

ENHANCING LEARNING WITH EDUCATIONAL TECHNOLOGY AND CLASSROOMS DESIGN IN NIGERIA

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Abstract

This paper seeks to enhance learning with application of educational technology tools and better classrooms designs in Nigeria's school system. It interrogates the configuration of classrooms using space syntax to assess the efficacy of what is available currently. The micro environments in the classrooms are evaluated in order to see how they impact on the learning process. Guidelines for more effective classroom environment integrated with educational technology tools are provided. It is purely an exploratory study that seeks to sensitize stake holders to evaluate current practices in classrooms designs and deployment of educational technology for learning in Nigeria against current research findings and global best practices.

Key words: Classrooms design, educational technology, environment, learning, Nigeria.

Introduction

Formal education is central to man's developmental endeavours. Accordingly, nations and human societies have established platforms to accomplish the quest for education. Since learning is a life long process and formal education is one of the traditional learning routes, there is the need to constantly interrogate the platform with a view to improve upon it.

The classroom is a built environment in which teaching and learning take place. It is found in educational institutions of all kinds, from pre-schools to Universities and is also found in non-school environment. The classroom provides a place that is conducive to learning. Researchers have found out that classrooms designs and the provisions of educational technology are very essential to how conducive as a learning environment a classroom is.

Wannarka and Ruhl (2008) in their study of the effect of sitting arrangements in class on knowledge assimilation found out that appropriate seating arrangements promote positive academic and behavioural outcomes. This finding collaborated that of Rosenfield (1989) who had earlier posited that good desk arrangements entrenches good behaviour amongst pupils in classrooms.

Jago and Tanner (1999) in their landmark study on the influence of school facility on student achievement had identified educational technology to have a profound positive impact on learning by students. Hunter (2002) in his study of environmental psychology in classroom design discovered that very bright colours were distractive to pupils while very dull colours tended to dull their brains. In the same vein, Fielding (2006) in his study of classrooms lighting and colour debunked certain traditionally held believes and proposed his colour and lighting theories for schools.

These studies and many more show that the classroom should be designed using appropriate considerations of size, colour, shape, lighting, sound and these should be complemented with appropriate educational technology tools. In this way, the classroom will not just be a place for learning but a place that enhances learning.

Formal Educational System in Nigeria

Nigerians Formal Educational System is divided into Kindergarten (for 2-4years olds), Primary Education (for 5-10years olds), Secondary Education (for 11-16years olds) and Tertiary Education (for those above 16years). Both the various levels of Governments and the private sector operate the system. The Federal and States Ministries of Education as well as the Education Departments of the Local Government take responsibility for implementing policies for Education under their respective areas of jurisdiction.

The Kindergarten and Primary levels of Education are run by the Local Governments and the Private Sector. In an effort to set standards, some state governments establish what is called “Model Primary Schools”. The secondary level of education is run by state governments and the private sector. Here also, the Federal Government often intervenes with the establishment of Federal Government Colleges or Unity Schools. The tertiary level of Education is a forte for the Federal and State Governments as well private sector investors. Currently, there are 40 Federal Universities, 36 state universities and 57 private universities all over the country (Education Instruction Database in Nigeria 2015). These are complemented by various polytechnics and Colleges of Education.

The Universal Basic Education (UBE) provides the policy framework for which Nigeria's formal education system (Universal Basic Education Commission UBEC 2014). The UBE involves 6 years of Primary school Education, 3 years of Junior Secondary Education and 3 years of Senior Secondary Education. Monitored by the Universal Basic Education System UBEC, it is also designed to incorporate adult literacy and non formal education, skill acquisition programmes and the education of special groups such as nomads and migrants, girl child and women, *Al-majiri*, street children and disabled people (Aliu, 2001).

Due to underfunding, mismanagement, understaffing, lack of incentives to teachers, and general societal decay, public schools in Nigeria have been abandoned for only the poor. Private schools which do not suffer from the above situations are thriving but they are expensive. These schools have smaller classes, modern equipment (educational technology tools) and better built environment. As of January 2015, the International Schools Consultancy (ISC) listed Nigeria as having 129 international schools (Nigeria Education Profile 2015). ISC defines an “international school” as that which delivers a curriculum to any combination of pre-school, primary or secondary school students, wholly or partly in English outside an English speaking country, or if a school is in a country where English is one of the official languages, offers an English-medium curriculum other than the country's national curriculum and is international in its orientation.

The Classroom

Definition

The classroom is a place in which classes are held. All educational institutions, from pre-schools to universities use classrooms for teaching and learning. Besides educational institutions, classrooms are also deployed for training by individuals and organizations so a classroom provides a place where learning and teaching can be done uninterrupted by external distractions (Fielding 2006).

Types of Classrooms

Different types of classrooms are in use the world over. While some are air conditioned indoor learning environments, others are outdoors under the sun or rain. According to Dyck (2002), this later group is found in rural areas particularly in the far North of Nigeria where it is common site to see pupils receiving formal education under trees. There are also the mobile classrooms for Nomadic Education. These classrooms are designed to enable nomads and herdsmen receive education while they are on the move shepherding their flock. Their education is very necessary when it is remembered that they occupy a prominent place in the food and agricultural chain, nay economy of the nation.

For lessons that require specific resources, specially built and equipped classrooms are provided. This allows for the use of those resources during instructions (Woolner 2010). This is known as situated learning. Examples of this include computer laboratories for information technology lessons, gymnasium for sports and science laboratories for biology, chemistry and physics. Classrooms can range in capacity from small ones for groups of five to six, to big ones with hundreds of students. A large classroom is called a lecture hall.

History of the Classroom Blackboard

The history of the classroom blackboard began in rudimentary form with students in ancient Babylonia and Siberia inscribing their lessons on clay tablets with a stylus in cuneiform writing as noted by (Rosenfield 2009). This later metamorphosed into pen and pencil. There were different forms of deployment. They could be used wet and erased to be used again, or baked to create a permanent document (Woolner 2010). By the 11th century, teachers in India had started using personal blackboards for their lessons (Dyck 2002).

Most classrooms have a large writing surface where the instructor writes for the students to copy or peruse. This was the traditional blackboard that is fast disappearing in classrooms today due to the intrusion of new educational technology tools like flipcharts, white boards and interactive white boards. There also available now, tools like television screens, maps, charts, pencils, books, monographs and LCD projectors for presenting information and images from a computer.

Classroom Designs

Lighting

Lighting, whether artificial or natural is a vital consideration in classrooms design. As much as possible, natural or day lighting is advocated. This is because studies have shown that day light has resulted in better school scores, better student attendance, and higher growth rates in students compared to those in classrooms using artificial lighting only. There were also concerns about prison like nature of classrooms with only artificial lighting and their psychological and emotional well being on students. Studies have recommended artificial lighting as a supplement only to natural lighting.

According to Heschong and Okura (2002), lighting in classrooms presents two principal concerns viz glare and shadow. To tackle the challenge of glare, it is recommended that classroom windows be designed facing north. Alternatively, classrooms could be designed with skylights rather than windows. The advantage here is that windows provide a view which may be distractive. As most students are right handed, it is recommended that classroom windows be on the left stretch of the class. This eliminates shadow on the surface of students' writing materials and provides for better clarity (Dyck 2002). Finishing materials for interior wall surfaces, floor and ceiling must be carefully chosen to enhance the visual quality in classrooms materials that are neither unduly bright nor unduly dull are recommended for instance, very bright wall surfaces may turn the classroom interior into a vast mirror while very dull wall surfaces will tend to absorb light and present a gloomy classroom interior (Heschong 1999).

Acoustics

The sound quality of classrooms though very important is often given little attention in classrooms design. Reverberating floor and wall surfaces greatly increase noise levels and impede learning. By utilizing soft surfaces, especially soft floor surfaces, sounds within the classrooms will be diminished. Here, carpets and rugs are obvious choices as floor finishing materials but they have their drawbacks in cleanliness and maintenance. Finishing materials for walls and ceilings of classroom interiors are also important for enhanced acoustic quality. Reverberations, echoes and other audio factors are accounted not only for by the shape and size of classrooms but also by the finishing materials of the interior wall surface and ceiling. Woolner (2002) had emphasized that shape and size of classrooms play important parts in determining the acoustic quality of the classroom interior. In the area of shape, most classrooms score zero. Most classrooms are rectangular in shape while a fan shaped interior is best for acoustics. Also important in shape consideration is the length width proportion. While a wide difference between the length and width will present the appearance of a tunnel for the classroom, a small difference will give a box like impression. For the area, classroom sizes for 20 to 25 pupils are easy to manage, with an area 0.5m^2 - 1m^2 per pupil. This will allow for desk, chair, maneuverability and storage and circulation. Educational technology tools like screens, projectors and computer tables can also be accommodated.

Colour

The choice of colour is another very important consideration in a classroom interior. Scientists have discovered the effects of different colours on the human psyche. Warm colours for classrooms interior have been found to make students more alert, increases brain activity and promotes reactivity. Cool colours had a relaxing effect. A balancing of warm and cool colours is therefore recommended for classroom interiors (Hunter 2002).

Furnishing

Furniture arrangement in a classroom is very important because students spend most of their study time seated in the classroom. Traditionally, classrooms have a default set up: straight rows of desks facing the chalkboard. This allows teachers to stand both in front of the chalkboard and in front of the students and teach. This also affords the teacher ample space to walk around. A draw back of this arrangement is that students sitting near the ends of the rows view the blackboard angularly and are disadvantaged especially in classrooms with big width (Wannarka and Ruhl 2008).

An alternative to this traditional row arrangement is to arrange the desks in groups two to six. The advantage of this is the ability to utilize these groups for different tasks without moving a single desk. However, this group arrangement has its own negative side. Students sitting in a group out of sight of the teacher are more likely to misbehave when the teacher is not looking in their direction.

A yet alternative arrangement is the circle/semi circle arrangement. This arrangement facilitates the flow of ideas among students. According to Wannarka and Ruhl (2008), this arrangement enables students see who is talking, make eye contact with the teacher and generally bond together. Students sitting in a circle arrangement tend to feel more comfortable in class and this arrangement makes it easier for the teacher to control the class, prevent misbehaviour, see all students at a go and all the students see the teacher in the front.

Furnishing

Apart from the furniture arrangement, materials for and designs of classrooms furniture are equally important considerations. Ideally, there should be different styles and different designs for different students age brackets. Curvilinear and fanciful designs tend to catch the fancy of toddlers and primary school pupils while more rectilinear designs are recommended for secondary and tertiary institutions classrooms.

For classrooms with ceramic floor tiles, metal stands make produce very screeching noise when moved against the floor. Against the fact that these furniture movements are inevitable amongst pupils and students, this can be very distracting during lessons (Wannarka and Ruhl 2008).

For materials consideration, plastic is preferred for toddlers and primary schools classrooms. This is because they are light and unlikely to cause grievous bodily harm on the pupils. Their draw back is lack of durability which makes plastics unsuitable for older students that are physically more destructive. Wood and synthetic materials are preferable for older students in secondary and tertiary institutions classrooms.

Educational Technology in Classrooms

Educational Technology refers to all valid and valuable applied education science, such as equipment, as well as processes and procedures that are derived from scientific research (Molenda 2008). In simple terms, this refers to both physical hardware and educational theoretic. The physical hardware component includes technological tools and media that assist in the development, communication and exchange of knowledge. Hopson, Simms and Knezek (2002) explained educational theoretic component as the theory and practice of educational approaches to learning. Educational technology is therefore an inclusive term for theories and tools that technologically support learning and teaching (Molenda 2008).

The introduction of educational technology tools in classrooms has its historical foundation in attempts at devising means to help people learn in ways that are easier, faster, surer or less expensive. This can be traced back to the emergence of very early educational tools such as paintings on cave walls (Reaves 1998). Students in ancient Babylonia and Siberia inscribed their lessons on clay tablets with a stylus in cuneiform writing. This stylus was the predecessor to the pencil and pen. Various types of abacus were also used.

By the early 11th century Trenten (2010) stated that writing slates have been introduced in Indian schools. These consisted of back tablets for children in the schools. By the end of the 18th century, students in Europe and America were still using individual slates made of pieces of wood coated with paint and grit and framed with wood. Paper and ink though already invented were expensive but slate and wood were in abundance and cheap making then the preferred options. Unfortunately they were highly inefficient. For instance, teachers had no where to teach the class as a whole but had to go to every student individually.

By 1801, James Pillans, a headmaster in an American High School debuted with a novel solution to the frustrating deficiency of slates. He is credited with inventing the first modern black board when he hung a large piece of slate on the classroom wall in America (Trenten 2010). But the above narration is as far as America's application of blackboards are concerned. This is because history had recorded its earlier invention and deployment for music education and composition in Europe as far back as the 16th Century. To buttress this assertion, the oxford English Dictionary provides a citation from 1739, to write "with

chalk on a black-board” Indeed by the early 19th century, the term “chalkboard” was used interchangeably with “black board”

Selwin (2011) noted that there are historical narrations that indicate that the blackboard was introduced into the US educational system from Europe. This narrative recorded the first occurrence at West Point, where George Baron, an English Mathematician used chalk and black board in a lecture on September 21, 1801. This narrative credits the earlier mentioned James Pillan with the invention of the coloured chalk in 1814 with a recipe of ground chalk, dyes and Porridge (Jago and Tanner 1999).

Al Januszewski and Molenda (2007) noted that initially, the black board was a reusable writing surface where writings or drawings are made with short sticks of calcium sulphate or calcium carbonate commonly called chalk. They were usually painted black hence the name blackboard and could be made with a variety of materials from thin sheet of slate to wood and metal. Higher grades may be made of porcelain and these could withstand 10-20years intensive use.

The writing instrument, the chalk gave it its alternate name the chalkboard. Chalk marks can easily be wiped off with a piece of cloth, a sponge or a specially made eraser consisting of a block of wood covered with soft pad called a duster. Sticks of chalk for writing are made from calcium sulphate.

The blackboards were later modified and painted different colours, given rise to green boards, blue boards and white boards but they all remained chalk boards written on with different colours of chalk pigmentation. By the 1980s, the whiteboards written on with markers appeared on the scene. Just like all innovations, the appearance of the white board and marker was due to the problem of chalk dust. Chalk dust was a serious health and hygiene nuisance. The white board with its erasable marker eliminates chalk dust nuisance in classrooms and also eliminates the need to clean chalk board with erasers. Selwin (2011) observed that the chalkboard retains the following advantages over the white board and marker.

- i. It is how tech, efficient and available in rural areas.
- ii. The resistance of the traditional chalkboard makes it easier to write on than the over smooth slickness of the white board and markers
- iii. Chalk requires no special care, white board markers must be capped or else they dry out.
- iv. Chalk is cheaper than marker for the same magnitude of writing.
- v. It is easier to draw lines of different weights and thicknesses with chalk than with marker.
- vi. Chalk has a mild smell, markers have a pungent smell
- vii. Chalk writing on blackboard often provides better contrast than white board markers
- viii. Chalk can easily be removed no matter how long it is left, marker left for a prolonged period of time may require a solvent to remove.
- ix. Chalk is easily removed from clothing, marker is a stain.

On the other hand though, white board and marker have the following advantages over the chalk board:

- a. Chalk produces dust, the amount depending on the quality
- b. Teachers have to wash their hands after using chalk or duster
- c. Allergy to chalk dust could be a serious health challenge for teachers and students
- d. Because chalk sticks are often short, they are not totally used before being discarded.
- e. There is the tendency to scratch nail or finger on the writing board if the chalk is very shot.

Modern Educational Technology Tools in Classrooms

The intrusion of modern educational technology tools in classrooms has been overwhelming. First came the introduction of books and pamphlets which have not only endured but have played profound roles in education. Despite the introduction of computers and tablets, it is unlikely they will ever be phased out (Nye 2007).

The use of electronic media for educational purposes is traceable to the first decade of the 20th century with the introduction of educational films. This was followed by Sidney Pressey's mechanical teaching machines in the 1920s. The US Army then pioneered a series of application of educational technology media in the 1830 and 40s as noted by (Hiltz 1990).

Bates (2005) stated that from the early 20th century duplicating machines such as the mimeograph and Gestetner stencil devices were used to produce examination scripts and other medium copy runs. These have been replaced by high resolution digital copiers and even clone coloured copiers that can do thousands of copies in a matter of minutes.

Slide projectors came into being in classrooms during the 1990s and were quickly deployed in educational institutions (Craft 2012). Again, they did not last long, having been displaced by high definition digital screen projectors that are non the less common in classrooms today. Dieker, Lane, O'brien and Kyger (2009) identified the commonest modern educational technology tools in classrooms today to be:

a. Audio and Video Devices.

The Audio and Video Technologies commonly available include digital cameras, video cameras, document cameras, VHS tapes and DVDs, digital video via server classroom microphones, often wireless are common.

b. Computers, tablets and mobile devices

Computers and tablets enable learners and educators to access websites as well as programmes such as Microsoft word, Power Point, PDF files and other soft wares. Mobile devices such as cell phones, smart phones, i-pads and dickers are widely available and used for instruction purposes.

c. Webcams

Webcams are deployed for web casting and creation of virtual classrooms or virtual learning environments, many computers and mobile devices come with inbuilt webcams systems and softwares.

d. White boards

Interactive white boards and smart boards allow students and teachers to write on the touch screen. Schools have been using interactive whiteboards for a long time before the arrival of tablets and other educational technology tools.

e. Social Networks

Group web pages, blogs and tweets permit learners and instructors to post thoughts, ideas and comments on a website in an interactive learning environment. Here subscribers can communicate by voice, chat, instant messaging, video conferencing and blogs.

Assessment of the Impact of Educational Technology in Classrooms

Educational technology tools are now an inseparable part of the classroom (Geer and Sweeny 2002). Even before school, little children are confronted with various forms of electronic media in their pre school life. Such devices like computers, cell smart phones, televisions and video machines are prevalent in homes. In assessing the impact of educational technology in classrooms, the following stand out:

a. E-learning

E-learning is the use of electronic educational technology in teaching and learning. This has many components and come by various acronyms that include but not limited to information and communication Technology (ICT), Technology-Enhanced learning (TEL), Computer Based Instruction (CBI), Web Based Training WBT, Virtual Learning Environment (VLE). These alternative names individually emphasize a particular digital approach or component instruction delivery method and each conflates to a broad domain of e-learning. Their impacts on the classroom have been positively overwhelming (Dejong 2010).

b. Virtual Schools

Virtual schools are platforms for learning that enables students to log onto an instructional environment anywhere there is internet connectivity. Related to virtual schools are online schools. On line schools create opportunity for students to receive education away from classrooms. Here educational technology has made learning not to be limited by location or class size. This is often called distant learning.

c. Classroom Efficiency

Educational technology has undoubtedly helped people learn in ways that are easier, faster, surer, less

expensive and more convenient. Modern classrooms are now endowed with facilities like flipcharts, whiteboards, interactive white boards, television sets, maps, charts pencils, pens, books, monographs, liquid crystal display (LCD) projectors for presenting information and images from a computer. These have revolutionized the face of classrooms (Molenda 2008).

d. Internet Connectivity

Internet connectivity in classrooms enable students to access course and instructional materials on the world wide web. Course materials on websites allow for a wide range of participation where time and location are no barriers for access.

Conclusion

This paper attempted to explore the benefits of good classrooms design and educational technology to an enhanced learning environment. Classrooms historically have provided the platform for formal education and it is proper to interrogate how well it is serving this function vis-à-vis its traditional outlook and its modern and continuously changing face. Studies by various scholars have established various standards, principles and guidelines of classroom designs for enhanced learning environment. These studies have established guides for anthropometrics, ergonomics, indoor weather characteristics, space syntax and use for various types of classrooms for various levels of education and for deferent climes.

The intrusion of educational technology on the other hand has a massive impact on the classroom environment. From teaching and learning to administration and aesthetics, the impact of educational technology on the classroom has been revolutionary. Each new technology has changed education for the better and has allowed for not only better learning but also better educational opportunities. There is no doubt that much of the giant strides recorded in the evolution of education owes to the invention and effective deployment of educational technology in teaching and learning.

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