



## EFFECTS OF LEARNING ACTIVITY PACKAGE (LAP) ON SECONDARY SCHOOL STUDENTS ACADEMIC ACHIEVEMENT IN TECHNICAL DRAWING

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### Abstract:

The study was carried out to find out the effect of LAP on secondary school students' achievement in technical drawing. Two research questions guided the study and two Null hypotheses were tested at .05 level of significance. A Quasi-experimental pre-test post-test design was adopted for the study. A sample of 294 SSII secondary school technical drawing students drawn by simple random sampling techniques from four single sex secondary schools in Bichi Local Government Area of Kano State was used for the study. The students were assigned to experimental and control groups respectively using simple random sampling. Two parallel instruments (Pre-TDAT and Post-TDAT) were developed and validated. A reliability coefficient of .88 and .89 was obtained using Kuder Richardson formular 20. Data collected were analysed using mean and standard derivation to answer the research questions, while analysis of co-variance (ANCOVA) was used to test the null hypothesis at 0.05 level of significance. The results of the study revealed that there was a significant difference between the mean achievement scores of the LAP group and control group. A significant different was found to exist between the mean achievement scores of male and female secondary school technical drawing students taught using LAP. Based on the findings, the study recommended that LAP should be used in teaching technical drawing in secondary schools in Bichi Local Government Area of Kano State.

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## 1. Introduction

Secondary schools are regarded as one of principal vocational institution in Nigeria. They give full training intended to prepare students for entry into various occupations (Okoro in Elbitar & Umunadi (2011). Secondary schools technical drawing students require knowledge and skills that will enable them to be employable, self-reliant or proceed to higher education, but the result of West African Examination Council and National Business and Technical Examination Board (NABTEB) certificate examination show poor performance of secondary schools technical students. According to Udu and Eze (2018), the WAEC and NABTEB conducted in May 2018 show the rate of failure (F9) as follows; Engineering 55%, Construction trade 49% and Technical drawing 65%. A close examination of this result shows that technical drawing has the highest rate of failure. This implies that most students that sat for technical drawing will not gain admission into higher institutions.

Technical drawing is the basics of modern industrial technology and has found wide application in the fields of engineering and construction technology. According to Elbitar and Umunadi (2011), technical drawing is essentially a universal language by means of which technicians, engineers, craftsmen, artisans and industrialists communication. Like all visuals, it transcends all languages, tribes and cultures. The ability to draw clearly, descriptively and interpret same effectively is an essential basic skill for all those concerned with technology (Goetsh, Chalk, Nelson & Rickman, 2010).

Technical drawing involves creativity, which is expressed in graphics and arts. It starts in the mind and the initial outlet is usually in graphic representation. Hence, what is concerned in the mind is made to form clear picture, which is then put on paper in the form of sketches of drawings. Designs are therefore, conceptualized in the mind, drawn on paper, and produced technically to ascertain the workability of functionality of the initial concept. It is safe therefore, to say that modern technology cannot be effective without technical drawing, since according to Ugonabo in Sulaiman and Akeem (2014), technical drawing is the language of technology and graphics. Technical drawing deals with graphical representations of ideas. According to Goetsh, Chalk, Nelson and Rickman (2010), technical drawing is a means of clearly and concisely communicating all of the information necessary to transform an idea or concept into a reality. Therefore, a technical drawing often contains more than just a graphical representation of its subject. It also contains dimensions, notes and specifications.

In consequently, the Federal Government of Nigeria (FGN) in National Policy on Education (2013 Revised Edition), made technical drawing as an elective subject offered at secondary school level and National Board for Technical Education (NBTE) stipulated that in technical colleges, technical drawing should be taught as a trade related course and should be taken by all students in engineering trade and construction trades except

craft practice, this is due to the basic knowledge and skills it provides in engineering and construction courses. Therefore, technical drawing as a trade related course in technical college must be studied by all students in the technical related areas for an improved academic achievement. One of the objectives of technical drawing as contained in the handbook published by National Institute for Educational Development (NIED), in Sulaiman and Akeem (2014) is to solve practical and technological problems through the process of communication skills which are central to design and planning.

Attainment of these objectives depends on teacher factors and pedagogical approaches; it is apparent that technical drawing cannot thrive without using appropriate instructional teaching strategies to teach the students. This is because future development of any nation in the fields of technology and construction depends on how well technical drawing is taught.

Despite the important of technical drawing, Chief Examiners' Report of National Technical Certificate (NTC) and National Business Certificate (NBC) (2018) noted that student still perform poorly in technical drawing. This gives an indication that meaningful learning has not been taking place. Various methods are used by technical drawing teachers in teaching technical drawing in order to bring about a meaningful learning. This includes lecture method, demonstration, project, field trip among others, but the most commonly is the lecture method. The lecture method has failed to recognize the uniqueness of the inquiry base nature of technical drawing and the learner's individuality (Goetsh, Chalk, Nelson & Rickman, 2010). It is in respect of this clamour for change that many innovative strategies were developed to bring about improvements in teaching and learning of technical drawing. Those strategies include Analogy, concept mapping, peer tutoring, inquiry learning, learning activity package (LAP) among others. Various researches such as Goetsh, Chalk, Nelson and Rickman (2010), Sulaiman and Akeem (2014) carried out in the past support the fact that each of these modern strategies can leads to higher academic achievement than the lecture method of teaching.

Learning activity package (LAP) is a student centered activity oriented teaching strategy where the teacher acts as a facilitator of learning, guiding the students through a series of activities and problems which may help learners to achieve highly (Abu in Njoku & Akamobi, 2009). Abu in Njoku and Akamobi further opined that learning activity package (LAP) promotes learning and students' academic achievement. In LAP, learning materials are broken into small steps that are arranged sequentially from known to unknown and in an increasing order of difficulty. Similarly, according to Cardarelli in Ezeano (2013), Learning Activity Package (LAP) is a student-cantered and activity-based teaching strategy, where the teacher acts as facilitator of learning, guiding the students through series of activities and problems that may lead to enhanced students' academic achievement. Idoko in Sulaiman and Akeem (2014) is of the strong opinion that the differential achievement between boys and girls is not unrelated to the societal and cultural beliefs, it has close link with the importance attached to gender related roles of male and female child which is based on culture. Onoh (2011) observed that females

returned better than males in both his experimental and control groups and that the difference in retention scores for each group is significant.

Contributing, Duke in Udu and Eze (2018) stated that Learning Activity Package is a programme of study in printed form which covers a particular aspect of a subject that follows a logical sequence of instructional objectives and activities for implementing the objectives. The student proceeds through the objectives and activities in the LAP at his/her own pace. Continuing, Duke in Udu and Eze maintained that in LAP, the learning materials are broken down and arranged sequentially into small steps, ranging from the known to the unknown and in an increasing order of difficulty. This implies from the foregoing that in the LAP instructions are individualised.

Furthermore, Learning Activity Package offers a very practical and successful method for individualising instruction. For instance, it gives students the opportunity to engage actively in the teaching and learning process by engaging in hands-on activities. Unlike the traditional classroom where the teacher talks much and the students go through their textbooks and workbooks, page by page, lock stepped together. Furthermore, in the traditional/conventional method, there is little or no provision for meeting differences in individual learning styles or differences in individual learning rates. But, the LAP provides the students the opportunity to grow in self-discipline, self-motivation and also presents occasions for genuine interaction between the teacher and students, which is lacking in the traditional method of teaching (Udu & Eze, 2018).

However, Abu in Njoku and Akamobi (2009) opined that learning activity package (LAP) promotes learning and students' academic achievement. Udu and Eze (2018) emphasised that the Learning Activity Package is one of the approaches to individualised instruction. There are many other approaches to individualised instructions such as; programmed instruction, computer assisted instruction, independent study, among others. Some of these approaches have been investigated and found to be effective in enhancing students' academic achievement but their applications in the teaching and learning process are hindered by several factors in Nigerian schools (Udu & Eze, 2018). Hence the need to determine the effect of learning activity package (LAP) on students' academic achievement in technical drawing in secondary schools of Bichi Local Government Area of Kano State Kano State.

## **2. Statement of the Problem**

Learning activity package may involve any of a number of instructional strategies, depending upon the instructional objectives of the unit or module. A web page or site may be effectively adopted by teachers developing learning activity packages as a wide variety of instructional strategies may be incorporated. The web page or site may contain instructional content (text, audio and video) links to other sites, interactive activities (tutorials, simulations and experiments etc), assignments, evaluation guides and any other required content. Freedman in Ezeano (2013) opined that the teacher presents an initial design brief to the students that ties the design tasks to the curriculum topics, but

leaves some aspects open for refinement. During the lesson, the teacher provides the students with the motivation for and explains the responsibility they will carry for being involved. Students form teams, discuss question and familiarise themselves with the brief.

Abu in Njoku and Akamobi (2009) opined that the LAP consists of the following components, topic and sub-topics, rationale, behavioural objectives, pre-test, learning activity, unit activities and posttest. LAP is a learner centered activity that leads to individualization of instruction which leads to higher academic achievement. Based on these advantages the researchers found it necessary to determine the effect of learning activity package (LAP) on students' academic achievement in technical drawing in secondary schools of Bichi Local Government Area of Kano State.

### **2.1 Purpose of the Study**

The aim of the study was to ascertain the effects of learning activity package (LAP) on students' achievement in technical drawing in secondary schools of Bichi Local Government Area of Kano State. Specifically, the study determined to find out the:

- 1) effect of LAP on students' achievement in technical drawing in secondary schools of Bichi Local Government Area of Kano State.
- 2) extent gender influence on students' achievement in technical drawing when taught using LAP in secondary schools of Bichi Local Government Area of Kano State.

### **2.2 Research Questions**

The following research questions guided the study.

- 1) What are the mean achievements scores of students taught technical drawing using LAP and those taught using lecture method in secondary schools of Bichi Local Government Area of Kano State?
- 2) What are the mean achievement scores of male and female students in technical drawing achievement test when taught with LAP in secondary schools of Bichi Local Government Area of Kano State?

### **2.3 Hypothesis**

The following null hypotheses were tested at .05 level of significance difference.

- 1) There is no significant difference between the mean achievement scores of technical drawing students taught using LAP and those taught using the lecture method in secondary schools of Bichi Local Government Area of Kano State.
- 2) There is no significant difference between the mean achievement scores of male and female students taught technical drawing using learning activity package in secondary schools of Bichi Local Government Area of Kano State.

### 3. Method

The study adopted quasi-experimental design. The study was conducted in secondary schools in Bichi Local Government Area of Kano State. The population of study comprised of all the senior secondary schools class two (SSII) technical drawing students in secondary schools in Bichi Local Government Area of Kano State. Single and mixed sex schools were used to avoid gender interaction. The number of students in these schools that offer technical drawing is 523 (source: Education Unit, Bichi Local Government Area). A sample of two boys' school and two girls' secondary school were purposely selected through random sampling method. A total of 294 SSII technical drawing students drawn from four secondary schools were used as research subjects. The assignment of intact classes to both LAP and lecture group was done randomly using a simple ballot system. The LAP group had 144 students while the lecture method group had 150 students.

The instrument used for data collection is Technical Drawing Achievement Test (TDAT) developed by the researcher. The Items were developed from SSII technical drawing curriculum. It contains 20 multiple choice test items. The TDAT was subjected to both face and content validation by 5 lecturers in the Department of Technical and Vocational Education and Computer Science, Federal College of Education (Technical), Bichi Local Government Area of Kano State. The content validating was ensured using the table of specification. The reliability of the instrument was established through trial testing of the instrument on a group of SSII students not used in the study. The internal consistency of TDAT (Pre-TDAT & Post-TDAT) was determined using Kuder Richardson formula 20 (K-R 20) with internal consistency coefficient of .89 and .88 obtained respectively.

On experimental procedure, before the on-set of the experiment, the research subjects were given the pre-TDAT by their regular teachers. Two treatment groups were used. The experimental group was taught using the LAP while the control group was taught using lecture method. This lasted for six weeks. To reduce the error that may arise as a result of teacher differences, the same teacher that had been teaching the subject taught both groups in their schools for the study, after the treatment, the post-TDAT was administered to the subject in both the experimental & control groups. The post-TDAT contained the same test items as the pre-TDAT. The data on students' achievement in technical drawing from the two treatment groups were kept separately and used to answer the research questions and to test the hypothesis that guided the study. Data collected were analysed using mean and standard deviation to answer the research questions while analysis of covariance (ANCOVA) was used to test the hypothesis at 0.05 level of significance. Decision Rule: Reject the Null hypothesis if the calculated F-value is greater than F-critical/table value, otherwise do not reject.

#### 4. Results

**Research Question 1:** What are the mean achievements scores of students taught technical drawing using LAP and those taught using lecture method in secondary schools of Bichi Local Government Area of Kano State?

**Table 1:** Mean Achievements Scores of Students Taught Technical Drawing using LAP and those Taught using Lecture Method (N=150)

Experimental Condition	Teaching Method	Test Type	No. of Subjects (N)	Mean ( $\bar{X}$ )	Standard Deviation (SD)	Gain Score
Experimental	LAP	Pre-test	144	21.51	3.15	6.71
		Post-test		28.22	6.13	
Control	Lecture	Pre-test	150	21.83	3.40	6.32
		Post-test		28.15	5.80	
Total			294			

As shown in Table 1, the mean scores of the students taught technical drawing with the LAP group obtained the mean of 21.5 and 28.22 in pre-test TDAT and Post-test TDAT and with standard deviation of 3.15 and 6.13 respectively and thus had the gain score of 6.71 after the treatment. This shows that the pre-test and post-test in the LAP group were similar at the beginning of the experiment. On the other hand, mean scores of the students taught technical drawing with the lecture method group had the mean of 21.83 and 28.15 in pre-test TDAT and Post-test TDAT and with standard deviation of 3.40 and 5.80 respectively and thus had the gain score of 6.71 after the treatment. This shows that the pre-test and post-test in the lecture method group were similar at the beginning of the experiment. The results indicated that the LAP group achieved higher than the lecturer method group both in Pre-test TDAT and post-test TDAT scores.

**Research Question 2:** What are the mean achievement scores of male and female students in technical drawing achievement test when taught with LAP in secondary schools of Bichi Local Government Area of Kano State?

**Table 2:** Mean Achievements Scores of Male and Female Students in Technical Drawing Achievement Test when Taught with LAP (N=150)

Experimental Condition	Teaching Method	Test Type	No. of Subjects (N)	Mean ( $\bar{X}$ )	Standard Deviation (SD)	Gain Score
Male	LAP	Pre-test	130	96.53	3.07	5.42
		Post-test		101.95	6.66	
Female	Lecture	Pre-test	164	98.51	2.25	2.38
		Post-test		100.89	6.06	
Total			294			

As shown in Table 2, the mean scores of the male students taught technical drawing with the LAP group obtained the mean of 96.53 and 101.95 in pre-test TDAT and Post-test TDAT and with standard deviation of 3.07 and 6.66 respectively and thus had the gain score of 5.42 after the treatment. This shows that the pre-test and post-test in the LAP group were similar at the beginning of the experiment. On the other hand, mean scores of the female students taught technical drawing with the lecture method group had the mean of 98.51 and 101.89 in pre-test TDAT and Post-test TDAT and with standard deviation of 2.25 and 6.06 respectively and thus had the gain score of 2.38 after the treatment. This shows that the pre-test and post-test in the lecture method group were similar at the beginning of the experiment. The results indicated that the males had higher achievement scores than the female group, the male also had a higher gain score when compared with the female group.

#### 4.1 Testing of Hypotheses

**Hypothesis 1:** There is no significant difference between the mean achievement scores of technical drawing students taught using LAP and those taught using the lecture method in secondary schools of Bichi Local Government Area of Kano State.

**Table 3:** Analysis of Covariance Results with Reference to Method and Gender (total of 150 Cases Processed)

Source of Variation	Sum of Squares	Df	Mean Square	F-cal	Sig of F	Remarks
Co-varieties	728.593	1	728.593	5.982	.015	Significant
Pre-TDAT	728.593	1	728.593	5.982	.015	Significant
Main Effects	1034.408	2	517.204	4.246	.015	Significant
Gender	807.568	1	807.568	6.630	.011	Significant
Method	213.887	1	213.887	1.7756	.186	Significant
2-way interaction	589.206	1	589.206	4.837	.029	Significant
Gender X method	589.206	1	589.206	4.837	.029	Significant
Explained	2173.152	4	543.288	4.460	.002	Significant

Table 3 showed the results of the ANCOVA used in testing the hypothesis. From the results, it is observed that the calculated value of F which is .756 is significant at .186 Critical value of F at the probability level of .05 set for this study, therefore the Null hypothesis is rejected. That there is significant difference between the groups achieved higher than the lecturer method group both in Pre-test TDAT and post-test TDAT scores.

**Hypothesis 2:** There is a significant difference between the mean achievement scores of male and female students taught technical drawing using learning activity package in secondary schools of Bichi Local Government Area of Kano State.

From Table 4 results it is observed that the calculated F-ratio of 4.837 which is for the two-way interaction (gender and methods) is significant. Therefore, Null hypothesis 2 is rejected. Therefore, there is significant difference between the mean achievement scores of male and female students taught technical drawing using LAP.

**Table 4:** Analysis of Covariance Results

Source of Variation	Sum of Squares	Df	Mean Square	F-cal	Sig of F	Remarks
Co-varieties	728.593	1	728.593	5.982	.015	Significant
Gender	807.568	1	807.568	6.630	.011	Significant
Method	213.887	1	213.887	1.7756	.186	Significant
2-way interaction	589.206	1	589.206	4.837	.029	Significant
Gender X method	589.206	1	589.206	4.837	.029	Significant

## 5. Discussion of Findings

Findings of the study in Table I revealed that students taught with LAP performed significantly better in technical drawing achievement test than those who were taught using the lecture method. The result was in agreement with what Nwosu in Abu, Njoku and Akamobi (2009) opined that learning activity package (LAP) promotes learning and students' academic achievement. This is because it is student centered and there is active participation of the students during the teaching learning process.

Furthermore, as indicated in Table 2, the mean achievement scores of male students were found to be better than their female counterparts. Idoko in Sulaiman and Akeem (2014) who revealed that boys and girls students is not unrelated to the societal and cultural beliefs, it has close link with the importance attached to gender related roles of male and female child which is based on culture. The findings of the study disagreed with the results of the experiment conducted by Onoh (2011) which showed that females returned better than males in both his experimental and control groups and that the difference in retention scores for each group is significant.

## 6. Conclusion

Learning Activity Package (LAP) was found to be more effective than conventional lecture method on secondary school students' achievement in technical drawing. There is a significant difference in the mean scores of both the treatment and control groups. The males used for the study achieved higher than their female counterparts. Based on that, it was concluded that LAP is effective in enhancing students' achievement in secondary schools in technical drawing subject.

### 6.1 Recommendations

In view of the findings the following were recommended.

- 1) The use of LAP instructional strategy should be given greater emphasis in the curriculum for pre-service teachers of technical drawing.
- 2) Seminars, workshops should be organized by relevant bodies to educate and sensitize the teachers on the use of LAP in teaching and learning of technical drawing.

- 3) Government and relevant professional associations should sponsor further research to find out ways of making the use of the LAP learning techniques easily practicable by teachers of technical drawing.
- 4) More textbooks on learning activity package as an instructional strategy should be produced.

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