AN APPRAISAL OF TEACHER/STUDENT ACCEPTANCE AND SATISFACTION WITH THE USE OF CAD PACKAGE AS COMPARED TO CONVENTIONAL METHOD FOR TEACHING TECHNICAL DRAWING AT SECONDARY SCHOOL LEVEL IN LAGOS STATE

Odo Moses 1.
Department of Science and Technology Education
Faculty of Education
University of Lagos

Abstract
Technical drawing is the language of engineers and it encompasses architectural, civil, mechanical and structural profession. Technical drawing is the means of conveying ideas or transforming ideas into reality. This study is an appraisal of Teacher/Student Acceptance and Satisfaction with the use of CAD package as compared to conventional method for teaching technical drawing at secondary school level in Lagos State. The study was carried out in Lagos State Senior Secondary Schools that offer technical drawing and has presented students in Technical Drawing in external examinations for five years. The design adopted for the study was survey andthe population for the study included all teachers teaching technical drawing and students of SS11 offering the subject. Four and two research questions and hypotheses respectively were raised to guide the study. A 30 structured questionnaire items was developed for the study. The instrument was rated in four-points rating scale of Very Effective (4), Effective (3), Not Effective (2) and Not Very Effective (1). The findings of the study showed that the CAD is very effective in teaching and learning technical drawing, CAD facilities are not adequate in schools and therefore teachers and students do not regularly use them both in their private studies and classroom activities. It was recommended that among others that teachers of technical drawing should undergo refreshers training on CAD application, schools should provide a well-equipped drawing studio, teachers of technical drawing should regularly use CAD in teaching technical drawingand students should be encouraged to practice technical drawing with CAD.

Key words: *Appraisal, Teacher/Student, Acceptance and Satisfaction, CAD conventional method, andtechnical drawing.*

Introduction

Technical drawing is the process of graphic representation of objects or concepts, using a universal language consisting of graphic symbols.Davies**(**2017) said thatit is the process of producing a pictorial representation of a designer or engineer's vision into a physical form. Technical drawings serve as a guide or plan to the construction of objects represented in the drawing.Okorie (2001) stated that is essentially the universal language which technicians, engineers, craftsmen and industrialist communicate with.Technical drawing, also known as drafting is the act and discipline of composing plans that visually communicate how something functions or has to be constructed. Drafting is the visual language of industry and engineering (Definitions.net.STANDS4LLC 2017). Drafting is the form of communication used in industry to represent graphics of machines, structures, and their parts and to describe the technical drawing to the builders of the products. Drafters produce technical drawings and plans to specify dimensions, materials, and processes used in the creation of the product. These drawings provide visual guidelines for the workers who will actually construct or manufacture the product. The drawings are standardized since they are used all over the world.
Technical drawing can be divided into four main disciplines or types: construction, cutaway, exploded view, and patent.Construction drawings serve as the framework for blue prints used in designing some type of structure.The main purpose of construction drawings (also called plans, blueprints, or working drawings) is to show *what* is to be built, while the specifications focus on the materials, installation techniques, and quality

standards. A patent drawing represents the internal make-up of a newly developed invention that is used to obtain a patent. A cutaway drawing is used to show the internal working parts of a complicated device or machine, and an exploded view drawing is used to instruct the viewer on the relationship or assembly of a machine or piece of equipment so that its set-up can be replicated.

Technical drawing is offered at the secondary school level; from Junior Secondary to Senior Secondary School. At the Junior Secondary School level technical drawing is taught as unit in basic technology while at the Senior Secondary School Level it is taught as a separate subject by a specialist. At the conventional secondary school technical drawing is offered as an optional subject while at the technical colleges it is a core-subject. The conventional method of teaching technical drawing is giving way to automatic computer aided design, popularly known as AutoCAD. This is an enhanced method of teaching technical drawing invented since the 18th century, and during the 20th century, this became aided by the use of computers.

The conventional method of teaching technical drawing involves the use of technical drawing instruments to draw on the blackboard. The teacher uses the ruler, T-square, protractor, compass, pair of dividers, set-squares to draw on the blackboard or drawing paper.This method has been used for many years by technical drawing teachers though has its set-backs. The teacher has to get himself or herself prepared, assemble the drawing equipment, and set the demonstration table strategically for the learners to observe. However, this creates some problems to both the teacher and students because not all will see and comprehend the activity. It is only when the drawing is done on the chalkboard that most of the students may clearly see what is been done but this strategy is time consuming, stressful and not much will be achieved with students within the time allotted for the lesson. The conventional method of teaching technical drawing however can be done whether there is electric power or not because the exercise does not need electric power to take place.However, the drawing studio must be well illuminated and conducive for long period of classroom work. Electric power does not play an important role in the conventional method therefore,the teaching exercise can be carried out any time and at any place. Since the introduction of CAD in drafting, drawing has become increasingly interesting and easy.

Computer-aided design (CAD) is a software application for writing and designing 2D and 3D drawings. It involves using computer hardware and software to manipulate stimuli on the screen. Computer Aided Designfully came into use as desktop application in 1982 and since 2010 as a mobile web and cloud-based application, and currently marketed as AutoCAD 360. According to Bertoline (1988), the use of CAD extends to the manufacturing industry changing the conventional method of producing drawings which has many disadvantages associated with it. This change is self-evident by the fact that prior to the introduction of CAD the drafting and design industry world-wide was still employing the same tools and instrument that were used by Euclid (father of geometry and Pythagoras).The CAD has been a great help to engineers and architectures that are finding it impossible to deal with drawings and plans of the project engineering work and then bring on the verge of perfection. CAD has the advantage of economy of time of drafting, faster and easier for a draftsman to draw, modify, and print a drawing and result for in improved performance, improved human interactive system design, improved organizational factors, and reduced stress.

UNESCO (2009), pointed out that education system all over the world are under increasing pressure to use CAD for the students the skillto teach students the knowledge and skill in the 21st century. UNESCO described the radical implications on how the new information and communication technologies have over the conventional teaching and learning method. CAD technologyprovided a transformation of the

teaching/teaching process and the way teachers and learners gain access to knowledge and information.The society is constantly in a state of technological flux, it therefore becomes necessary to monitor from time to time the competenciesand skills required for efficient performance. Oyebode (2015) pointed out that the emergency of information communication technology has brought with it changes in work processes as well as the process of imparting and acquiring knowledge. Teaching and learningprocess have been made interesting and less stressful by the application of the computer aided instruction.Therefore, the use of computer has become increasingly important in generating and developing ideas and creativity of teachers in the teaching and learning process. The emergency of CAD has greatly improved the efficiency and effectiveness of teaching and learning oftechnical drawing. The use of computer in teaching technical drawinghas enhanced understanding and visualization among students.

Statement of the Problem

Technical drawing requires a high level of imagination and vision. The students are required to acquire or possess the creative skills to enable them perform well in technical drawing. To this effect, it becomes necessary to find ways of improving the present state of affairs so as to improve the teaching of technical drawing in technical colleges. The use of manual method of teaching Technical Drawing in technical colleges has some set back like time consuming, errors in measurement, waste of drawing materials and stress of drawing on the board, tracing and printing the drawings. These challenges have caused both teachers and students to have very low interest in Technical Drawing leading to failures of students in both internal and external examinations in the subject. Therefore, it becomes necessary thatan appraisal of teacher/student acceptance and satisfaction with the use of CAD package as compared to conventional method for teaching technical drawingbe carried out. The appraisal will give impetus for improved method of technical drawing to meet up with demand in the construction industry.

Purpose of the Study

The purpose of the study is toappraiseteacher/student acceptance and satisfaction with the use of CAD package as compared to conventional method for teaching technical drawing at Secondary School level in Lagos state. Specifically the study tends to:

1. Find the perceptions of teachers and students towards the use of CAD package as compared to conventional method for teaching technical drawing.
2. Find the level ofusageof CAD package as compared to conventional method for teaching technical drawing.
3. Find the factors affecting the use of CAD in teaching Technical Drawing at Secondary School Level.
4. Determine the extent of the interests of students and teachers in using CAD in teaching and learning Technical Drawing.

Research Question

1. What are the perceptions of teachers and students towards the use of CAD package as compared to conventional method for teaching technical drawing?
2. To what extent is the level of usage of CAD package byteachers and students as compared to conventional method for teaching technical drawing?
3. What are the factors affecting the use of CAD in teaching Technical Drawing at Secondary School Level?
4. What is the level of the interests of students and teachers in using CAD in teaching and learning Technical Drawing?

Hypotheses

1. The use of CAD in teaching Technical Drawing does not significantly affect thestudents method oflearning Technical Drawing.

2. There is no significance difference between the mean responses of teachers and studentson the level of awareness of CAD inteaching and learning TechnicalDrawing.

Methodology

The design adopted for this study is the survey. This design was considered appropriate because it seeks to obtain information from the respondents onteacher/student acceptance and satisfaction with the use of CAD package as compared to conventional method for teaching technical drawing.

Population for the Study

The population forthe study included all the students in Senior Secondary Schools and Technical Drawing Teachers in District IV Education Zone, Lagos State offering Technical Drawing.There are 104Senior Secondary Schools in this district.

Sample and Sampling Technique

Purposive sampling technique was adopted to select twentySenior Secondary Schools from the 104 Schools in the district that offer Technical Drawing. These schools selected have presented students for both National Examination Council and West African Senior Certificate Examinations in Technical Drawing for at least five years.All the teachers (42 teachers) teaching technical drawing in the selected twenty Senior Secondary Schools were used as respondents while only SS 11 students (74) offering technical drawing were purposefully selected.

Instrument for Data Collection

A 30 structured questionnaire items divided into four sections "A – D" was developed by the researcher for the study. The instrument was rated in four-point response mode and each of the section has five questionnaire items. Section A is on the perceptions of teachers and students towards the use of CAD package as compared to conventional method for teaching technical drawing while section B elicited information on the level of usage of CAD package by teachers and students as compared to conventional method for teaching technical drawing. Section C dealt with the factors affecting the use of CAD in teaching Technical Drawing at Secondary School Level while section D sourced information on the level of the interests of students and teachers in using CAD in teaching and learning Technical Drawing.

Validation of the Instrument

Copies of the questionnaire were given to senior lecturers in the department of Science and Technology Education who validated the items based on the technicality and content.

Reliability of the Instrument

Twenty copies of the questionnaire items were distributed to 20 students from another secondary school outside the study area. Their responses were divided into two halves, odd and even numbers. The two sets of scores were correlated using Pearson Product Moment Correlation Coefficient to determine the reliability of the instrument as 6.74

Method of Data Collection

The questionnaire was administered to the respondents by the researcher. Two days were given to the respondents to fill the questionnaire. The same number (116) given to the respondents were collected.

Method of Data Analysis

The mean and standard deviation were the statistical tools used to analyse the responses gathered from the respondents. Any mean greater or equal to 2.50 was regarded as effective while means below 2.50 will be regarded as not effective. The hypotheses were tested at 0.05 level of significance using t-test.

Results.

1. **Research Question 1:**What are the perceptions of teachers and students towards the use of CAD package as compared to conventional method for teaching technical drawing?

Table 1: Responses of the respondents on the perceptions of teachers and students towards the use of CAD package as compared to conventional method for teaching technical drawing.

S/No	Item	SD	$\overline{X}$	Remark
1.	The use of AUTCAD in teaching technical drawing as compared with traditional method makes lesson interesting.	0.76	3.06	Effective
2.	There is the economy of time with the use of CAD in teaching Technical drawing compared with traditional method.	0.80	3.66	Effective
3.	Students learn faster with use of CAD in teaching technical Drawing.	0.68	2.76	Effective
4.	The use of CAD makes teaching and learning of technical Drawing simpler.	0.70	3.00	Effective
5.	It is difficult to use CAD to teach Technical Drawing.	0.76	2.29	not Effective
6.	CAD facilities are not readily available in the School.	0.70	3.25	Effective

Table 1 showed that most of the respondents were of the opinion that both teachers and students prefer the use of AUTOCAD package as compared to conventional method for teaching technical drawing. Item number 2 has the highest mean value of 3.66 while item number 1 has the lowest mean value of 3.06. Item number 5 has a mean value of 2.29 shows that CAD is not a difficult to use to teach technical drawing.

Research Question 2: To what extent is the level of usage of CAD package byteachers and students as compared to conventional method for teaching technical drawing?

Table 2: Responses of the respondents on the extent of the level of usage of CAD package by teachers and students as compared to conventional method for teaching technical drawing.

S/No	Item	SD	$\overline{X}$	Remark
7.	Students regularly practice TD with CAD	0.76	2.36	Not Effective
8.	Teachers regularly use CAD in teaching TD	0.66	2.35	Not Effective
9.	The use of CAD can arouse the interest of the students.	0.81	2.86	Effective
10	Students can learn TD easier by the use of CAD	0.78	2.73	Effective
11	The use of CAD in teaching TD is time consuming	0.59	2.00	Not Effective
12	Students learn TD faster with the use of CAD compared to Conventional method.	0.71	3.02	Effective
13	Students' responsive in the class when CAD is used to teach TD is high as compared to conventional method	0.80	3.12	Effective
14	.Students' skills can be improved in TD with use of CAD	0.76	3.20	Effective

Table 2 showed that items number 7 and 8 are not effective. This means that both teachers and students do not regularly use CAD for teaching and practice respectively. The finding of the study also revealed that the use of CAD in teaching TD does not consume time unnecessarily. However, the respondents indicated effective for item numbers 9, 10, 12, 13 and 14.

Research Question 3: What are the factors affecting the use of CAD in teaching Technical Drawing at Secondary School Level?

Table 3: Responses of the respondents on the factors affecting the use of CAD in teaching Technical Drawing at Secondary School Level

S/No	Item	SD	$\overline{X}$	Remark
15.	Inadequate CAD facilities in the school	0.83	2.89	Effective
16.	No standard drawing studio.	0.77	2.97	Effective
17.	Irregular power supply for use of CAD.	0.63	2.81	Effective
18.	Inadequate period allocation for the drawing.	0.71	3.11	Effective
19.	Irregularity of TD teacher to class lessons.	0.78	2.01	Not Effective
20.	Teachers lack the skill to use CAD.	0.80	3.20	Effective
21.	Difficulty in visualizing three-dimensions of objects.	0.68	2.09	Not Effective
22.	Difficulty in forming the mental picture of an object.	0.59	3.43	Not Effective

The findings of the study in table 3 revealed that items numbers 19, 21 and 22 are not effective. This showed that Technical Drawing teachers regularly attend to their lessons also can visualize objects in 3-D and form the mental picture. All other items are effective indicating poor CAD facilities, irregular power supply, inadequate time allocation for drawing and teacher's poor knowledge of the use of CAD for drawing.

Research Question 4: What is the level of the interests of students and teachers in using CAD in teaching and learning Technical Drawing?

Table 4: Responses of the respondents on theinterests of students and teachers in using CAD in teaching and learning Technical Drawing.

S/No	Item	SD	$\overline{X}$	Remark
23.	Students pay more attention in the class when using CAD to Teach TD.	0.78	3.12	Effective
24.	Students abscond from classes when using CAD to teach Technical drawing.	0.88	2.10	Not Effective
25.	Interaction between the teacher and students is cordial when using CAD to teach TD.	0.60	2.90	Effective
26.	Teachers enjoy using CAD to teacher TD as compared to Conventional method.	0.57	3.35	Effective
27.	Students can endure long period of lesson with the use of CAD.	0.66	3.15	Effective

Table 4 revealed that all the items except number 24 on the table create interest in the students with regard to the use of CAD in teaching technical drawing. Therefore, the respondents indicated that the use of CAD in teaching technical drawing creates and enhances the acquisition of drawing skill. It also makes it simpler for the students and memory in the learner lasts.

Hypothesis 1: The use of CAD in teaching Technical Drawing does not significantly affect the students' methods of learning Technical Drawing..

Table 5: t-test analysis of effect of the use of CAD in teaching Technical Drawing on students' method of learning technical drawing.

Groups	Number	Mean	SD	DF	Cal-t	t-table	Remarks
Teachers	42	3.11	0.45				
				114	2.45	1.66	significant
Students	74	2.98	0.85				

The table revealed that calculated-t value (2.45) is higher than the critical-t value (1.66)therefore, hypothesis is significant at 0.05 level of significant which means that the use of CAD in teaching and learning technical drawing has effect on the students. This is as compared to traditional method of T-squares and drawing boards method.

Hypothesis 2: There is no significance difference between the mean responses of teachers and students on the level of awareness of the use of CAD in teaching and learning Technical Drawing.

Table 6: t-test analysis of difference in the mean responses of teachers and students on the level of awareness of the use of CAD in teaching and learning Technical Drawing.

Groups	N	Mean	SD	DF	Cal-t	t-table	Remarks
Teachers.	42	3.11	0.45				
				114	2.62	1.66	significant
Students	74	2.98	0.85				

Table 6 showed that there is significance difference between the mean responses of teachers and students on the level of awareness of the use of CAD in teaching and learning Technical Drawing. The hypothesis is significant at 0.05 level, which means that teachers and students hold the same opinion on the level of awareness of the use of CAD in teaching and learning Technical Drawing.

Findings of the Study

The following are the findings from the study.

1. The use of CAD in teaching and learning Technical Drawing is better than the traditional method in that it :
    i) Makes teaching and learning of technical drawing easier and faster.
    ii) There is economy of time with use of CAD
    iii) Arouse the interest of students.
2. Students do not regularly practice with CAD on their private studies
3. Students lack the skills to use CAD.
4. Teachers do not regularly teach technical drawing with the use of CAD
5. CAD facilities are inadequate in the schools.
6. The use of CAD in teaching technical drawing helps the students to visualize and form the mental picture of the object.

Discussion of the Findings

The finding of the study revealed that the use of CAD in teaching and learning technical drawing is better than the traditional method. Oluwadare, Adebayo and Kayode (2015) pointed out that AutoCAD otherwise

referred to Computer Aided Design is a software application for presenting an object in either 2D or 3D. This application is of a great help to engineers and as well as several architectural drawings especially when perfection in engineering work is needed. Sulekha (2018) noted that the CAD software provides great tools for design professions that will help in carrying out design and analysis of a proposed design. These tools also help in producing designs with high accuracy and the scope for errors is much lower when compared to hand drawing. The higher accuracy will lead to better designs and these better designs helps in manufacturing faster. Manual design not only takes more time but the errors caused will delay the process in overall.

The result of the study showed that the use of CAD in teaching and learning technical drawing makes the classroom lesson interesting, understandable, saves time, and explanation easier. This is in agreement with the findings of Aysen & Kemal (2016) in 60 minutes drawing class using manual and CAD method. The difference in quality observed may be due to the advantages of the CAD technique at the 30th minute. At the end of the 60th minute, a huge difference was observed between the conventional and CAD and the CAD was more successful than the conventional drafting. Consequently, the CAD technique has a better outcome from the aspect of time and quality compared to the conventional technique.

The study also revealed that teachers do not always use CAD in teaching technical drawing probably inadequate CAD facilities or lack of proper use of CAD. This could be that some of the technical drawing teachers do have adequate CAD training. Since the teachers do not have adequate knowledge of the use of CAD it will definitely affect their classroom lesson delivering. Students because they do not have adequate knowledge of the use CAD they do not use it for their private technical drawing practices. Pektas and Erkip,(2006) have pointed out that Computer Aided Design (CAD) are now implemented by professionals in most architectural school curricula to enhance CAD teaching skills, such as 3D modelling and digital presentation, consequently grabbing academia to impromptu develop pedagogy for a digital practice . Similarly, Wang (2009) stressed on the need for instructors to be aquatinted with the use of digital tools so that prospective instructors not only gain skills in working with equipment and software, but also experience how technology can be used to explore, organize, and communicate knowledge by emphasizing discovery approaches to learning in a technologically astute environment.

Timothy and Halil (2015) in their studies observed that however, some schools of thought, consents with the potentials of digital tools, as it has caught them impromptu to work with the technology of today, believing that students can feel the space better and see how it look like in real life with 3D programs. A student that knows how to manipulate these digital tools can add colour, texture and lighting to the space at a glance. To an extent, most instructors in various architectural schools agree that hand sketching should be used in the initial design phase to create the idea and digital tools to improve the final presentation of the project. On the contrary, some educators believe that all can be done with digital technology, since creativity is from the mind not the hand. For instance, it is apparent that nowadays in America, and some part of Europe, the traditional system are eliminated, and students start working with computer digital programs for the first year.

Conclusion

From foregoing, it is evident from the study and reviewed related literature that though students and technical drawing teachers are used to manual method of drawing CAD proves to be better in every ramification in teaching and learning technical drawing. Teachers and students do not regularly use CAD in teaching and learning technical drawing probably because of inadequate knowledge of the use or lack of the facilities in the schools.

Recommendations

The following recommendations are made based on the findings

1. Teachers of technical drawing should undergo refreshers training on CAD application.
2. Schools should provide a well-equipped drawing studio.
3. Teachers of technical drawing should regularly use CAD in teaching technical drawing.
4. Students should be encouraged to practice technical drawing with CAD.

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