LABORATORY/WORKSHOP TRENDS IN ELECTRONICS TECHNOLOGY EDUCATION

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Abstract
Electronics technology education requires workshop or laboratory setting for an ideal teaching situation. This programme helps the learners to learn how to design, construct, experiment, test, dismantle, repair and create. In the method of planning laboratory or workshop in electronic technology education, technological educators determine the need to up date the workshop. Anticipated formal planning needs, equipment, furniture, built in storage, cabinets, shelving, special storage racks, special consideration for auxiliary room, wall, floors, door and windows; duly protected, permanent, rare service, school environment and access drivers, are unavoidably provided in study. In electronics laboratory, space relationship, use of double diagram to show the relationships and equipment location .Technology education laboratory/workshop curriculum, industrial arts recommendations and metreage table are included in the study. Illuminating engineering society recommendations, laboratory/workshops instructional activities are available in the study. Planning the laboratory for teaching and learning activities are the invaluable quality facilities needed in electronics workshops.

Introduction

Electronics technology education requires laboratory setting for an ideal learning situation in which the learner may design, construct, experiment, test dismantle, repair and create. The understanding study of the role of laboratory and workshop is very essential to the study of electronics technology education. This is because active laboratory/workshop works in electronics technology education is purely the study of industrial technology. Nwagbo (2007) noted that laboratory/workshop utilization in technology education has the following facilities: electrical winding machine, leads, panels, tools, electrical materials, electronics components, electronics appliances and equipment. All that are needed in industrial electronics workshop are also required in electronics technology education laboratory/workshop setting.

Laboratory and workshop has facilities and therefore needed proper planning of the physical infra-structural standards to enable the investment to be sound and make educational programme productive. An ideal laboratory/workshop planning should identify the programme's philosophy, specific objectives of teachers and learners' activities. Expected number of learners to be enrolled, financial resources to facilitate electronics' laboratory/workshop to function, course content, laboratory tools, equipment, materials necessary before these are converted into useful industrial studies. Electronics technology education laboratories/workshops are designed to reflect the technological curriculum and the desired level of education. The programme in technology education specifications are clearly explained to meet the standard which may serve as a basis for facility planning decisions. They are founded on the premise that electronics technology educational programme planning must precede any physical facility design. Ezeji (2002) noted that the format for the content and arrangement of materials in electronics technology education specifications is often outlined by the agency designated with the responsibility of organizing, editing, and approving the desired programmes. Knowledgeable electronics technology laboratory/workshop personnel are incharge of preparing the required specifications of the infra-structural facilities

to house all tools, machines and equipment. The above type of laboratory best suited for electronics courses in education has been a topic of concern among teachers of the programme.

Presently in Nigerian institutions of higher learning, there is no one general purpose laboratory that meets the needs of the great variety of electronics courses offered. However, there are some common considerations that apply to the planning and layout of all electronics technology education laboratories/workshops. The programme laboratory/workshop should be the overall layout of the programme, which includes planning the work areas, lighting, location of equipment, storage, and colours. The laboratory/workshop should be developed to meet the specific needs of electronic technology education laboratories/workshop curriculum planning.

All that are needed in the programmes of technology education laboratory/workshop should reflect the same as in industry in which the student is expected to work after graduation. The laboratory/workshop should be designed for the greatest ease of teaching and learning. The laboratory/workshop must contain the latest and much up-to-date tools, machines and equipment as may be purchased within the institutions budget. Certainly a newly designed and constructed laboratory/workshop makes it easier to plan on a contemporary basis. Contemporary is the current overall layout of the laboratory/workshop. Although older laboratory/workshop can be brought, up-to-dated by redesigning and rearrangement. The course plan should be by the determining factor in laboratory planning. The course plan presents the materials that the teacher is planning to teach laboratory/workshop activities that have been developed. The nature of the laboratory/workshop should be in the order of the laboratory/workshop in the industrial activities which may be feasibly carried out. Realistically, the laboratory/workshop should be set up in such a way that all planned activities may be performed by the learner with little inconvenience and reorganization during study. All electronic laboratory/workshop should reflect the concept and the spirit of electronics industrial setting. Reference is again made to the relationship of industrial education to industry. If the course content reflects modern electronics industrial concepts so shall the laboratory/workshop teachers visit the electronics industries in this area of teaching for this will often give the good ideas for laboratory/workshop arrangement. (I.E.E.E, 2000)

Method of Planning of Laboratory/Workshop in Electronic Technology Educations

When technology educators determine the need to-up date the electronics laboratory/workshop, the following steps are suggested in order that the new facilities may be adequate for instruction to meet the learners needs. Silvius (1990) stated the following guidelines for functional workshop.

Establishment of Local Electronics Laboratory/Workshop Committee

The committee shall be determined by the environmental situation and estimated size of the programme to be developed. The committee shall include experts in electronics industries, the supervisor also from the industry, administrator from the ministry of education and university consultant as a resource person. The committee chairman planned the general steering committee for the new building infrastructural facilities.

Technology and vocational education departments provide the reference materials for the committee as follows:

- Accreditation standards using Nigeria University commission (NUC) criteria
- Related Nigeria universities laws and regulations
- Technology education of Nigeria universities philosophy and goals.
- Outlines for preparing educational specification such as purpose, programme, facilities, instructions and supervision.

- National policy on education 2004 trend in the universities of technology. Estimate the available funds for consideration.
- Establish a schedule for committee meetings and the completing of its tasks on accepts of term of reference.

The committee is charged to write and submit the educational programme and facility specifications for electronics laboratory/workshop programme. The suggested outline earlier mentioned should be helpful, guide and insure the completeness of educational specification. When the education specifications have been completed by the electronics technology education laboratory/workshop committee, they should be coordinated to the educational specifications of the other curriculum area and then submitted to the senate of the universities for the approval. The university senate approval of the specification is received, the specifications is handed to the architect for the preparation of the preliminary plans. This plan shows space allocations and configurations which satisfy the recommended programme equipment and number of laboratory/workshop. Finally, the electronics technology education laboratory/workshop committee should be utilized to locate equipment on the preliminary plan prior to final approval.

Philosophy and goals

State the philosophy and goals of the electronics technology education laboratory/workshop. State the objectives needed to implement this philosophy

Instructional Procedures

Develop the scope the sequence of electronics technology education laboratory/workshop for the grade levels to be included.

- Like course titles and content.
- Detail description of the activities of teachers fully
- Also describe the activities of the learners

Equipment

Categorize the electronics laboratory/workshop auxiliary space where they are located: number, name of item, sizes, descriptive information, and voltage for power machines. Electronics technology education is that subject field which provides opportunities for all learners from elementary through higher education to develop an understanding about the technology, consumer, occupation, recreational, organization, managerial, social, historical, cultural aspects of industry and technology. Furthermore, it is a programme whereby learners acquire industrial-technology knowledge and skills through creative and problem-solving. Learning experiences involving such activities as experimenting, planning, designing constructing, evaluating, and using tools, machines, materials and processes to achieve technology education goals.

The instructional and laboratory/workshop experiences help learners to make wiser and more valid educational and career choices. Since the Nigerian-maintenance culture is distinctly technological, and since the primary purposes of education in Nigerian society is to acquaint the young with the nature of the culture and their role in it, then electronics, because of its primacy, becomes fundamental education in Nigeria schools.

Ronal (1972) noted that industrial arts education draws its content from man's technological development and his current needs for effective living in the resulting society. Man, since his origin and during his rise to dominance on earth, is unique as he thinks and creates, works with his hands, use materials, makes tools and machines, develops techniques and processes, changes his environment and lives in a society dominated by technology. Electronics technology education is the study of an aspect of industrial technology education.

Electronics Technology Education Laboratory/Workshop

The purpose of providing electronics technology education laboratory/workshop is to acquaint learners with their human potential and personality trends, creating conducive environment for career development and development of industrial skills and knowledge. This will enable the learners to interact with their electronics laboratory and workshop modulates while the initial consideration concerns the goals of a sound programmes. The development of electronics laboratory/workshop skills in each learner helps the learner to have an insight and understanding of electronics computer industries, and its place in electronics global village. Industries are constructive, dynamic force in the world currently, the universities have to take it as a challenge, to provide opportunities for each learner to understand this industrial forces better. There is the need to understand that electronics computer industries provide significant learning experiences relating to electronic industries-in order for the learners to acquire skills in performance and have knowledge of design and constructing of electronics appliances.

Electronics Technology Education

Laboratories/workshops help the learners discover and develop their talents in industrial technological field. The responsibilities of the university is to assist the learners by providing a standardized electronics technology education so that the learners will discover and develop their talents. It is the responsibility of electronics industrial education to identify the special field in the electronics computer industrial technology.

Workshop/laboratory help the learners to develop problem solving abilities related to the materials, designing, constructing and producing electronics appliances. Electronics technology education centres on the problem-solving approach in industry, which involves creative thinking and giving the learners opportunity to apply principles of planning, designing, construction techniques, industrial processes, scientific principles, and mathematical computations to the solution of problems. It develops in each learner skills in the proficient and safe use of tools, in each machines, which enable the learners to acquire industrial technology skills. These electronic workshop offer opportunities to develop a computing skills commensurate with the mental and physical maturity of the learner.

With the total electronics department membership, various formulae can be applied to determine the size of laboratory and teachers required. National Policy on Education (2004) states that for effective participation of learners in practical or workshop work, the teacher-learners ratio shall be kept at 1:20. In another instance, a straight line formula is computed using a standard measure such as one laboratory and two teachers of electronics.

Planning the Electronics Laboratory for Learning

The development of an industrial education laboratory/workshop in electronics technology area is an ongoing process. The electronics technology education laboratory/workshop has to be learning oriented, before decisions on arrangement of items, materials storage, facilities and supplies can be made.

According to William (1996) after initial thought-out arrangement of laboratory, probably the best way to evaluate effectiveness for learning is by careful observation of the learning process during courses being thought. William stressed that there might be congested areas where students are expected to perform desired activities. Another common observation is that students will be waiting to make use of necessary equipment, provided, or their activities have not been planned to make necessary facilities available at the right time.

Planning the electronic laboratory/workshop for learning requires constant evaluating the learning process in regard to facilities and more adjustments and re-arrangements as necessary. Instructional media is included in the concept of electronics laboratory/workshop for learning. In planning electronics laboratory or workshop for learning, arrangement to

provide effective learning activities are itemized below.

i.   Make certainly sure that facilities for demonstrations are readily available and all learners are able to see and hear.

ii.   Provide adequate seating and planning space for ease of study, or designing or drawing.

iii.   Make reference materials readily available and convenient for learners use.

iv.   Plan equipment arrangement so that each item is easily accessible for discussions, demonstrations and individual's use.

v.   Make your electronics laboratory or workshop look as if it actually represents the contents of the courses you are teaching, discussions, conferences, and seminars.

vi   Provide adequate and convenient storage for learners supplies and products.

vii   Plan instructional media equipment for maximum and effective use. Correct location of projector, screens, power point, learning carrels, tape recorders, closed circuit television and other equipment that deserve close attention.

Instructional Activities:

Efficiently use the facilities and obtain a separate but adjacent instructional area where learners may be comfortably seated in classroom fashion. One such area can often suffice for electronics laboratories/workshop. Instructional area can be walled off by wood or metal partitions. In some cases separate classrooms are not available, the laboratory/workshop equipment, furniture are so arranged to accommodate the workbenches with the tools. The workbenches and tools areas serve as the demonstration, lecture, audio visual, planning and writing area. These are the integral part of the electronics technology education laboratory and workshop. This type of laboratory and workshop, is a learning center where electronics skills are acquired. Modern laboratory or workshop today and lecture room are integrated and demonstration are expected to be done in them. Electronics laboratory workshop today as the requirement of industry, dictate the need for laboratories in the technology and vocational education to integrate area for experimentation, testing, planning, multimedia, learning, construction, production, research and accommodation. Although the many electronics workshop areas of study will vary considerably, from such extreme as drawing electronics circuitry teaching and learning activity area. In other words, the whole concept of learning should override traditional placement of equipment and desks. The teaching and planning area should include all the necessary components integrated and equipment to provide an optimum learning atmosphere for teaching and learning. It is suggested that teaching and learning situations be considered in designing a learning centre.

Place yourself in the position of a computer technology teacher and consider the layout of a laboratory to meet the needs of both electronics technology and psychology of learning. You will undoubtedly need facilities for learners to do planning and layout work, group discussions and presentation, testing and experimentation with the component, functioning, papers and a multitude of other materials and operations of all types of computer appliance reproduction equipment, large scale integrations (LSI) and very large scale integration (VLSI) processes, and many more,. The whole laboratory becomes a learning centre with special facilities for learner's planning and designing. Any industrial laboratory or workshop education, should provide facilities to some degrees. The objectives of the electronics workshop programmes will give direction to how much emphasis should be placed on planning and learner study area.

References and Resource Library

One of the most beneficial aspects of any electronics laboratory/workshop is the availability of reference and resource materials for learner's use. It is difficult to comprehend that any technology course could be effectively taught by using no other resource material than

a textbook regardless of the quality of the text. A set of bookshelves of magazine racks should be suitably located for learners use during electronic laboratory/workshop instruction, free period, and after university hours. These materials will be needed often to supplement course content, provide for research activities, indicate suppliers so that learners may write for specifications and information, provide for advanced investigation, and instructions for equipment operation and testing. Technology textbooks, manufacturer publications, technological association magazines, industrial literature, professional magazine, career publication and teacher prepared reference are the materials one should consider for references.

Electronics Laboratory/Workshop as Part of Industrial Set Up

Get all electronics industrial equipment and machines for manufacturing into electronics laboratory/workshop environment. The offices of management, the design and electronics engineering department, research and development, materials and product, testing areas, reference libraries, manufacturing, production, packages and sales department. Compare all items in the industry to that in the electronics laboratory/workshop and determine if it reflects the industry and electronics department. Industry is the framework from which the subject matter is obtained, and many electronics learners are handling, the course. From the industrial point of view, both the course contents and learners are placed in an industrial setting. Electronics laboratory/workshops resembles the industrial setting, provide the learner with a realistic transition from learning to earning. A field trip to an industrial concern will often surprise learners not so much in what is being manufactured or processed, but what is learning in their own electronics laboratory/workshop. Certainly, the institutions cannot afford to buy of very large scale far beyond the needs of the institutions. Although similar scale and variety of instructional media will introduce the leaner to the same learning concept to plan the electronics laboratory/workshop along the same principles that industrial planners have used.

Conclusion

An ideal electronics laboratory/workshop setting is required for electronic practical teaching and learning situation. The required standard of electronics laboratory/workshop is highly needed in this aspect of education activities. The number of learners to be enrolled on the programme depends on their interest and abilities. The learners on this programmes must be knowledgeable so that they will be able to design, construct, or assemble many electronic appliances, and components. The laboratory or workshops activities in electronics have to meet the needs of the great variety of courses requiring practicals. The curriculum of electronics laboratory/workshop should be comprehensive and planned accordingly.

All the necessary tools, equipments, machines, building infrastructural facilities are highly appreciated in the electronics laboratory or workshops. The dimension or measurements must be followed in building infra-structures of electronics laboratory or workshops. All the apartments to accommodate cabinets, shelving, special storage racks accordingly should be provided. The electronics laboratory workshop must follow its philosophy and goals, the goals will help the learners to discover and develop their talents in industrial technological field. The electronics laboratory or workshop must be streamlined with industrial art recommended metreage per laboratory.

Recommendations
1.   Make a visit to an industrial concern dealing with the electronics field and discuss the problems of tool storage, machines and equipment maintenance, equipment arrangement, working conditions, and material storage. Planning the electronics laboratory should be from the information the teacher have received.
2.   Write to a number of electronics companies that specialize in industrial electronics

dynamics and ask for literature to solve electronic laboratory problems.

3. For the technology area, make a floor plan drawing for an electronics laboratory using the principles of contemporary laboratory planning.

4. For the electronics technology area; make a listing of any special lighting conditions which would be necessary in the laboratory/workshop for ideal conditions.

5. Make list of the latest in electronic laboratory or workshop equipment that would be necessary to teach the concepts drown from the course outline and planned learning activities.

6. Begin a collection of supply catalogue dealing with the technological specialization. Make a survey of industrial suppliers as well as those who specialize in supplies for industrial electronic technology education laboratory or workshop.

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