Nigerians to become scientifically and technologically recognized and be self-dependent, they need to develop their conceptual framework under which the mind gathers many particulars into one name and many instances into one general induction.

The faculty that is specifically human and which of course is the common root for scientific and technological development seems to spring and grow and flourish together is imagination – the reasoning ability. Bronowski described imagination as the ability to make images and to move them about inside one's head in new arrangements. Nigerians need it for scientific and technological break-through, Nigerians have it; Nigerians must develop their imaginative ability. This is idealism; it can graduate into a reality.

However, Nigerian society should cultivate the habit of being tolerant of the dissent of others. Nigerians have to recognize the fallibility of other person's achievement and yet do them honour because it is their achievement. The activity of science cannot be successfully carried out if you do not have a society organized in this way. A society which is descent and yet rich is tolerant and rich in honour. It appears that in this are the beginnings of principles which the scientist can teach to the world at large. Nigerian teachers must exercise great creative skills in providing opportunities for the learners' minds to discover, analyse, unify, synthesize and create applications of knowledge to life and behaviour.

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