IMPROVING THE TEACHING OF GEOMETRY IN SECONDARY SCHOOLS FOR ENHANCED SCIENTIFIC AND TECHNOLOGICAL ADVANCEMENT IN NIGERIA

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Abstract

This paper discussed how geometry can be taught to enhance students' performance in secondary school mathematics with the ultimate goal of fostering scientific and technological advancement in Nigeria. The paper examined the development of geometry, which culminated as a course in school mathematics and the genetic problems with the secondary school geometry teaching. The paper recommended that geometry teaching be done to appeal to the intuition of the students. The paper concluded that geometry teaching should emphasize exploration and discovering in new ways where geometry could be useful in scientific and technological advancement in Nigeria.

Introduction

The school mathematics resulted from the confluence of two traditions. The first rooted in Babylonia astronomy, Egyptian earth measurement and ancient commerce, is mathematics as a reckoning, as a tool required for everyday life. The second tradition is rooted in Greek geometry and medieval algebra, is mathematics as reasoning, as one of liberal art whose mastery marks an educated person. In this tradition, mathematics offers aesthetics satisfaction as well as a means of developing the mind capacity for abstract thought. Every society attempts to pass to its children the language and skills it has acquired or developed for dealing with numerical and spatial problems. When schools are organized to give children grounding in their culture or to achieve their desires, this practical sort of mathematics is what appears in the curriculum.

According to Marut (1999; P.35), mathematics arose from the need for a system for counting and calculating areas of surfaces and volumes of objects, but it has over the centuries become less concerned with practical matters and has turned instead to logic and pure intellectual speculation. He further noted that mathematics, the mother and language of all sciences has been defined by many as the science of number and space. He furthermore noted that the great achievement of technology in all its forms, which deeply influenced the life of every human being, has led to a widespread recognition of the importance of mathematics and thus interest in mathematics has therefore grown steadily. Davies (2001) noted that without mathematics, there will be no development for the scientists as mathematics is the guarantee for precision and objectivity. Modern science and technology derive their inspiration and initiation from the philosophy that affirmed the mathematical design of nature. Pilant (2009) noted that mathematics allows scientists to communicate ideas using universally accepted terminology and that it is truly the language of science. He further noted that many technologies that we take for granted today developed from the results of mathematical research. These include fiber-optic cables that carry our telephone messages, Doppler radar images used in weather forecasting, fuel-efficient jets airplanes and streamline automobile and medical imaging processes.

Among the branches of mathematics is geometry. According to Funk and Wagnalls (MCMLXXI;P.90), geometry is the branch of mathematics that deals with the properties of spaces. In its most elementary form geometry is concerned with metrical problems of determining the areas and

diameters of two dimensional figures and surface areas and volumes of solids. They further added that other fields of geometry include descriptive geometry, analysis situs or topology, the geometry of spaces having four or more dimensions and non-Euclidean geometry. Furthermore, geometry is the mathematical study of shapes and sizes of figures termed plane geometry, when plane figures are involved and analytical geometry when algebra and coordinates (numbers) are applied to geometric problems. Additionally, geometry is designated Euclidean when axioms of Euclid form the basis of the system-particularly parallel postulates, namely that two parallel lines do not intersect and non-Euclidean geometry when different sets of postulates are used to develop a consistent system. Pilant (2009) noted that geometry is the branch of mathematics that deals with the properties of space. That student in high school studies plane geometry-the geometry of flat surfaces-and may move onto solid geometry, the geometry of three-dimensional surfaces. He further noted that geometry has many more fields, including the study of spaces with four or more dimensions.

According to Kline (1979), the derivation of the term, geometry, is an accurate description of the works of the early geometers who were concerned with such problems of measuring the size of fields and laying out accurate right angles for corners of buildings. That this empirical geometry that flourished in ancient Egypt, was refined and systematized by the Greeks. He further noted that Pythagoras laid the corner stone of scientific geometry showing that the various arbitrary and unconnected laws of empirical geometry could be proved to follow as logical conclusion from a limited number of axioms or postulates. He further noted that these postulates were taken by Pythagoras and his successors to be self-evident truth but in modern mathematical thinking they are considered merely as a group of convenient but arbitrary assumptions.

According to Hushkowtiz, Bruckhenier and Vinner (1987), a basic knowledge of geometric concepts, their attributes and simple relations is fundamental for children to interact effectively with their environment as well as for them to enter into a formal study of geometry, itself, and other areas like science and engineering. Also Fey (1991) noted that all geometry instruction is to foster intellectual formation, that is, students should come to know what geometrical thinking is, what geometry is, what it studies and how it devises its method to do this study. He noted that geometrical thinking should not be identified as logical thinking for the latter is the domain of all mathematics. He further noted that the goal of geometry is to transmit important information about space that has been provided in the past and appear to be necessary in the years to come. That this necessity applies not only to preparing for further study of mathematics but for applying geometric knowledge to specific everyday affairs. He furthermore noted that knowledge of geometry is to develop skills in geometric problem-solving that is techniques by which one may find answers to unknown situations through building of geometrical models of physical and behavioral theories or by using geometry as a means of explanation.

However, Fey (1991;P.839) observed that despite the obvious importance of geometry to wide range of important real world problems and the strong traditional belief that geometry is ideal vehicle for teaching logical reasoning, the place of geometry in contemporary school is neither satisfactory nor settled Lassa (1998;p.4) observed that mathematics in our schools, colleges and universities is in a sorry state. That there have been so much concern and outcry from many quarters about the poor performance of students in mathematics at Senior School Certificate Examination (SSCE) and universities. He furthermore observed that hardly is there any day when issues relating to education are not reported in our daily papers and that in most cases, the issue discussed relate to bad performance of students in mathematics and its attendant consequences in our quest for technological development. He noted that we need to face this squarely and increase demand for mathematics as we enter the twenty-first century. He furthermore noted that the rise of modern

science, the desire of most countries (Nigeria included) for development of egalitarian and technological societies and other desirable aspirations compel us to accord increasing weight to the teaching/learning of mathematics in secondary schools. Ukeje (1999) compared the performances of candidates in May/June West African Examination Council (WAEC) Senior School Certificate Examination (SSCE) for 1998 in eleven subject areas (Mathematics inclusive) among West African Countries. He found out that Nigeria took second to the last position in mathematics. Ayodele (2001) analysed trends in the performance of candidates in WAEC/SSCE mathematics as a subject area for the year 1990 to 1996. he discovered that for each year, the bar for F9 in mathematics was always higher than those for other grades combined. Obioma (1985) expressed worries over the poor performance of students in mathematics when he discovered that deficiency profile of Junior Secondary School Students in mathematics were highest in geometry and statistics. WAEC (1996) noted that the performance of candidates in mathematics continued to slide on the downward trend. That it appeared that many of the candidates did not have clear understanding of the subject matter. WAEC noted that the candidates were generally weak in areas of geometry and trigonometry. WAEC (2002, 2003, 2004) also reported that candidates performed poorly in mathematics and also identified that candidates were weak in areas of geometry, WAEC attributed the weakness to among other reasons; inadequate coverage of the syllabuses, poor knowledge of the subject matter and inability of the candidates to show any firm grasp of the details needed to answer the questions.

Bature and Bature (2005;P.64) opined that the teaching and learning processes in mathematics are in a situation that requires urgent attention if better performance is to be expected. They further opined that mathematics is poorly learnt because it is poorly taught in secondary schools. Onah (2006;P.136) observed that the poor performance of students in mathematics can be attributed to lack of the understanding of the subject matter. Oyetunde (2003) pointed out that it is the concern of educational administrators around the world to improve the quality of education generally (mathematics included) and how best to teach because there is general dissatisfaction with the kind of teaching that goes on in the classroom. Herrera (2001) noted that teaching for improved performance in mathematics as a subject of study in schools and colleges should be done in a meaningful manner and that this should also conform to the widely acclaimed standard advocated by the National Council of Teachers of Mathematics (NCTM), where they emphasize acquisition of skills for problem solving, reasoning, communication and connections among mathematics topics and to other subjects when students learn mathematics. Thus, in trying to improve the performance of learners in mathematics, the role of the teacher becomes crucial in teaching/learning process. The teacher should not only teach content knowledge of mathematics but should be able to indicate strategies that are required by the content to make leaning meaningful, integrated and transferable. Hence this paper discusses the teaching of geometry and the importance of transformation approach to the teaching of geometry in secondary schools which could improve students' performance in mathematics and enhanced scientific and technological advancement in Nigeria.

Rationale for Transformation Approach to Geometry Teaching.

According to Marjoram (1974), researches into how children learn mathematics indicated that learning based on intuition and experiences of the children can enhance retention and application. Also Fremont (1969) noted that these research findings arrived at differing points of view regarding learning process but have established common characteristics as well. That the direction of learning moves from concrete, physical experience with complete freedom to project hypotheses and test them in given situations to the more logical, analytical abstract ordering of what has been done. Furthermore, those teachers who are intended upon building mathematics experience for children can

not ignore these works if they are to help each of their students to experience the joy and satisfaction that are all often missed in mathematics classroom.

Lassa (1998;P.6) opined that the children in secondary schools should be made to have pleasure in learning mathematics. He noted that on the whole it used to be dreadful business, and no attempt was made to select subject matters that reflected their culture and be related to their future profession. He further noted that our ideas about the subject depended very much upon the ways in which we study mathematics in the schools and colleges. That some of us experienced only rote learning where teachers showed us on backboard, how to work out a particular problem, then we had to do a number of examples in the same way often without understanding what we were doing, but always trying very had to get the right answer. However, we did not find it easy to do examples that were not exactly like those we had been shown. And that others of course were fortunate, that teachers helped them to understand what they were doing, by providing practical activities and encouraging them to find out as much as possible for themselves. Thus, that they became confident in dealing with questions they had not seen before. He furthermore noted that with the demand for more mathematical knowledge of all professions and for coping with life there is need to change the method of teaching mathematics in the secondary school.

Timku (2004;P.111) noted that generally speaking, there are two extreme methods of teaching geometry, which are intuitive approach and the formal/axiomatic approach. He opined that for any topic of instruction, a place can be found for it between these two extremes. He further noted that recommendations are converging on the position that emphasis should be laid more on practical, intuitive numerical application strategies rather than relying on the previous strategies which emphasized memorization of book theorems.

Transformation Approach to Geometry Teaching.

Fletcher (1976) noted that the first contact pupils in primary schools have with the study of geometry is through motion geometry`: when a shape or an object is moved from one position to another and the motion can be thought of in terms of separate processes, under the guide of the teacher. The movements, she termed transformation and the separate processes involved include turning (rotation), sliding (translation) and mirroring (reflection). She noted that this approach to teaching geometry encourages the pupils to develop geometric thinking, explore and discover geometric ideas to the best of their ability and maturity and eventually aided them in problem solving and stimulated their interest in geometry.

Marjoram (1974) noted that the mostly neglected group of missed opportunities in secondary schools is the development of the study of geometry through the basic transformations of reflection, rotation, translation and enlargement. Bishop (1991;P.860) noted that concerning the methods of teaching geometry, which transformation approach allows, that it can be seen that ideas of rotation and reflection are all intuitively familiar to students. That many actions of body operate on objects in our environment by means of rotation, for example throwing and twisting; and mirrors, windows and water give reflection; sliding and balancing give translation. That this appeals to intuition lays the foundation for geometry as empirical study in schools. He further noted that actual objects can be transformed as can drawn shapes at later stages. That many paper-folding activities can be developed once connections are made with aesthetic ideas of pattern, symmetry and balance. Line symmetry can be approached through the practical methods of folding. That this reinforces the fact that a line of symmetry divides a shape or an object into equal halves each fitting exactly onto the other and can be useful in treatment of similarity in geometry. Tessellation can be looked at and the ideas of congruence are introduced in this framework. Students can be encouraged to look at tessellation in

their world around them. Later the transformation can be symbolized algebraically and systematically analysed. Combinations of transformations can be explored and suitable axiomatic treatment proposed linking geometry with other branches of mathematics (Wynne, 1977). The basic aim is to encourage students to approach the study of geometry in a spirit of discovery and adventure for them to understand to the fullest extent consistent with their ability and maturity how mathematical facts are discovered and how mathematical concepts are formulated and can be generalized and extended. In fact, the students should be led to develop mathematical understanding and power. For example Archimedes in attempting to find the formula for the area of a segment of a parabola, imagined this area placed at one end of a level arm and the other end the rectangle circumscribing the parabola. He then undertook to determine where the fulcrum must be placed so that the figure may be in equilibrium. From this consideration he deduced that the area of the parabolic segment was two-thirds that of the rectangle.

Bishop (1991) noted that on the problem of the objects of this geometric study, that they are not the details of particular shapes but highly general operations and relationships. That, however, this is not to say that objects such as triangles, circles, quadrilaterals and polygons generally are ignored. That, in fact parallels relate to translation, circles relate to rotation and perpendiculars relate to reflection and many Euclidean theorems can be interpreted transformationally. That the transformations predominantly studied in schools now are the rigid motion of plan-isometrics-where distances between points are preserved, that is translations, reflections, rotations, enlargements and similarities, and affine transformation, where parallelism is preserved, that is, shears, stretches.

The transformation approach to geometry enables it to be connected with other parts of mathematics like vector, matrices, abstract algebra and group theory. Also, the transformation approach helps to unify mathematics of algebra and arithmetic in the concept of application of vector space and linear algebra. Furthermore the transformation approach can lay the foundation for scientific and technological advancement in that it provides powerful link between geometry, algebra and the physical world. Situations in the physical sciences which involve one or other of these self-same operations; reflection, rotation, translation and enlargement require transformation geometry. Also technology requires these self-same operations in that the mechanisms of technology rely on the principles of reflection, rotation, translation and enlargement.

Conclusion

Crucial to this paper is the importance of making the Nigerian child become familiar with science and technology through instructions in geometry. Most Nigerian children come to secondary schools without exposure to scientific and technological knowledge and also the age which children find themselves in secondary schools, call for instructions in geometry to be adopted to the experience and maturity of the children. The best approach to meet the needs of Nigerian growing children therefore is to start early in life to provide the necessary training and the experiences for the development of scientific attitude. Thus teachers must have to direct their instructions to appeal to the intuition of the students to encourage and stimulate scientific and technological advancement.

Recommendations

Federal Government of Nigeria. (1998) identified one of the specific aims and objectives of secondary education is to equip students to live effectively in our modern age of science and technology. Literatures available indicated that instructions in mathematics can facilitate the attainment of this aim and objective. Also literatures are available that observed that students perform poorly in mathematics and that an area of students weakness is geometry. In order to attain this aim

and objective through instructions in geometry in secondary schools, the following recommendations are among the many that can be adopted.

1. Teachers should engage in the meaningful teaching of geometry not only to teach the content of geometry course but take cognizance of the ability and maturity of the students.
2. Teachers should teach geometry with links to real life situations.
3. Teachers should encourage students to participate in the teaching/learning process of geometry.
4. Teachers should be given opportunities to attend seminars and workshops to expose them to innovations in teaching/learning of mathematics.
5. Government should employ qualified and well-trained teachers to teach mathematics.
6. Government should provide incentives to well-dedicated mathematics teachers.
7. School authorities should provide adequate textual materials for teaching geometry.
8. Schools authorities should increase the number of periods of teaching mathematics on the school timetable.
9. Parents should provide adequate textual materials for learning geometry.

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INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND THE STUDY AND PRACTICE OF FINE/APPLIED ARTS

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Abstract

The Information and Communication Technology (ICT) has made the world a global village. ICT enables networking of computers all over the world, which makes sharing of information and resources possible no matter where they are located and are needed. The introduction of ICT in Fine and Applied Arts education has been observed to enhance the quality of graduates from art schools, productivity, and also save time and cost. This paper analyses the application of some ICT tools and packages in the teaching, learning and practice of Fine and Applied Arts. It identifies shortage of ICT facilities and personnel in schools as some problems, and recommends among others, the review of the art curriculum and active involvement of the art students, teachers and practitioners in ICT so as to benefit maximally in terms of increased productivity, teamwork, collaboration and socio-cultural integration.

Introduction

With science and technology and the spirit of teamwork, collaboration and socio-cultural integration, the world seems to be gradually approaching a target where the sharp distinction between art and science is rapidly being replaced with the mission of global development. The introduction of Information and Communication Technology (ICT) is an indispensable recreation of the theory and practice of the arts and sciences and the usage for the advancement of global development must be properly understood. According to Jon-Nwakalo (1995), the sooner you fall behind in information and communication technology, the more time you have to catch up. An individual that is grossly inadequate in ICT might spend enormous amount of time, perhaps, a lifetime trying to catch up. In recent time, the study and practice of Fine and Applied Arts has been griped by this all-embracing technology that encourages teamwork, generation and dissemination of quality information and visuals and collaboration in art education.

Definition of Basic Concepts.

To position our thought and imagination on a clear path in this discourse, the understanding of some key concepts is necessary. Such as "Information", "Communication", "Technology", "Information Technology" "Information and "Communication Technology" and "Fine and Applied Arts".

What is information? According to the 6th edition of Oxford Advanced Learner's Dictionary, information is fact or details about somebody or something. Fact refers to a situation that is known to exist and true.

Communication Akpoveta and Ogbemi (2006), gave a social perspective definition of communication as a process of information exchange within, between or among individuals, groups, association, organization and nation. Nwosu (2000), defined communication as a social process that uses signs, symbols and other such means to bring about interchange of thoughts and meanings between and among individuals and groups for better understanding and relationships.

Communication therefore involves senders and receivers of messages using symbols and icons to create meaning. Okoye and Adigwe (1998), opined that communication can be one- way requiring no response or feedback or two-way or bi-directional allowing for feedback or exchange.

Technology- According to Perrow (1965), technology is a technique or complex of techniques employed to alter materials (human or non human, mental or physical) in an anticipated manner. It is the knowledge of using tools and machines to do tasks effectively and efficiently.

Information Technology refers to the creation, gathering, processing, storage and delivery of information and the processes and devices that makes all these possible (Okonta, 2008). This definition sees information technology as the use of hardwares, softwares, services and supporting infrastructure to manage and deliver information using voice, data and video.

Information and Communication Technology is the science and skill of all aspects of computing, data storage and communication. It involves hardware, software, transmission and presentation of information.

Fine and Applied Arts - The term Fine and Applied Arts refers to two subsets of the broad classification of the art field. Fine art which is based mainly on aesthetic functionality consists of painting, sculpture and drawing, while applied art that is mainly utilitarian and rarely aesthetic, consists of graphic design, textile design, fashion design, ceramics (pottery), photography technology, industrial design, jewelry design among others. Fine and applied arts is also known as visual arts. Other areas of art include dramatic arts (music, drama and dance) and liberal arts (poetry, literature, philosophy, history among others).

ICT tools and Packages in the Study/Practice of Fine and Applied Arts

ICT consists of the hardwares, softwares, transmission and presentation of information. The use of ICT in the classroom has been observed to support both extrinsic and intrinsic motivation of students and greatly enhancing productivity in practice. The various tools and packages available to the artist have been observed to enhance and manifest the skill already acquired therefore, the Nigerian artist must as a matter of obligation, supplant ideological sensitivity into the use of tools and equipment in the process of solving visual communication problems. As Uche- Okeke (1982) puts it, techniques as far as they relate to art, have universal application, whereas design proper is a product of a socio-cultural system or a national artist. The artist can therefore achieve his goal through technology by skillfully and creatively manipulating ICT tools and packages. Some common ICT equipment includes:

(a) Desktop/Laptop computers
(b) LCD projector
(c) Video recorder/discs
(d) Film, slide, transparency or filmstrip projectors
(e) Tapes/flash cards.
(f) Record players/discs.
(g) TV sets
(h) Talking books
(i) Video/Audio sensors
(j) Digital camera

Some common application packages include

(a) Word processing package (MS-Word)
(b) Spreadsheet package (MS- Excel)
(c) Presentation package (MS-Power Point)
(d) Desktop publishing package (Corel Draw)
(e) Architectural package (AutoCAD)
(f) Database package (MS-Access)

An important skill that is prominent today is computer literacy. Although computer technology is relatively new in Nigeria, the artist must have adequate knowledge of its application if he must retain his pride of place in the competitive market. Dvorak (1994) cautioned that we must remember that the driving force behind computers has always been to gain competitive advantage over the person sitting at the next desk.

The Old Technology

Technologies of the present day are nothing more than accumulated heritage of the past; the combined experiments and technical creations of hundreds of generations. In every age, new techniques are invented and old forms are discarded or revived or combined with the new. (Onuchukwu, 1990; Uzoagba, 2002). Every civilization therefore, evolves its science and technology in response to its inner logic and material resources. While the old technique of study and practice has left much positive impact to posterity, art is evolving so rapidly with the introduction of information and communication technology that another revolution in the study and practice of art is gradually creeping in. Every artist must be up and doing, so that no one is left behind in this craze of modernization. With more modern electrical and electronic equipment, the former mode of operation in Fine and Applied Arts is becoming more automated with less time and cost involved.

The New Technology

Many aspects of Fine and Applied Arts are recently experiencing a subtle wind of revolution both in the methods, materials and processes. This is a direct consequence of the Information and Communication Technology. Let us briefly analyze some aspects of Fine and Applied Arts that are influenced by ICT.

Design /Illustration- with the availability of softwares like the Corel draw, Corel photo, instant artist, draw etc, the artist can draw, shade or paint objects using the appropriate menu and tools. Fonts of various classes are available for use either as headlines, sub-headlines or text matters. Fonts could as well be configured to form display typography in designs. The computer can be effectively used for the illustration of textbooks, posters, advertising copy and so on. Clip-arts are available either stored in the hard drive or diskette and can be retrieved directly or through the CD-ROM and treated to suit local needs. The scanner is an input/output peripheral that can reproduce photographs, drawings or paintings to be used in any part of a design. Such illustrations can as well be treated or configured as required. According to Vickers (1995), the addition of scanning board into computers is a current advantage.

Publishing: Before the introduction of the computer to Nigeria, production process in publishing was a herculean task for the artist. He manually illustrated both the cover of the text book and the text pages. He also drew the layout and pasted the typesetting, done in scroll by the compugraphic machine, into their proper positions manually. Larger fonts for display functions are difficult to

achieve and type characters are limited. Letraset materials for display typography are expensive and scarce. These stages of production are indeed painstaking, time consuming and the end products are relatively inferior.

In Desktop publishing, there are softwares like the PageMaker, Microsoft Word, Word Perfect and so on that are specially adapted to meet the requirements for publishing a book. There is a wide range of type fonts to choose from and there is the freedom of enlarging and reducing them. The different facilities required for book production are abound in these softwares. In page planning, layout could be drawn choosing either symmetrical or asymmetrical format. Margin and columns/gutter planning could be easily and speedily done with the computer. Commands for indenting, spell checking, justification, highlighting or emphasis (either bold, light, underlined or italicized), rendition of fonts in both upper and lower cases and so on are readily provided in the computer. Microsoft word 2007 has all the reference styles to choose from. There are no more manual paste-ups as type matters are set into their appropriate positions in the design.

Photography Technology: there are two important ICT equipment that are absolutely essential in the recording, treatment and presentation of photographs for use in the art field. These are the scanner and digital camera. Packages such as Adobe photo shop and Corel draw can also be used in the treatment and presentation of photographs. With the digital camera, the computer can undertake task on pictures, music and video, working with the video and audio files. The photo editing tool of the digital camera provides a complete photo enhancement, editing and retouching controls. It can also create personal album with unique design and layout for greeting cards, photo book, calendars and so on. Scanned photographs can be configured, distorted, blurred, sharpened and used as required in any design.

Information Dissemination according to Okonta, Iyawa and Ugbo (2006), one of the newest applications in the world of multimedia is video and audio conferencing over the internet. These applications range from point to point products such as vocal Tec's internet phone to multi users conferencing packages such as Microsoft net meeting. Telecommunication is the electronic transmission with devices, laser beams, optical cables or fiber and direct wiring. This includes teleconferencing where group of people can meet miles away and discuss, dialogue and exchange discussions as if they are in the same room. Advertising presentations in form of animation, cartoons and real-life photographs can be carried out easily using the computer and other multimedia devices to amuse people and as well sell products.

Teaching and Learning Computer programmes can be used to teach students directly. Tabwassah (2006), upholds that it is particularly useful in drill and practice lessons, where repetition is necessary in order that concept of skill can be learnt. The distant learning system or open air learning is easier through the Information and Communication Technology. Lecture materials are transmitted through e-mails, TV and radio. With ICT, the deaf and blind can learn art with less difficulty. ICT also encourages lecture-sharing where instructors are short in supply and teachers and students are geographically separated from each other. ICT learning eliminates barriers such as age, distance, time and cost thereby, bringing educational opportunities to the doorstep of Nigerians. It also reduces the hardship students experience as a result of poor library services and high cost of professional books. With ICT, library services can be shared all over the world.

Web Exhibition paintings and other art works are scanned, stored in files and can be electronically transferred to other parts of the world through electronic mail attachment. With this, planning for exhibition anywhere in the world is made easier. Web exhibition can also be organized through the internet. Visitors to such gallery can subscribe and purchase original works through such exhibitions.

Production in most art industries, computers are used in business for increased productivity, efficiency, flow of information, improvement in the performance of planning, decision making and control of activities. In addition to data base package used in industries, Computer-Aided Design (CAD) software and Computer-Aided Manufacturing systems (CAM) software are available to undertake the tasks of decision making, product designs, and product manufacturing. With the introduction of ICT, ceramic industries, textile industries, fashion industries, painting and publishing industries to mention a few are now operating with automated machines that ensures increased productivity.

Challenges in the Application of ICT in Fine and Applied Arts.

Because of the numerous advantages of networking which is made possible by Information and Communication Technology, many employees see ICT as a treat to job security. Networking enables sharing of resources for instance, one printer can serve 20 computers in an organization. There is also the advantage of entering data, evaluating and processing shared data at the same time. This amounts to increased productivity and not an attempt to lay off workers. More production outlets can be opened that can engage the services of other workers.

However, the cost of ICT gadgets for art industries are expensive. Very few practitioners can afford all the ICT gadgets required for effective production of art products. Majority of these art industries are privately owned and in an economy that is struggling to stabilize, access to fund is difficult and where possible, very costly.

Another setback in the use of ICT equipment is power supply. Most ICT gadgets are powered by electricity and requires constant supply. Erratic load shedding of electricity and fluctuating power supply are detrimental to the life of these gadgets. The use of suitable generating sets for ICT gadgets is expensive and not reliable.

In most public art schools, the availability of ICT equipment is grossly inadequate. More of them are found in private schools whose charges are beyond the reach of the common man. The education personnel in art schools should be conversant with modern ICT equipment so as to be effective in instructional delivery. More and more ICT equipment are introduced periodically and educational personnel must undergo retraining on them to avoid dissemination of obsolete instructions.

The art curriculum that are implemented in some art schools are not ICT- compliant. Some aspects of the curriculum should be modified in accordance with ICT specifications. This is the only way that artists could be trained to be knowledgeable in information and communication technology.

Conclusion

The aesthetic and utilitarian nature of Fine and Applied Arts, subjects it to diverse operations in an attempt to satisfy people from all works of life. In all these operations, the introduction of Information and Communication Technology has offered a common denominator by which diverse human wants and desires can be satisfied through the art medium. Creators of art products therefore, should not only embrace this technology, but also monitor its rapidly evolving developments so as to continually create products that will always meet the current needs of members of the society.

Recommendations

(1) The art curriculum of schools, colleges, polytechnics and universities should be modified to give more emphasis to ICT in terms of content and methodology.

(2) Education authorities at local, state and federal government levels should as a matter of obligation, establish ICT centres in all public schools. This should be done at the basic education level, senior secondary school level and tertiary institution level. Such effort will motivate pupils to develop interest in ICT from the cradle.

(3) Education authorities should recruit and post ICT instructors and engineers to all schools to implement ICT curriculum and install/maintain ICT facilities respectively. Because ICT is a new technology that is very dynamic, the trainers should be retrained periodically through workshops, conferences and/or seminars so as to be well informed of recent developments in information and communication technology.

(4) Government and non-governmental organizations should endeavour to assist art industries especially those who accept students for industrial training with ICT facilities and other grants that will enable them render quality service to the education industry.

(5) To solve the problem of power supply in Nigeria, all hands must be on deck: government should formulate tenable policies and purposeful budgeting; the private sector in partnership with government, should embark on feasible investment in electricity; the religious organizations should embark on intercessory prayers that can break the yoke of non-attainment of goals in the power sector; the international community should assist the power sector with technical aids/grants; and the entire citizens should develop the spirit of patriotism and total positive rebranding.

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