TECHNICAL DRAWING/ GRAPHIC SKILLS ACQUISITION FOR TEACHING AND LEARNING AND CHALLENGES IN TECHNOLOGY EDUCATION

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ABSTRACT

Due to the current technological development and changing demands in the society and labour market it become necessary for teaching and learning to devices the means for overcoming the challenges in technology education and in particular technical drawing/graphic these could only be successful through sound pedagogy and information computer technology (ICT), application of these will improve, enrich and sustain employability. There is rapid changes in the fields of computer aided design (CAD), difficulties in visualizing multi-view drawing and use of ICT in the teaching methodology, becomes an open challenges facing Technical Graphic/Drawing skills acquisition for teaching and learning. The study reviews the challenges facing technical graphic/ drawing skills acquisition, the use of ICT in the teaching methodology and the essentials issues related to the enhancement of teaching and learning. The reviews revealed that learners find it difficult in the Visualizing a Multi-view Drawing and used of CAD. Various researches discover that, the used of ICT such as Computer Animated Module for Engineering Drawing (CAMED) and multimedia computer-based instruction enhances Technical Graphic/ Drawing skills acquisition for teaching and learning. The study clearly shows that there are difficulties faced by both learner and teacher of technical drawing and especially in the teaching and learning situation. Also, shows the significance of the use of CAD and ICT to enhance teaching methodology and to promote Continuing Professional Development and Learning. In conclusion recommendations were suggested based on the document analysis and findings.

Key Words: Technical Graphic/Drawing, Skills, Visualisation, CAD, CAMED,

INTRODUCTION

Technical Drawing/Graphic is a medium of communication among technologist, engineers, architectures, technicians and so on and is widely used in many fields and professions. In Nigerian educational system Technical Drawing/Graphic is in practice as a subject/module at various levels such as post-primary schools and tertiary institutions. According to

Igbinomwanhia and Aliu (2013) Engineering drawing is used for communicating ideas, thoughts and designs to others. In general, it provides necessary information about the shape, size, surface quality, material, tolerance, manufacturing process etc., of the design.

A systematic integration of variety of resources in teaching – learning process and

environment produce appropriate learning experiences, which in turn result in effective (active) or meaningful learning. The problem bedevilling the teaching and learning of this important course (Engineering drawing) is what this paper intends to investigate and proffer possible solutions. (Medupin, et, al 2015).

The study intend to look into various literatures in order to discuss and analyse the rolls of innovative method in teaching technical drawing, also to review skills acquisition in technical/graphic drawing and challenges face in teaching and learning process.

Technical graphic/drawing

A drawing is a graphical representation of objects and structures and is done using freehand, mechanical, or computer methods. Drawings may be abstract, such as the multiview drawings shown in, or more concrete, such as the very sophisticated computer model shown in. While, Technical drawing is used to represent complex technical ideas with sufficient precision for the product to be mass-produced and the parts to be easily interchanged. Bertoline and Wiebe (2013)

Kabouridis, (2010) stated that, Technical drawings have been used to communicate ideas from ancient times to the modern era. As the vernacular of industry, technical design, drafting and drawing are essential to the curricula of all technology engineering and design programs.

The fields of computer aided design (CAD)

The advancement of the computer has allowed the addition of computer-aided design drafting (CADD) software packages such as AutoCAD, CAD Key, SDRC, Pro E, and other software for depicting three-dimensional objects. By adding the capabilities of the computer and CADD software, the technical educator can create and manipulate three-dimensional models to help enhance

the learning process (Mackenzie & Jansen, 1998; Bertoline, 1991).

Computer-aided design (CAD) simply means "use of computer software for design." (Encarta, 2008). In other words in the category of software that is used to create designs. Now CAD almost take over drawing/designs, that is why design move from studio room to CAD studio or "paper-less studio" as it sometime called. (Wikipedia, 2003).

The advantages of CAD system are numerous, as it was stated: "It is estimated that a good CAD system save as much as 90 percent in conceptual design time, 25 percent in design cost, 30 percent in bidding time, 15 percent in construction cost and 40 percent in construction loan expenses, the cost of designing a repeat job involves few changes can be reduced by 90 percents." (Encarta, 2008).

Difficulties in visualizing multi-view drawing

Pei, Campbell, and Evans, (2011) Visualizing - being able to move from abstract to concrete, manipulating materials, mental rehearsal of physical space and of practical design solutions. The most difficult skill that students of a mechanical engineering department must acquire is to study the views of an object and to form a mental image of it, meaning to visualise its three-dimensional shape. Expressed in another way, visualisation is a mental comprehension of virtual information. Kabouridis, G. (2010).

Problems of visualization is one of the major challenges in teaching technical drawing and the use of diversify methods will help in overcoming the current situation. It seems that it will be necessary to resort to a didactic intervention which goes beyond simply presenting the theoretical concepts of the systems of representation. A didactic intervention which makes the

students practice these procedures. (Garmendia, Guisasola, and Sierra, 2007).

Information computer technology (ICT) in the teaching methodology

Some scholars have the opinion of combine traditional and modern methods that is chalk and board and ICT. A hybrid teaching method of the multimedia courseware with blackboard, the proposed teaching method can not only make the tedious teaching process to be colorful but also cause the passive study ardor to be active. The table 1 below shows how teaching methodology in technical drawing can be applied using appropriate methods.

Table 1: Teaching methodology in technical drawing

Teaching means	Blackboard	Multimedia courseware	Internet
Time	Much	Little	Unlimited
Information	Few	Many and abundant	Many and abundant
Exploration of spatial analysis ability	Abstract	Ocular demonstration	Normal
Process	Trivial and dull	Vivid	No feedback

Source: Yuming (2008)

The use of technology especially Information Communication Tecnology (ICT) in education can bring some changes in how teaching and learning happen in the classroom. ICT application allows more interactive learning and students' participation in class activities (Brandusa, 2010). The application of ICT in teaching and learning used to improved skill acquisition this occurs in the development and application of Computer Animated Module for Engineering Drawing (CAMED) developed and applied in an experiment conducted by Halim, Yasin, and Ishar (2012); and it have been observed that "the developed module (CAMED) was able to develop skills in engineering drawing and their understanding of the basic concepts. The developed CAMED also helped them to better solve problems related to the subject matter. In addition to acquiring the related drawing skills (e.g. how to use the drawing instruments properly and ability to sketch), (Halim, Yasin, and Ishar 2012).

Yumming (2008) demonstrate how multimedia Courseware and Blackboard can be used in teaching Screw tightening and connecting part:

Screw tightening and connecting part is a most normal standard part in the courses of engineer drawing. Its drawing is an important standard in the country standard. Therefore, during the course of teaching, the teacher should firstly lay out the bolt and nut to the students and demonstrate their connecting assembling, and then demonstrate the practicality menu with different kinds of connecting form and the procedure process of drilling and tapping with multimedia courseware, which may help student understand the procedure process of screw tightening and connecting part. Projections with perspective are formed by 3D body rotation and split in multimedia courseware. The students can observe the inside structure. Simultaneously, the

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teacher explains its projection process in detailed. And then, taking the discussion method, the teacher draws the prescript drawing method about the connecting part of bolt on the blackboard, which can make student understand the prescript drawing method really. Pp. 25-26

The challenges facing technical graphic/ drawing Skills and skills acquisition

The European Commission‟s Cedefop glossary (Cedefop, 2008) defines a skill as follows: t*he ability to perform tasks and solve problems*. Generally the most important in skills acquisition is learning by doing. In Miller's pyramid of learning model (Figure 1) the acme of knowledge is being able to do or achieve something, such as, in this case, the ability to communicate ideas in a visual format (Norcini,2008)
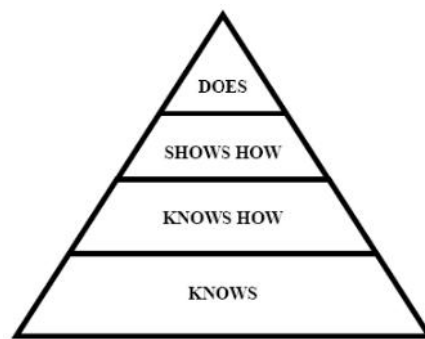

Figure 1: *Miller's pyramid of learning*

CONCLUSION

The literature review and documents analysis shows that the used of multimedia approaches to teaching technical drawing especially the use of Courseware and CAD soft wear in general will enhance the teaching and learning technical drawing. Also, innovative teaching method using ICT such as Computer Animated Module for Engineering Drawing (CAMED) will make tremendous progress in understanding visualization problems.

RECOMMENDATIONS

The paper propose the following recommendation for teaching technical/Graphic drawing in technology education. The technical drawing/Graphic teachers/Lecturers should

1. Incorporate CAD soft wear in teaching and learning process.
2. Drawing studio should be combining both computers and traditional equipment.
3. Used elements of multimedia such as animation has shown to be able to improve students' attention towards learning a difficult and abstract subject thus making the subject more interesting.
4. Teachers/Lecturers should use visualization tool in their teaching and learning activities since it can give a positive impact on students' motivation, achievement and problem solving ability.

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5. CAD studio should be available in all our tertiary institutions which will go hand by hand with drawing studio.

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