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Availability and Effective Utilization of Improvised Instructional Materials for Teaching Technical Drawing in Kano State Technical Colleges

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ABSTRACT

The study examined the availability and effective utilization of improvised instructional materials for teaching technical drawing at selected technical colleges (TD) in Kano state, Nigeria. Survey and experiment research design was adopted for the study and simple random sampling technique was used to select five out of all Government Technical Colleges in Kano state. Three technical drawing (TD) teachers and seventeen NTC2 students were taken from each of the selected colleges making a total of 100 samples. Teachers and students' questionnaire were used to gather data for the research. Descriptive statistic and regression analysis were used to analyze the data and revealed that the available instructional materials for teaching and learning TD in Kano state Technical colleges are in adequate and TD teachers have positive perceptions towards improvisation of teaching facilities. Teachers' awareness for improvisation and the level of utilization of improvised instructional materials is very low. Students have interest on using improvised teaching materials for learning process despite the low level of utilization of improvised teaching materials by their teachers. Regression analysis revealed that approximately 62% of the variation in the dependent variable (students' performances) is explained or influenced by using improvised instructional materials. The study therefore, recommends among others, that Teachers should be resourceful so as to improvise when the original materials are not available, Improvised materials should be used properly in relation to the topic to be taught. Funds should be provided to schools for the purposes of buying materials needed for improvisation. Improvisation workshops should be organized by the Ministry of Education.

Keywords: Effective utilization, Improvisation, Instructional materials, Technical Drawing
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Introduction

The accessibility and the utilization of instructional materials in educational area cannot be overemphasized. Olawale (2013), in his views, instructional materials comprise materials to ease learning for enhanced results. Likewise, Uzuegbi, Mbadiwe and Anulobi (2013) regard to instructional material to all devices utilize to help the teacher in the teaching of a lesson and ease students learning of the subject taught. They involve those items that are acquired commercially or improvised by the instructor to make conceptual abstraction more sound and visible to the learners (Iwu, Ijioma, Onoja and Nzewuihe, 2011). Nevertheless, good instruction in teaching cannot be fully achieved without the availability and utilization of instructional materials. The use promotes closer and effective communication between the teacher and the learners (Utibe-Abasi, 2015). This instructional materials could be printed such as textbooks, workshops and non-printed such as films, videotapes, television. Also, there are different instructional materials to be use in teaching basic subject effectively but not all topics require the same type and quality of material. Hence, instructional materials are classified in different ways such as audio, audio-visual, and visual (Adewoyin, 2012). In order to achieve the objectives, any materials to be used as teaching aid must have the following characteristics such as, colour, visibility, flexibility, sufficiency, simplicity, appropriate, artistic, bright, clear, brief, and clean.

Therefore, teachers should make instructional material available and utilize for effective and efficient teaching to take place (Aina, 2013).

Improvisation on the other hand, is the make-shift of a learning material. According to NTI (2005), it is the process of generating a totally new material, instrument, material objects or improving existing one for a special purpose. Improvisation is carried out either where the original material is not obtainable or where it is accessible but could not be important to the instructional purposes. According to Iji (2014), improvisation of instructional materials in teaching, provides active class and worthy due to the inherent significance that is obtained when improvised instructional materials are utilized in learning. (Onasanya, & Omosewo, 2011) Improvised instructional materials ease quick understanding and provide first hand learning experiences which is easily remembered. They afford the students the opportunity for individual studies by promoting individualization instruction and self studies. (Ramel-galima, Rivera & Almanza, 2013)

Improvisation plays a vital role in teaching and learning process from the various disciplines and studies, the concept of improvisation materials are very important to the substance of any education system (Clement, Patience & Nanna, 2014). The usefulness of improvisation in education system gained support by the Government which led to the policy statement in the national policy of education (2004). Frequent observations by educationist concerning

teacher's ignorance in the use of improvised material to aids learning has become of concern. Teachers mostly neglect the use of appropriate improvised material because of the ignorance of their benefit to students or laziness of the teacher to put things together or because of time and so on (Okolie, 2014). Previous researchers' even theoretical findings have not been able to proffer a lasting solution in relation to the use of improvised instructional materials in teaching and learning of Technical Drawing in our technical colleges, hence the gap of knowledge this area. Therefore, to this end, the researcher deem it necessary to research further and deeply on the topic: 'Availability and effective utilization of improvised instructional materials for teaching technical drawing in Kano state technical colleges' as this would help to proffer a modest panacea towards improving performance of technical school students, even in Nigeria at large.

With all the efforts of the Nigerian Government to enhance Technical Education sector, most of the students in the technical colleges perform below average in technical drawing lessons and examinations. Without technical drawing engineering and technology cannot have solid foundation in Nigeria and if student's performances continue to be poor in the subject, our engineering and technology foundation will probably be incapable to attain the lead found in other countries of the world. This problem is associated mainly with fact that majority of the technical drawing teachers

use traditional ways of delivering lessons during teaching and learning. Discussion and lecture methods of teaching are often utilized by majority of technical teachers during technical drawing lesson instead of improvising instructional materials when the standard ones are not obtainable.

1.3 Research Questions

The study thinks to find answers to the following research questions.

1. Are the instructional materials for teaching Technical Drawing (TD) available in technical colleges in Kano state?
2. To what extent are the instructional materials for teaching TD available in technical colleges in Kano state?
3. What is the perception on the TD teachers towards improvisation of teaching facilities in Kano state technical colleges?
4. To what extent are the TD teachers aware of the specific instructional materials that could be improvised locally?
5. How often do teachers in Kano state technical colleges use improvised materials to teach TD?
6. What are students' views on improvised instructional materials in teaching TD in Kano state technical colleges?
7. Do improvised instructional materials have positive impact on students' performances?

2.0 RESEARCH METHODOLOGY

2.1 Research Design

Survey research design was utilized for this study. According to Ibaam (2012) survey research is used to generate detailed

description of phenomena in existence with the view of employing information to justify present conditions and practices, or to make more reasonable plans for enhancing them. Also, according to Oguranti (2010), survey is that kind of design in which the researcher gathers data from a huge sample drawn from a known population and presents some features of the sample as they are at the duration of the study and which are of interest to the researcher. From the above meaning, survey has to do with gathering information from a huge group of a population with the intention of examining certain features, behaviors or characteristics of the group and also generalizing the results to the entire population.

2.2 Population of the Study

The population of the study comprised all TD teachers and NTC2 (SS2) students from five Technical colleges in Kano state randomly selected.

2.3 Sample and Sampling Techniques

Simple random sampling technique was used to select five out of all Government Technical Colleges in Kano state. 3 TD teachers and 17 NTC2 students were utilized in the research from each of the selected colleges making a total of 100 samples. The selection of the students was also randomized.

2.4 Instrument for Data Collection

The researcher developed questionnaire for the purpose of gathering data for the research work, The teachers and students' questionnaire contained number of items

requiring the respondents to respond accordingly which are divided in to two parts, that is part A and B respectively; part A is a general information of the respondents qualification(s) and teachers experiences while part B were used to find out if the teacher use their creative idea to improvised relevant materials for teaching TD. The instrument was based on a 4-point rating scale thus: Strongly Agreed (SA), Agreed (A), Disagreed (D) and Strongly Disagree (SD). An item in the questionnaire was therefore considered positive if the positive average percentage of the respondents was higher and considered negative if the otherwise,

2.4.1 Validation of the Instrument

The instrument was first validated by the supervisor of the researcher and other two experts in technical education. The experts were given the purpose of the study and the research questions to serve as guide. The experts were required to examine the instrument with respect to the extent to which the questions were appropriate and relevant to objectives. Their comments and suggestions helped in the final production of the research instrument

2.4.2 Reliability of the Instrument

A pilot study was conducted using three TD teachers and ten students from other Government Technical College. The said teachers and students were not part of the sample for the study. A test-retest method was used; the instrument was administered to the respondents and re-administered to them after

two weeks. The two sets of responses obtained were correlated using Pearson Product Moment Coefficient. The internal consistency of the items calculated yields a coefficient of 0.79 which is strong enough.

2.5 Procedure for Data Collection

The researcher carried out collection of data with the introduction letter to various selected Technical Colleges under study. In order to ensure effective collection of data required, personal visitation was used in administration and collection process of questionnaires. Copies of questionnaire were distributed to the teachers and students, this was to ensure easy collection and valid finds; the researcher used all TD teachers which are manageable in number in the colleges selected. Both quantitative and qualitative questions were designed for teachers and students to gather information. The experimental design for the study was in three stages: Pre-assessment – Experiment – Post-assessment. In the pre-assessment students were given questionnaires to respond on the knowledge they had on improvised instructional materials. The students were placed into two different groups namely groups A and B for the experiment aspect. Group A were taught with conventional method for teaching the concept (Development of surfaces) and Group B were taught with the designed improvised instructional materials. The groups were counterbalanced in the second experiment and Group A were then used the improvised materials in studying the concept and Group B

used conventional method in the study of the same concept. Both groups answered questions after the experiment to determine effectiveness of improvised instructional materials.

2.6 Data Analysis Techniques

Descriptive statistic and regression analysis were used to generate frequencies, mean/average and percentages of the collected data and to ascertain the difference in the performance of students. The data collected by administering the research instruments were analyzed in line with the research questions and the data was presented in tables for easy interpretation.

2.6.1 Frequency

This is the number of times a particular observation occurs in a given data, it's usually denoted by letter “ f ”.

2.6.2 Mean/Average

This is the summation of the total observations divided by the total number of the observations.

$$\frac{\sum fx}{\sum n} \quad (1)$$

Where f is the frequency, x is the observation and n is the number of observations

2.6.3 Percentage

The percentages were gotten by multiplying the number of respondents who ticked certain items in the questionnaire by 100, and thereafter, divided by the total number of respondents.

That is:

$$\frac{A}{T} \times 100\% \quad (2)$$

Where A is the number of persons who ticked a particular item, T is the total number of respondents

2.6.4 Regression Analysis

Regression analysis was used to ascertain the relation between the mean responses of students before and after the experiment so as to find out the effect of improvised instructional materials on learning process. Pearson's correlation coefficient (r) and the regression (r^2) were determined. The equations (3) and (4) were used to determine the relations.

$$r = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum(X - \bar{X})^2} \sqrt{\sum(Y - \bar{Y})^2}} \quad (3)$$

$$r^2 = \text{(pearson's } r \text{ squared) coefficient of determination} \quad (4)$$

Where X and Y are responses before and after using improvised instructional materials respectively, $\bar{X}$ and $\bar{Y}$ are means of X and Y respectively

3.0 DATA PRESENTATION AND ANALYSIS

3.1 Data Presentation and Analysis

The presentation of data was based on the responses gathered from the questionnaires distributed and collected from the respondents.

Research question1: Are the instructional materials for teaching Technical Drawing (TD) available in technical colleges in Kano state?

Both teachers and students were given questionnaires to answer base on the above research question. Fifteen teachers and eighty-five students participated in answering the questions. Table 1 shows the responses. 67% of the respondents strongly agreed that there are available instructional materials for teaching TD, 3 teachers and 20 students (23%) agreed while 2 teachers and 8 students (10%) disagreed. The average percent in favour of the availability of instructional materials is 90% while 10% of the cases show the unfavourable disposition of respondents towards the availability of improvised instructional materials for teaching TD. This means that there is availability of instructional materials for teaching TD in their technical college but not sufficient.

Table 1: Availability of instructional materials for teaching Technical Drawing (TD) in Kano state technical colleges

Responses	Teachers	Students	Frequency	Percentage	Total percentage
SA	10	57	67	67	90 (+)
A	3	20	23	23	
D	2	8	10	10	10 (-)
SD	0	0	0	0	
Total	15	85	100	100	

Research field study (2019)

Research question 2: To what extent are the instructional materials for teaching TD available in technical colleges in Kano State?

The result in table 2 showed the opinions of teachers and students under study over the extent to which the instructional materials for teaching TD are available. 10 teachers and 55 students (65%) strongly disagreed, 5 teachers and 25 students (30%) disagreed, 5 students

(5%) agreed. The average percent in favour of the adequacy of improvised instructional materials is 5% while 95% of the cases show the unfavourable dispositions of teachers and students toward the adequacy of the improvised instructional materials for teaching and learning processes. This means that the improvised instructional materials for teaching TD in Kano state technical colleges are inadequate.

Table 2: Adequacy of available instructional materials for teaching Technical Drawing (TD) in Kano state technical colleges

Responses	Teachers	Students	Frequency	Percentages	Total percentage
SA	0	0	0	0	5 (+)
A	0	5	5	5	
D	5	25	30	30	95 (-)
SD	10	55	65	65	
Total	15	85	100	100	

Research field study (2019)

Research question 3: What is the perception on the TD teachers towards improvisation of teaching materials in Kano state technical colleges?

Items on table 3 sought to investigate the perception of TD teachers regarding improvisation of teaching facilities. The average percent in favour of improvisation of instructional facilities is 60% while 40% of the cases show the unfavourable position of teachers towards improvisation.

Table 3: Perception of TD teachers towards improvisation of teaching facilities in Kano state technical colleges

Items	Responses (%)				Total
	SA	A	D	SD	
It is simpler to conduct theory lesson in TD than to improvise for practical lesson Instructional materials for TD can easily be improvised	8 (53.3%)	4 (26.7%)	2 (13.3%)	1 (6.7%)	15 (100%)
TD teachers have positive feeling towards improvisation	6 (40.0%)	4 (26.7%)	3 (20.0%)	2 (13.3%)	15 (100%)
Teachers of TD are aware of improvisation in school but do not have interest on improvisation	2 (13.3%)	3 (20.0%)	6 (40.0%)	4 (26.7%)	15(100%)
Average percentages	60% (+)		40% (-)		

Research field study (2019)

Research question 4: To what extent are the TD teachers aware of the specific instructional materials that could be improvised locally?

Items considered on table 4 were utilized to find the extent to which the TD teachers were aware of specific teaching facilities that could

be improvised. The mean percentage level of awareness in for improvisation is 26.67% while 73.33% of the teachers claimed ignorance about materials that could be improvised. The level of awareness is very low or non-existent.

Table 4: Degree of Awareness of Improvised Materials by the TD teachers

Items	Responses (%)				Total
	SA	A	D	SD	
Are you aware of the quality of resource materials to be used for improvisation in TD?	2 (13.3%)	1 (6.7%)	6 (40.0%)	6 (40.0%)	15 (100%)
Are you aware that using local materials in improvising TD teaching materials promotes students learning?	1 (6.7%)	3 (20.0%)	3 (20.0%)	8 (53.3%)	15 (100%)
Are you aware that improvisation of teaching resources in TD motivates students learning?	2 (13.3%)	3 (20.0%)	4 (26.7%)	6 (40.0%)	15 (100%)
Average percentage	26.67 (+)		73.33(-)		

Research field study (2019)

Research question 5: How often do teachers in Kano state technical colleges use improvised materials to teach TD?

Table 5 indicates the extent of utilization of improvised materials in teaching Technical drawing by the teachers. The average response in favour of utilization of improvised materials is 33.34% while the response for non-utilization of improvised materials stands at 66.66%. This shows that the level of utilization of improvised teaching materials in Technical drawing is low.

Table 5: Extent of Utilization of improvised Materials

Items	Responses (%)				Total
	SA	A	D	SD	
Do you often use improvised materials for the teaching of TD?	2 (13.3%)	1 (6.7%)	3 (20.0%)	9 (60.0%)	15 (100%)
Do you have a well equipped studio/workshop that is utilized for the improvisation of teaching materials?	0 (0.0%)	3 (20.0%)	4 (26.7%)	8 (53.3%)	15 (100%)
Do your TD students use improvised materials for a group practical project?	1 (6.7%)	3 (20.0%)	5 (33.3%)	6 (40.0%)	15 (100%)
Do students have interest in utilizing improvised materials in the learning of TD?	8 (53.3%)	3 (20.0%)	3 (20.0%)	1 (6.7%)	15 (100%)
Do you accept the fact that improvised teaching materials should be used in teaching 60% of TD practical?	3 (20.0%)	1 (6.7%)	6 (40.0%)	5 (33.3%)	15 (100%)
Average percentage	33.34 (+)		66.66 (-)		

Research field study (2019)

Research question 6: What are students' views on improvised instructional materials in teaching TD in Kano state technical colleges? Students were given questionnaires to answer base on the research question six. Eighty-five students participated in answering the questions. Table 6 showed the responses of students on their views on improvised instructional materials for teaching TD. The analysis showed higher negative responses

towards items one, two and three in the table where as students' interest toward the use of improvised instructional materials received positive response. The average response in favour of students' views on improvised materials is 39.70% while the negative response stands at 60.30%. This shows that the level of utilization of improvised teaching materials in Technical drawing is low. However, students have interest on using

improvised teaching materials for learning process.

Table 6: Students' views on improvised instructional materials for teaching TD

Items	Responses (%)				Total
	SA	A	D	SD	
Does your TD teacher often use improvised materials to teach a concept?	20 (23.5%)	10 (11.8%)	25 (29.4%)	30 (35.3%)	85 (100%)
Do you have a well equipped studio/workshop that is utilized for the improvisation of teaching materials?	10 (11.8%)	15 (17.6%)	30 (35.3%)	30 (35.3%)	85 (100%)
Do you students use improvised materials for a group practical work?	13 (15.3%)	7 (8.2%)	25 (29.4%)	40 (47.1%)	85 (100%)
Do you students have interest in utilizing improvised materials in the learning of process?	41 (48.2%)	19 (22.4%)	18 (21.2%)	7 (8.2%)	85 (100%)
Average percentage	39.70 (+)		60.30 (-)		

Research field study (2019)

Research question 7: Do improvised instructional materials have positive impact on students' performances?

Experimental design was used to answer this research question. Two experiments were performed using and without improvised instructional materials in teaching concept (Development of surfaces). In the first experiment, students were taught without improvised instructional materials and

answered a set of question. The second part consisted of students taught using improvised instructional materials and answered another set of question. The mean responses of the students prior to and post the use of improvised instructional materials were correlated. Correlation coefficient (r) and regression coefficient of determination were calculated to determine if the use of improvised instructional materials could positively affect students' performances.

Table 7 displayed the result.

Table 7: Mean of students responses before and after experiment

X	Y	$X - \bar{X}$	$Y - \bar{Y}$	$(X - \bar{X})^2$	$(Y - \bar{Y})^2$	$(X - \bar{X})(Y - \bar{Y})$
1.3	2.5	-0.75	-0.82	0.5625	0.6724	0.615
2	2.8	-0.05	-0.52	0.0025	0.2704	0.026
2.3	3	0.25	-0.32	0.0625	0.1024	-0.08
1.5	2.8	-0.55	-0.52	0.3025	0.2704	0.286
2	3.3	-0.05	-0.02	0.0025	0.0004	0.001
2	3.5	-0.05	0.18	0.0025	0.0324	-0.009
2.8	3.8	0.75	0.48	0.5625	0.2304	0.36
2	3.3	-0.05	-0.02	0.0025	0.0004	0.001
2.3	3.8	0.25	0.48	0.0625	0.2304	0.12
2.3	3.5	0.25	0.18	0.0625	0.0324	0.045
$\bar{X} = 2.05$	$\bar{Y} = 3.23$			$\Sigma 1.625$	$\Sigma 1.842$	$\Sigma 1.365$

$$r = 0.788971 = 0.79$$

$$r^2 = 0.622476 = 0.62$$

$$= 62\%$$

Analysis

It can be seen from the above result that the correlation coefficient is 0.79. This indicates that the correlation among the mean responses is positive. This statistic, which ranges from -1 to +1, it also indicated the strong relation. The coefficient of determination, r^2 , is 62.24%. This indicates that approximately 62% of the variation in the subordinate variable (students' performances) is explained or influenced by using improvised instructional materials.

3.3 Discussion of the Result Findings

The data collected and findings of this research shows that, there is availability of instructional materials for teaching and learning Technical Drawing (TD) in Kano state Technical colleges but not sufficient. This is one of the factors that necessitate the use of the improvised instructional materials. The study showed that there is inadequate instructional material for teaching and learning TD in Kano state Technical colleges selected for this study. However, as stated earlier, the materials resources that should be

available in the schools such as Text books, Maps, Audio visual and electronics and other instructional materials must be in good condition for proper teaching and learning process. These agree with research finding of Adeniyi (2011). The findings of the research reveal that TD teachers have positive understanding towards improvisation of teaching facilities. Teacher's awareness for improvisation of instructional materials and their level of application of improvised materials is minimum; the perception of the teachers towards improvisation is not matched with relating enthusiasm to actually carry out improvisation. Research has proved that effective use of instructional materials arouse student's interest (Ahmad, 2008). It is therefore, expected that in the absence of the commercially made instructional materials for the teaching and learning of TD, teachers can improvise. The high ignorance level of 73.33% is disgusting and may be responsible for the teachers not being able to direct students to take part in improvising materials for the practical lessons. Students have greater interest of utilization of improvised instructional materials as boosted the level of their academic performance. Finally, the use of improvised instructional materials for teaching TD greatly and positively affects students' performances with about 62%.

Conclusions

Based on the data presented, analyzed and interpreted, the researcher is able to come out with the followings conclusions.

- I. There is availability of instructional materials for teaching and learning TD in Kano state Technical colleges.
- II. The available instructional materials for teaching and learning TD in Kano state Technical colleges are in adequate.
- III. TD teachers have positive perceptions towards improvisation of teaching facilities
- IV. TD teachers' awareness for improvisation of instructional materials is very low or non-existent.
- V. The level of utilization of improvised instructional materials by TD teachers is very low.
- VI. Students have interest on using improvised teaching materials for learning process despite the low level of utilization of improvised teaching materials by their teachers.
- VII. Regression analysis revealed that approximately 62% of the variation in the dependent variable (students' performances) is explained or influenced by using improvised instructional materials.

Recommendations

The following recommendations were made in line with the findings of the study:

- i. Teachers should be resourceful so as to improvise when the original materials are not available.
- ii. Improvised materials should be used properly in relation to the topic to be taught.
- iv. Funds should be provided to schools for purposes of buying materials needed for improvisation.

- v. Improvisation workshops should be organized by the Ministry of Education.
- vi. All technical teacher education programmes should include a course on improvisation of technical education equipment.
- vii. Practicing TD teachers should attend regular, conference, workshops and seminar in improvisation.

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