

**Improving the Teaching-Learning of Computer Aided Drafting and Designing (CADD) for  
Effective Skill Development in Nigeria Tertiary Institution**

**MBAH, CHIDOZIE ONYEKACHUKWU**

**Department of Technology and Vocational Education  
Enugu State University of Science and Technology (ESUT)  
[doziembah@yahoo.com](mailto:doziembah@yahoo.com)**

**&**

**UMURHURHU, EDIRIN BENJAMIN**

**Department of Mechanical Engineering  
Delta State Polytechnic, Ozoro  
[umusbenji@fmail.com](mailto:umusbenji@fmail.com)**

**Abstract**

*Any attempt to improve teaching-Learning of technology and engineering education for technological development should address the development of skill in drafting and design. Development of skill in computer aided drafting and design (CADD) has been seen as an approach to modern engineering design. Teaching-learning of CADD in higher institution will open new employment opportunities for Nigerian youths. Due to innovation in technology, the paper and pencil drawing has become an outdated trend notwithstanding its relevance in foundation stage of technology design and engineering education. Teachers are totally responsible for initiating learning and they need to diversify and update the learning tasks. This paper therefore x-rayed the challenges and measures for improving teaching-learning of computer aided drafting and designing for skill development. It was recommended, among others, that well trained and skilled professionals should be recruited to teach CADD in Nigerian tertiary institutions and facilities needed for the teaching-learning of CADD should be provided in order to develop the required skills among the students.*

**Key words: Teaching-learning, skill Development, Drafting and designing and computer aided drafting and design (CADD)**

## Introduction

The development of information technology (IT) has affected many areas of human life and education is not left out. Engineering and technology education have also witnessed the application of IT in teaching-learning of technological concepts, principles and theories. Drafting and designing are practically universal graphic language of lines, signs and symbols used for giving specification of object size and shape. Due to the development of IT, the conventional paper and pencil method of drawing has been converted into computer aided drafting. According to Narayan (2008), computer aided drafting and designing (CADD) is the use of computer systems to assist in the creation, modification, analysis or optimization of design. Its use makes drafting and designing easier, faster and interesting to students and teachers.

Moreover, Bilalis (2000) opined that computer aided design is the use of information technology in the designing processes. Computer aided drafting and designing is the use of computer technology in drafting and designing of components and documentations. Computer aided drafting and design (CADD) may be used to design curves and figures in two dimension (2D) spaces or curves, surfaces and solids in three dimension (3D) space (Frain, Hoschek & Kim, 2002). As in the manual drafting and designing of technical and engineering drawing, CADD drawings provide information such as materials, processes,

dimensions and tolerance in accordance with the software specifications used. CADD is an important industrial art extensively used in many applications such as machine, automobile and architectural designs. It also involves ship building, aerospace, surveying, automotive and other applications. For many years, different software have been developed to suit the design needed in different areas. Some of the CADD based software includes AutoCAD, Arch CAD, Solid works and Rivet architecture. Jennifer (2010) pointed out that the development of CADD software for personal desktops and laptop computer was the reason for universal application of CADD in all areas of construction and design. Indeed, the use of CADD in many areas of engineering and technology cannot be overemphasized.

Developing skills in CADD among technology and engineering students will enable them to acquire the industrial competencies needed in contemporary industrial technology. Skill according to Osinem (2008) is the expertness, practiced ability or proficiency displayed in the performance of a task. Skill need in CADD can be categorized in to the basic, psychomotor or manipulative, technical, adaptive, conceptual and transferable skills. Skill development according to Olabiyi, Aiyelabowo & Keshinro (2013) is a learned sequence of movements that are combined to produce a smooth and efficient action in order to master a particular task. It is the ability to make the purposeful movements that are necessary to complete or master a particular task. It

is the ability to make the purposeful movements that are necessary to complete or master a prescribed task (Ogwo & Oranu, 2006). Skill development in CADD is developing dexterity in the use of computer to design a product or object and document the soft copy for modification or improvement in the design. Effective skill development requires that students should master the learning task as the teacher presents it in teaching-learning situation.

Teaching according to Omoifo & Urevbu (2007) is any activity that triggers excellent learning, that helps the learner to acquire knowledge and think independently. Teaching is any action geared towards making another person to learn. According to Ifeagwu (2000) learning can be defined as the behavioural change that takes place at the end of a teacher and student interaction in a classroom setting. The assessment of learning is through a permanent change in students' behaviours, teaching and learning of CADD involves series and sequential activities planned to cause a desirable change in the skill performance of the students. Skill development in CADD exposes students to the techniques that are used to draw and edit drawing entities, manipulate screen displays, write texts, layout drawings, stimulate drawings, print and plot drawing files. Based on the advancement of technology, employees in engineering and related occupations are required to have good knowledge of CADD and other software skills as demanded in the public and private sectors.

### **Contribution of CADD to Technological Development**

The contribution of CADD to technological development cannot be over emphasized as it has improved the quality of design of engineering components and indigenous technology. Bilalis (2000) identifies the following contributions of CADD in designing and production of technological products;

1. CADD provides accurately generated and easily modifiable graphical representation of products.
2. It performs complex design analysis in short time,
3. CADD has the capability to record and recall information with consistency and speed,
4. It has the ability to provide a digital prototype of the product at early stages of design process, which can be used for testing and evaluation,
5. CADD shortens the design time of a product,
6. It enables the application of concurrent engineering and can have significant influence on final product cost, functionality and quality,
7. CADD is also used to produce computer animation for special effect in movies, advertising and technical manuals.

However, CADD is mainly used in designing of tools, machinery and in drafting and designing of all types of buildings from small residential building to the largest commercial and industrial structures. The use of CADD system has

also been extended to all industrial sectors such as automotive, electronics, textiles, packaging, clothing, leather works and shoes making. The use depends on the profession of the user and the type of software in question.

### **Principles in Using CADD in Teaching-Learning for Effective Skill Development**

The conventional method of teaching and learning of drawing is no longer providing all the skills required in contemporary technological systems. In teaching CADD like any other area of skill development, certain principles are required for the teacher to achieve the stated objectives. The principles include;

- 1) Computer aided drawing teachers should possess the required competencies for effective utilization and management of devices.
- 2) Availability of power for the amenities should be considered.
- 3) Teachers should always provide a backup plan in case of equipment failure. Olabiyi, Aiyelabowo and Keshinro (2013) asserted that teachers should ensure that computer class should have adequate back up plan during instructional programme.
- 4) The students' number, classroom size and available equipment should be considered.
- 5) Clear objective must be stated in each instructional task. Specific objectives for each instructional skill according to Mbah (2012) should be stated to the

learner at the beginning of the class to enable the students to develop the expected skill at the end of the instruction.

- 6) Clear expectation and standard for assessing the students' performance should be stated.

### **Challenges to Teaching-Learning of CADD in Nigeria Tertiary Institutions**

Challenges to teaching-learning of CADD for skill development among students include; inadequate funding, power problem, manpower constraints, inadequate facilities, quality management, software installation and configuration management.

**Inadequate Funding:** For technical and engineering education to achieve its objectives in development of Nigeria, adequate fund is required. The education system needs fund to improve the reading culture among the youths and for overall improvement in the quality of delivery of education. Atueyi (2015) pointed that Nigeria government needs to allocate more than 30% of its national budget to education in order to improve the sector. Adequate funding is a very crucial factor in skill development and especially in CADD.

**Power problem:** Computer aided drafting and designing demands power for the computer systems to operate. It is sad to note that Nigeria with over 140 million people is experiencing epileptic power supply. This epileptic power supply according to Ogbonnia (2015) has taken a turn for worse despite huge investment in the sector in the past 15 years. A total 6000

megawatts (MW) is expected but half has not being generated or distributed in recent time. This inadequacy of power hinders the teaching and learning of CADD in educational institutions in the country.

**Manpower Constraints:** There is a constant shortage of well-educated teachers to handle the conventional paper and pencil drawing and the computer aided drafting and designing. Some skilled professionals abandon teaching in favour of other more economic lucrative activities and political appointments which are not related to their training. The students cannot get the best and this inadequacy negates positive achievement of the educational objectives (Obunadike, 2012). Skill development demands expertise and experience on the part of the teacher. This manpower constraint can easily be seen in the incompetence of the teacher. Many students with bright academic and psychomotor potentials fail to actualize their ambitions because of incompetent and ineffective teachers that taught them in schools. This in turn creates unemployment as the contemporary skill need could not be achieved.

**Inadequate Facilities:** There is gross inadequacy of facilities in schools because many higher institutions do not have sitting materials, drawing studio, drawing tables and computer laboratories. When they exist at all, they are in deterioratory condition for some are old and out of use. A condition of this nature cannot even help in developing skill in paper and pencil drawings; talk more of computer aided drawing. Uwaifo (2010) opine that inadequacy in teaching, laboratory and

workshop facilities has contributed to the diminution of the quality of graduates.

**Quality Management of Higher Institutions:** Among the problems of Nigeria as a nation is corruption. The level of corruption in Nigeria is at alarming stage and it has equally affected the educational system. For example, fund meant for the improvement of infrastructure in tertiary institutions are most time diverted to personal pockets. The expectation of many African nations, including Nigeria has been that investments in higher education will trigger rapid development of the nations. This is due to miss management of the fund for the development of the institutions. This management inability has resulted to poor provision of facilities for teaching and students skill development in CADD.

**Software Installation and Configuration Management:** Many different CADD system tools are currently used by different discipline based on the accuracy and suitability to the design. Installation and keeping different software and their version and maintaining interface is not cost effective. The management demands expertise of the teacher or computer instructor.

### **Measures for Improving the Teaching-Learning of CADD in Higher Institutions**

Among the measures for teaching-learning of CADD in Higher Institutions include;

**Provision of Learner Friendly Environment:** The emphasis on the development of skills worldwide is focused on creating learner friendly school environment. Okoro (2006) pointed out that the jobs given to the

learners while in training should not be pseudo exercises, but real jobs with real tools, machines and turning out real products. The environment should be the one in which there are sufficient provision of facilities such as drawing studio, electronic drawing room, internet services, classrooms, workshops, practical and modeling materials and accessories. Perfection of skill in computer aided design and drafting can be realized when they experience and carry out drawing, modeling and simulation exercises by themselves and discover their own unique ways of using the CADD software tools for subsequent application in the world of work.

**Innovation and Creativity in Teaching:** Innovation according to Onoh (2011) is doing common things in an uncommon way, old things in a new way or varying old factors and changing parameters to achieve new results. Innovation and creativity as teaching-learning concepts impact positively on the strategies for rearranging and combining modern information technology in instructional process for effective delivery and skill development. Creative and innovative teacher comes up with new ideas and imaginations on how to present CADD instruction competently. CADD class is seen as electronics or digital classroom, where instructor will use the teaching strategies that encourage divergent reasoning so that students can think in a flexible manner and apply originality in imagination and design.

**Re-training of Teachers:** Re-training of teachers according to Dhawan (2014) is

aimed at increasing the quality possessed by a teacher which positively affects his/her performances. Seminar and workshop need to be organized by government and relevant professional bodies like Nigeria teachers of technology to educate and sensitize the teachers on the use of computer in teaching drafting and designing. Training and retraining of technical teachers are the most important steps for the successful implementation of a CADD system in education. Emphasis should be placed on building a solid level of user expertise and confidence in the teachers for them to engineer the skill development properly.

**Proper Funding:** Higher Institutions require sufficient fund for improvement in ICT facilities, internet connectivity, provision of alternative power and general implementation cost. Implementation cost of skill development in CADD system consists of equipment and software acquisition, training and support cost. There is no doubt that lack of these facilities hinder tertiary institutions from competing with their foreign counterparts. Adisa (2012) noted that funding is the greatest problem confronting the usage of computer in Nigeria education.

**Proper Management:** High institution leadership should not be politicized for any reason. People of proven integrity should be appointed in the position of leadership especially in the education system. This gives way to proper management of fund and other resources for the development of the institution. Funds saved through prudent management could be redeployed for the purchase of CADD equipment.

### Conclusion

Innovations in the industry today demand for a modern & holistic approach in the teaching and learning of concepts, theories and principles in higher institutions to enable students acquire required industrial competency for contemporary jobs. CADD has made drafting and design simple cheap and less time consuming. It is expected that higher institutions should enable their students to acquire the skills in the use of computer for drawing and equally include CADD in the curriculum with the conventional paper and pencil which provides the foundation of engineering drafting and design. However, teachers are expected to diversify their knowledge in modern trends in CAAD and its related areas.

### Recommendations

For effective skill development in CADD, the following recommendations are made. The government and stakeholders should ensure that these points are in place.

1. The funding for technical and engineering education in Nigeria tertiary institutions should be enhanced.
2. Steady power supply to engineering education laboratory should be implemented to promote the teaching of and learning of CAAD and other technological courses.
3. Well trained and skilled professionals should be recruited to teach CADD in Nigerian tertiary institutions
4. Facilities needed for the teaching-learning of CADD should be provided in order to develop the required skills among the students

## References

- Adisa, O. P. (2012). The correlation between information and communication technology (ICT) and learning of political science in Emmanuel allemande college of education, Oyo. *Journal of Research and development*. 4(1)123-129
- Atueyi, U. (2015). Nigeria should strive for a Minimum of 30 per cent budget on education. Retrieved on 03/04/2016 from [m.guardian.ng/features/education/nigeria-should-strive-for-a-minimum-of-30-per-cent-budget-on-education/](http://m.guardian.ng/features/education/nigeria-should-strive-for-a-minimum-of-30-per-cent-budget-on-education/)
- Bilalis, N. (2000). *Computer Aided Design (CAD)*. Report produced for the EC funded project: INNOREGLO project.
- Dhawan, S. (2014). In-service training of teachers in imparting knowledge in life skill and action research. *International Journal of Management and Social Science Research (IJMSSR)* 3(1) 86-90
- Frain, G.O., Hoscheck, J. & Kim, M. (2002). *Handbook of computer aided geometric design* (electronic resource) Elsevier: Retrieved from [http:// computer.aided.geometric.design.net.org](http://computer.aided.geometric.design.net.org) on 14 Oct. 2015
- Ifeagwu, I. C. (2000). Strategies for enhancing teaching and learning in all levels of education. Retrieved from <http://teachinglearning/harp.net.org> on 11 Oct. 2015.
- Jennifer, H. (2010). *3D model based design setting the definition straight*". Retrieved from [http:// 3Dmodelbaseddesign.net.org](http://3Dmodelbaseddesign.net.org) MCADCAFE on 13 October 2015.
- Mbah, C.O. (2012). Technical competencies needed by mechanical Students in technical colleges for employment in Enugu State. *Unpublished B.Sc project report*. Presented to the Department of Technology and Vocational Education, Faculty of Education ESUT.
- Narayan, K. L. (2008). *Computer aided design and manufacturing*. New Delhi: prentice Hall.
- Obunadike, J.C. (2012). Effective staff management: A sine qua non for quality assurance in education; *Lit Academic Journal* 1(1) 191-200
- Ogbonnia, S.K.C. (2015). Nigeria's Electricity Crisis is Leadership Failure. Retrieved on 28/04/2016 from [www.vanguardngr.com/2015/05/nigerias-electricity-crisis-is-leadership-failure/](http://www.vanguardngr.com/2015/05/nigerias-electricity-crisis-is-leadership-failure/).
- Ogwo, B. A. & Oranu, R.N. (2006). *Methodology in formal and Non-formal Technical/vocational Education*. Enugu: University of Nigeria Press, Ltd.
- Okoro, O.M. (2006). *Principles and Methods vocational and technical education*, Nsukka: University Trust Publishers.
- Olabiya, O.S., Aiyelabowo, O.P. & Keshinso, O.T (2013). Relevance of computer assisted instruction (CAL) for



effective skill development among Technology education students in Nigeria. *Journal of Education and practice* 4 (21) 80-89.

Omoifo, C.N. & Urevbu, .A.O. (2007). An overview of teaching and learning. A paper presented at workshop on pedagogy for junior and intermediate lectures in University of Benin organized by centre for Gender Studies.

Onoh, B.C.E.C. (2011). *Foundational of entrepreneurship studies*. Enugu: Cheston Agency Press Ltd

Osinem, E.C. (2008). *Managing agricultural education and training: resources, principle and methods*. Enugu: Belony International Publishers.

Uwaifo, V. O. (2010). Technical education and its challenges in Nigeria in the 21<sup>st</sup> Century. *International NGO Journal* 5(2) 40-44.