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Digital Technologies and Woodwork Skills Development: The Nigeria Experience

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Abstract

The paper explained digital technologies, woodwork and its skills. It discussed digital technologies used for woodwork skills development. The importance of digital technologies to woodwork skills development was highlighted. This includes: using 3D modeling software for designing wood articles and it allows students to practice on their own and gain more experience in designing wood articles, computer has software that stimulate real woodworking machine and allows students to practice and have hands-on-experience, it saves labour and makes work easier and faster. The constraints to digital technology usage for woodwork skills development were also discussed. These constraints include lack of digital technology equipment in many schools for woodwork skills development, some schools that have few of these digital technology equipment lack experts to operate them epileptic power supply also affect effective use of these digital equipment, paying lip service to technical and vocational education (Woodwork skills development) by federal and state government and negative attitude of some school administrators to woodwork as a trade. It is suggested that woodwork teachers and instructors should be up-skilled in order to use these modern woodwork equipment effectively since many of them are fitted with digital technology equipment, modern woodwork equipment should be supplied by federal and state government and emphasis should be given to tertiary institutions and technical colleges in the first instance. School administrators of schools should strive to provide woodwork shops with generating plant for effective use of this equipment.

Keywords: Digital technology, Development Woodwork, Skills.

Introduction

The digital world is increasingly penetrating the education and skills domain, with technology gradually being used to deliver education, knowledge and skills in new and innovative ways. This penetration is coupled with changes in the mode and pattern of teaching and learning skills. According to Ebert and Duarte (2016) digital technologies are electronic tools, systems, devices and resources that generate, store or process data. Well known examples of digital technologies include social media, online games, multimedia and mobile phones, big data, 3D modeling software and computer design simulation software used to enhance students learning practice through hands-on-experience.

The application of digital technologies in education gave birth to concept of digital learning. Westerman, Calm ejane, Bonnet, Ferraris and McAfee (2011) defined digital learning as any type of learning that uses technology as its major instructional aid. It can happen across all curriculum

learning areas and across all discipline of study. Westerman *et al* (2011) asserted that with the rise of new digital technologies such as social networks, mobile devices, big data, among others, firms in virtually all industries domains are conducting multiple initiatives to explore and exploit their benefits to their organization.

This frequently involves transformations of key industrial operations and affects industrial products and processes, as well as organizational structures, as companies need to establish management practices to govern these complex transformations dominated by application of digital technologies daily. Thus, the society as a whole is facing a fast and radical change due to the maturation of digital technologies and their ubiquitous penetration of all aspects of industries, markets and the educational sector. According to Bharadwaj (2010), to add to the increased demand from learners, teachers, customers, companies are facing ever tougher competition due to globalization and putting pressure to go digital before others do, seeking to survive and attain competitive advantages in today's digital world.

Given the increased use of fast changing digital technologies in the workplace and educational institutions, new skills needs have emerged. According to Zinder and Yunatova (2016), the major skills required to maximally use digital technologies are digital skills and digital navigation skills. Digital skills are technical skills required to use digital technologies, whereas digital navigation skills are set of skills needed to succeed in the digital world (Zinder & Yunatova, 2016). These digital navigation skills or core soft skills include: skills in finding information, prioritizing information and assessing the quality and reliability of information. These digital navigation skills are not fundamentally different from the non-digital skills that were necessary in the past and that are still required today. Although, they have to be translated for use in a digital context. These digital navigation skills were also referred to as 'eternal skills' or core soft skills and is the basic motivation for effective utilization of digital technologies in teaching, learning and research in educational institutions and organization of industries.

Despite the numerous advantages in the application of digital technologies in the educational system of technologically advanced countries and some developing countries, the researchers in this study observed that the Nigeria education system is yet to explore the benefits of digital technology in teaching, learning and research processes. According to the researchers, the

Nigeria problem in exploring digital technology in teaching and learning is evident in the presence of outdated instructional materials available in Nigerian schools. Most of the public technical colleges and higher institutions in Nigeria still use manual-based instructional materials instead of the current computer-interactive board used in advanced countries. The researchers also observed that, in schools where the digital technologies are used in teaching, the tuition fees are exorbitant and not affordable by the average Nigeria citizen. The scarcity of digital technologies equipment and the low level of utilization of digital technologies in teaching and learning in Nigeria technical colleges and higher institutions is the reason for the poor and low level of Woodwork skills development in Nigeria.

Woodwork Skills Development in Nigeria

Woodwork is an art of wood practices or the skill of making things from wood such as furniture making, carpentry, joinery, cabinet making, machine woodworking, ornamental design or pattern making, painting and wood finishing. In these arts, items that are strictly functional or decorative which includes sculpture, furniture and tools are usually made from wood. The producers of these functional items are referred to as joiners, carpenters, upholsters, cabinet makers, wood machinists and ornamental designers or pattern makers. The skills relating to woodworking therefore are joinery, carpentry, upholstery, cabinet making, wood machining and ornamental design or pattern making (Kareem & Okwori, 2017). These skills can be learnt through formal and informal system of education.

In formal education, wood work skills are learnt by students through technical education courses and subject of study in University, Polytechnic, Colleges of education and Technical Colleges leading to acquisition of skills at professional and sub-professional level. Woodworking technology skill according to Agbo (2004) is that type of training intended to prepare students to earn a living in an occupation in which success is dependent largely on understanding of technology as applied to modern technology and design. This type of education according to Okoro (1993) provides knowledge and attitude necessary for effective employment in a specific occupation. Therefore, it is an aspect of Technical Education programme suitable for contributing to national social economic development through human resources development.

In the informal education system, woodwork skills can be learnt through informal education training as apprenticeship. This type of training according to International Labour Organisation (ILO, 2010) is the sum of total of all income learning activities legally regulated by enterprises and employment relation. Usually there is no syllabus and no entry qualification required. The training period is between three (3) to five (5) years depending on the age of trainee. Most of the master trainers learn the skill through the same apprenticeship training programme.

In Nigeria, the skill acquisition or training processes in both formal and informal training system are mostly devoid of the use of digital technologies prevalently used in technologically advanced countries. The researchers attributed this to the poor and low level of woodwork skills development prevailing among Nigeria woodwork professionals. Woodwork skills development refers to the trends of practice in practical workmanship in woodworking activities displayed by wood professionals such as trainees, artisans, craftsmen technicians, technologies, engineers and wood scientists during woodworking operations in the classroom, school workshops, industrial workshops or wood production plants (Hess, Matt, Benlian, & Wiesböck, 2016). In essence, woodwork skills development connotes the trends in skills usage of woodwork professionals compared to the current practice in ideal industrial and school workshop practice setting.

Digital Technologies Used for Woodwork Skills Development

The use of digital technologies in woodwork skills development in the woodwork industries as well as in workshops in technical colleges and higher technological institutions are numerous. Below are some of the digital technologies used for woodwork skills development According to Carcary, Doherty and Conway (2016), it ranges from the use of 3D modeling software for designing wood articles, use of self instructional learning software, that allows students to practice on their own and gain more experience in designing wood articles, use of computer software that simulate real woodworking machine that allows students to practice and have hands-on-experience, use of Computer Numerical Controlled (CNC) machines and laser cutters, Interactive Whiteboards (IWB), Software Applications (Apps) Web 2.0 as well as Computer Aided Design and Manufacturing (CAD-CAM) whose usage saves labour and makes work easier and faster.

Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) :As digital design is increasing its impact among the design community, redefining design and production practices in woodworking activities such as furniture industry. In furniture design, this business model became feasible as Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) has streamlined the wood design process, particularly with the use of Computer Numerical Controlled (CNC) machines and laser cutters. The use of digital design media in the process of designing has contributed to the redefinition of the role of the designer. Computers are no longer used only to provide accurate representation of a design, but also to generate, evaluate and provide information to automatically produce artifacts. These facts raise issues on the designer performance, particularly concerning the nature of interactivity with the media and type of control of design process (Carcary *et al*, 2016).

In a broad sense, CAD allows the generation in a virtual environment of the different parts of the product, of their assembly; and it permits the simulation of its real aspect and the specification of how it will be manufactured, if the production is computer assisted (Henriette, Feki & Boughzala, 2015). These functionalities according to Henriette *et al* (2015) require different modes of operation. The translation of CAD data into a CAM file is made during the product engineering phase, sometimes separated from the design / conceptual phase. Usually done in different software, this procedure may be characterized by the conversion of CAD drawings into a neutral data format that can be read by CAM software in order to define the tool path that will direct the motion of the tool to machine the part. Sometimes it is necessary to redraw the virtual model, due to errors that exist in converted data, which results in productivity loss in the global design process. The translation of computation to execution is an important issue that must be streamlined in order to optimize process' workflow. The use of CAD as a valid tool in the wood design process, gradually replacing manual technical drawings, redefined furniture design's methodology as well as the shapes of the objects as designers creatively explored possibilities afforded by the tool (Henriette *et al*, 2015). It is worthy to note that, CAM as a tool used by the furniture designer, may open new dimensions in the creation of customized furniture design by allowing a broader control over the process and thus an improvement in woodwork skills development. Expanding the scope of the wood designer in the use of CAD-CAM skills may enhance its activity because it provides a closer understanding and contact with production.

Interactive Whiteboards (IWB): Interactive Whiteboards (IWB) allow images from a computer to be displayed through a digital projector, onto a large (usually wall-mounted) board. Users can interact with the content on the board using fingers or a stylus.

Software Applications (Apps) : Software Applications (Apps) are designed to operate on mobile devices such as smart phones and tablet computers.

Web 2.0 : Web 2.0 refers to the second generation of the World Wide Web. Web 2.0 includes features and functionality that were not available before, for example. podcasts, blogs, wikis, RSS (Rich Site Summary – used for updating regularly changing web content), social networking and tagging.

Importance of Digital Technologies to Woodwork Skills Development

The importance of digital technologies in woodwork skills development in the woodwork industries as well as in workshops in technical colleges and higher technological institutions are numerous. It ranges from the use of 3D modeling software for designing wood articles, use of self instructional learning software, that allows students to practice on their own and gain more experience in designing wood articles, use of computer software that simulate real woodworking machine that allows students to practice and have hands-on-experience, use of Computer Numerical Controlled (CNC) machines and laser cutters, Interactive Whiteboards (IWB), Software Applications (Apps) Web 2.0 as well as Computer Aided Design and Manufacturing (CAD-CAM) whose usage saves labour and makes work easier and faster.

Petticrew and Roberts (2016) revealed that the potential benefits of digital technologies are that it can foster dialogic and emancipatory practice.

Dialogic practice: Dialogic practice is that in which students are active, engaged and empowered participants in a conversation from which learning emerges. For example, learners working on a new wood design and construction programme can start to have conversations about what they see on a computer screen without having to rely on terminology that they may not yet be familiar with. The teacher can then add the appropriate language into the conversation as the project develops.

Emancipatory practice: Emancipatory practice is that in which an individual student's ideas are beyond the learning prescribed by the teacher/syllabus as they draw on knowledge gained outside formal education to construct understanding. For example, in practical creative

Woodwork lessons, learners can use their own knowledge and expertise in creative works or using technology to create their own wood design. They can then bring in ideas that they have created at home or in self study lessons.

The two different technologies or practices approaches can improve learning by augmenting and connecting learning activities (Petticrew & Roberts, 2016). For example, in a Woodwork lesson two classes in different schools may link up via the internet to explore environmental issue in relation to a particular global issue such as pollution from wood industries or energy supply to wood industries. The groups could work together to understand not just the issue itself but its impact on communities and individuals by talking to real people. In situations where bandwidth is limited this could be done at a whole class level via video or even over email or SMS (Short Message Service) messaging.

Digital technology can often also be exciting for learners and offers a potentially more engaging alternative. At the same time, it is important to be aware that some learners may be less confident in learning with digital technologies and steps need to be taken to ensure equality of access. Digital technology offers immediate feedback for both the learner and the teacher (Petticrew & Roberts, 2016).

Constraints to Digital Technology Usage for Woodwork Skills Development in Nigeria

From extensive review of relevant literature and observation by the researchers, it was deduced that the constraints or challenges to digital technology usage for woodwork skills development in Nigeria include:

- i. Digital technologies are expensive and consume time: A lot of time and resources are currently being invested into digital technologies and applications that have yet to be proven to be effective or efficient when compared to more traditional classroom learning contexts. Teachers and schools need to think carefully about when, why and how to use technologies as well as evaluating their efficiency and effectiveness (Tranfield, Denyer & Smart, 2013).
- ii. Constraint of Digital divide: There is a digital divide. The divide between those who have access to digital technology and the internet, and those that do not. The disparities in

access to digital technologies across developed and developing countries have great disadvantage and is a major challenge to the use of digital technologies in woodwork skills development in Nigeria (Coombes & Nicholson, 2013). Due to the digital divide, there may be problems with the existing infrastructure, for example internet connections may be inconsistent and/or slow in developing countries especially Nigeria.

- iii. High cost of implementing and maintenance of digital technology equipment: Implementing and then maintaining new digital technology is costly particularly as systems can quickly become out of date.
- iv. Insecurity brought about by digital technology equipment: Safety for students and teachers is a key challenge with prevention of cyber-bullying, the hacking of personal information, access to illegal or banned materials and distractions from learning (such as social networking and mobile phone use) all being high on institutional agendas.
- v. Health hazards associated with the use of digital technology equipment: Some uses of technologies can be harmful. For example, poor posture and eyestrain are common problems when working at desktop computers for prolonged periods. Also Repetitive Strain Injury (RSI) is a risk that occurs from the repeated actions necessary to control mobile devices.
- vi. Lack of digital technology equipment in many schools for woodwork skills development. Several public technical colleges and higher institutions that run woodwork technology programmes in Nigeria are not having the currently needed digital technology equipment required to enhance woodwork skills development compared to the job demands of the 21st century workplace.
- vii. Lack properly trained technical personnel or experts to operate the available digital technology equipment. In some schools that have few of these digital technology equipment, lack experts to operate them is a major challenge faced. This rendered the equipment to be redundant since they are not put to use.
- viii. Epileptic power supply also affect effective use of these digital equipment. In the few technical colleges and technological institutions that have digital technology equipment, epileptic power supply common in Nigeria has been the major challenge to utilization of this equipment. This is because so many of the digital technology equipment are driven by electrical power.

- ix. Paying lip service to technical and vocational education (Woodwork skills development) by federal and state government in Nigeria. Woodwork is an option or area of specialization in technical and vocational education. Paying lip service to technical and vocational education especially woodwork skills development is another major challenge to usage of digital technologies in Nigerian schools.
- x. Negative attitude of some Nigeria school administrators to woodwork as a trade. Most school administrators in Nigeria show poor and negative attitude towards woodwork trade. Some administrators relegate woodwork trade and thus don not show serious concern towards the acquisition of the digital skills needed to enhance woodwork skills development in their schools.
- xi. Corruption and appointing non professional administrators to head and oversee the affairs of technical and technological institutions. In Nigeria, it is common for non professional and non technically trained persons to head technical and technological institutions. For example a graduate of History heading a technical and technological institution is a major challenge to woodwork skills development through digital technology equipment. These non professional administrators see the digital equipment as been too exorbitant and end diverting the fund allocated to personal use.

Suggestion for Effective Usage of Digital Technologies for Woodwork Skills Development

From extensive review of relevant literature and observation by the researchers, the researchers came up with the following suggestion to enhance effective usage of digital technologies for woodwork skills development in Nigerian schools.

- i. Woodwork teachers and instructors should be up-skilled in order to use digital technology equipment (modern woodwork equipment) effectively since many of them are fitted with digital devices.
- ii. The modern digital woodwork equipment should be supplied by federal and state government in Nigeria and emphasis should be given to tertiary institutions and technical colleges in the first instance.
- iii. School administrators should strive to provide woodwork workshops with generating plant for effective use of this digital technology equipment, since the equipment is mostly driven by electrical power.

- iv. Schools can allow teachers and learners the freedom to explore potential new uses of devices and systems as well as combinations of technologies into novel digital environments.
- v. Schools should invite experts in digital technology equipment usage to training their staff through capacity building programmed to enhance effective usage of digital equipment in woodwork skill development. This will help to foster the effective dialogue and emancipatory practice that is a component of deeper critical understanding.
- vi. Teachers, learners and digital technology experts should be encouraged to share their practice with each other in the classroom and more widely.
- vii. Teachers can make the best use of technology in the classroom by developing their awareness of a range of digital technologies and considering carefully both how and why they can be used to support students' learning.
- viii. Teachers should acquire relevant knowledge on how best to select and use digital technology equipment for various categories of learners. Effective selection of software and devices is vital to appreciation of digital technologies in the teaching, learning and research activities in schools. The consideration of what learning will be achieved and how the technology may help is fundamental to its effective deployment.

Conclusion

The pace of usage of digital technologies in woodwork skills development in society and in schools is at an exponential level and will continue to be so. This is in response of industries and schools to meet up with the current challenges posed by digital skills usage in the 21st century woodwork industries and technological classroom. Teachers are using digital technology equipment to support their role in providing students with structure and advice, monitoring their progress and assessing their accomplishments in relation to their skill development in woodwork trade. It was established that numerous digital technology equipment are used for woodwork skill development in technologically advanced countries. Constraints to effective usage of digital technologies for woodwork skills development are also numerous. This accounts for poor and low level of woodwork skills development in Nigeria. Application of the researchers' suggestion for effective usage of digital technologies for woodwork skills development will go a long way

to enhance woodwork skills development in Nigeria through the use of digital technology equipment.

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