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INFLUENCE OF SOCIAL AND COGNITIVE CONSTRUCTIVIST INSTRUCTIONAL APPROACHES ON LEARNING OUTCOMES OF TECHNICAL DRAWING STUDENTS IN TECHNICAL COLLEGES IN NIGER STATE, NIGERIA

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ABSTRACT

This study examined the effect of social and cognitive constructivist instructional techniques on students' learning outcomes in Technical Drawing in technical colleges in Niger State, Nigeria. Three objectives and three corresponding research questions were formulated to guide the study. A quasi-experimental research design was adopted. The study was conducted in all the NBTE-accredited technical colleges offering Technical Drawing in Niger State. The target population comprised 220 NTC II students (163 males and 57 females). Due to the manageable size of the population, no sampling technique was employed, as the entire population was used. Data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 23.0. Descriptive statistics, including mean and standard deviation, were used to answer the research questions, while inferential statistics were applied using the General Linear Model for Analysis of Covariance (ANCOVA). All null hypotheses were tested at a 0.05 level of significance. The findings revealed that students taught using cognitive constructivist instructional techniques achieved higher academic performance than those taught using social constructivist techniques, with a mean gain score of 15.96. Similarly, the cognitive constructivist group demonstrated higher interest in Technical Drawing, with a mean score of 83.40. In terms of retention, the cognitive constructivist group also performed better, with a mean difference score of 0.47. The study further revealed a significant difference in academic achievement between the two groups ($p = 0.01 < 0.05$), while no significant difference was observed in another achievement measure ($p = 0.58 > 0.05$). However, a significant difference was found in retention scores ($p = 0.002 < 0.05$). The study recommended that Technical Drawing teachers adopt cognitive constructivist instructional techniques to enhance students' academic achievement, interest, and retention, and to promote effective skill acquisition in technical colleges.

KEYWORDS: Social and Cognitive, Constructivist, Instructional Techniques, Technical Drawing Students, Learning Outcomes, Technical Education

Introduction

Technical colleges are specialized institutions designed to equip learners with practical and theoretical knowledge in specific trades, preparing them for gainful employment or self-reliance. According to Eze et al. (2020), technical colleges operate at the post-basic level within Nigeria's vocational education system and are established to produce skilled craftsmen and

master craftsmen. Students in these institutions are trained to acquire relevant knowledge, attitudes, and practical competencies in their chosen fields. The Federal Republic of Nigeria (2013) emphasized that graduates of technical colleges are expected to either secure employment in industries or become self-employed. Achieving this objective largely depends on a curriculum that aligns with students' interests and career aspirations.

Trades offered in technical colleges include blocklaying, electrical installation, fabrication and welding, mechanical engineering craft practice, motor vehicle mechanics, refrigeration and air-conditioning, and Technical Drawing, among others, as approved by the National Board for Technical Education (2016). Technical Drawing is a foundational subject that equips students with skills in graphical representation, interpretation of engineering designs, and visualization of objects. It plays a crucial role in developing learners' spatial abilities, precision, and problem-solving skills required in technical fields.

Technical Drawing is taught at different levels leading to the award of National Technical Certificate (NTC) and Advanced National Technical Certificate (ANTC). The subject exposes students to skills such as interpreting drawings, constructing geometric figures, understanding orthographic and isometric projections, and applying design principles in practical contexts. However, teaching in technical colleges has largely remained dominated by traditional teacher-centred methods.

Instructional technique refers to the systematic process of organizing and delivering learning experiences to achieve specific objectives. Dokadawa (2017) described it as a structured procedure through which teaching is carried out in a logical and step-by-step manner. Instructional techniques guide teachers in managing classroom activities, resources, and interactions to enhance effective learning. These techniques are essential in promoting active student participation and improving academic performance. Examples include lecture, demonstration, project-based learning, and constructivist approaches.

Constructivist instructional techniques emphasize learner participation, collaboration, and active knowledge construction. Taber (2016) described constructivism as a framework that explains how learners build new knowledge based on prior experiences. In this approach, the teacher acts as a facilitator rather than a sole knowledge provider. Constructivist strategies shift learning from passive reception to active engagement, encouraging students to think critically and participate meaningfully.

Social constructivist instructional techniques focus on collaborative learning through interaction, discussion, and shared experiences. Akpan et al. (2020) noted that this approach promotes group work, peer interaction, and collective problem-solving. Students engage in discussions, brainstorming sessions, and cooperative tasks to construct knowledge together, thereby enhancing critical thinking and communication skills.

Cognitive constructivist instructional techniques, on the other hand, emphasize individual learning processes where students actively construct knowledge based on prior understanding. According to Eze (2020) and McLeod (2023), this approach involves guiding learners to assimilate new information into existing cognitive structures through inquiry, reflection, and problem-solving. It encourages deeper understanding and independent thinking.

In many technical colleges, students' low interest in Technical Drawing may be attributed to the nature of instruction, which often relies on teacher-centred methods. There is a growing

need to adopt student-centred approaches that promote interaction, collaboration, and critical thinking. Such a shift can enhance students' interest, retention, and academic performance, ultimately improving learning outcomes.

Learning outcomes refer to measurable knowledge, skills, attitudes, and competencies that students are expected to demonstrate after instruction. The Organisation for Economic Co-operation and Development (OECD, 2013) defined learning outcomes as indicators of what learners know, understand, and can do after a learning process. Effective instructional techniques play a significant role in achieving desirable learning outcomes in Technical Drawing.

Academic achievement reflects the extent to which students have attained educational objectives. It serves as a key indicator of the effectiveness of teaching methods. Interest and retention are also critical factors influencing students' performance. Interest represents a learner's willingness and enthusiasm to engage in a subject, while retention refers to the ability to remember and apply learned knowledge over time.

Gender, as a socially constructed concept, also influences students' learning experiences. Differences in interest, retention, and performance between male and female students in Technical Drawing have been a concern for educators. Instructional techniques can either bridge or widen these gaps depending on how they are applied.

Despite varying findings in previous studies regarding the effectiveness of instructional techniques, there remains a need to explore innovative approaches. Therefore, this study seeks to examine the effect of social and cognitive constructivist instructional techniques on students' learning outcomes in Technical Drawing in technical colleges in Niger State, Nigeria.

Statement of the Research Problem

Technical Drawing provides students with essential skills for visual communication, design interpretation, and technical problem-solving. However, students' learning outcomes in the subject largely depend on the instructional techniques employed. Dokadawa (2017) identified teaching methodology as a major challenge in technical education, while Faridah (2018) observed that the continued use of traditional teacher-centred methods limits students' creativity and critical thinking.

The dominance of lecture-based instruction in technical colleges restricts students' active participation and reduces opportunities for skill development. This situation is further compounded by advancements in technology, which demand modern teaching approaches that incorporate digital tools, interactive learning, and practical engagement.

Technical Drawing requires learners to develop practical competencies, analytical skills, and creativity, which cannot be effectively achieved through passive learning. Therefore, there is a need to transition from teacher-centred methods to student-centred approaches such as social and cognitive constructivist techniques. These approaches encourage collaboration, problem-solving, critical thinking, and active engagement.

Such a shift is essential for improving students' interest, retention, and academic achievement in Technical Drawing. It will also equip learners with relevant skills needed for the modern workplace. Hence, this study is designed to determine the effect of social and cognitive

constructivist instructional techniques on students' learning outcomes in Technical Drawing in technical colleges in Niger State, Nigeria.

Aim and Objectives of the Study

The aims of this study is to determine the effect of social and cognitive constructivist instructional techniques on technical drawing students learning outcomes in technical colleges in Niger State, Nigeria; specifically, the study will seek to determine the;

i. Difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.
ii. Difference between the mean interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.
iii. Difference between the mean retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

Research Questions

The following research questions guided the study:

i. What is the difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique?
ii. What is the difference between the mean interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique?
iii. What is the difference between the mean retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique?

Hypotheses

The following hypotheses are tested at 0.05 level of significance:

HO_1: There is no significant difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

HO_2: There is no significant difference between the mean interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

HO_3: There is no significant difference between the mean retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

Methodology

This study will adopt a quasi-experimental research design. The study will be carried out in all the NBTE-accredited technical colleges offering Technical Drawing as a trade-related subject in Niger State, Nigeria, with Minna as the state capital. The target population will consist of 229 NTC II students (159 males and 70 females) enrolled in Technical Drawing across the six technical colleges in the state. Due to the manageable size of the population, a census sampling approach will be employed, involving all the students. The instruments for data collection will include the Technical Drawing Achievement Test (TDAT), Technical Drawing Retention Test (TDRT), and Technical Drawing Interest Inventory (TDII). In addition, the researcher will develop two sets of lesson plans based on selected modules for the study. These instructional

plans will serve as treatment guides for the experimental groups. The instruments and lesson plans will be subjected to face and content validation by five experts: four from the Department of Industrial and Technology Education, Federal University of Technology, Minna, and one expert from the Technical Drawing Department of Niger State College of Education, Minna. A pilot test will be conducted to determine the internal consistency of the Technical Drawing Achievement and Retention Tests, as well as the Technical Drawing Interest Inventory. The study will be conducted during regular school hours. The regular Technical Drawing teachers will administer the pre-test to students in both groups before the commencement of treatment. Data collected will be analyzed using the Statistical Package for Social Sciences (SPSS) version 23.0. Descriptive statistics, including mean and standard deviation, will be used to answer the research questions, while inferential statistics will be applied using the General Linear Model for Analysis of Covariance (ANCOVA). All null hypotheses will be tested at a 0.05 level of significance.

Results

Research question one

What is the difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique?

To answer research question one, mean and standard deviation was used to analyse the pretest and post test scores of students as shown in Table 1

Table 1: Mean and Standard Deviation of Pre-test and Post-test Scores of Students Taught Technical drawing using Social Constructivism Instructional Technique and those Taught Using Cognitive Constructivism Instructional Technique

Group	N	Pre-test		Posttest		
		Mean	SD	Mean	SD	Mean Gain
Cognitive Constructivism	110	14.15	4.94	30.11	3.63	15.96
Social Constructivism	110	19.55	5.44	27.19	7.81	7.64

Table 1 shows the mean and standard deviation of pre-test and post-test scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The cognitive constructivism group had achievement mean score of 14.15 with a standard deviation of 4.94 at the pre-test while the social constructivism had achievement mean score of 19.55 with a standard deviation of 5.44. The cognitive constructivism group had achievement mean score of 30.11 with a standard deviation of 3.63 at the posttest while the social constructivism group had achievement mean score of 27.19 with a standard deviation of 7.81. The standard deviation for the social constructivism group (7.81) was significantly higher than for the cognitive constructivism group (3.63), indicating greater variability in students' performance when taught with social constructivism. Mean gain scores of 15.96 and 7.64 for the cognitive constructivism and social constructivism group respectively, this indicated that cognitive constructivism group achieved higher than social constructivism group.

Research question two

What is the difference between the mean interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique?

To answer research question two, mean and standard deviation was used to analyse the interest scores of students as shown in Table 2

Table 2: Mean and Standard Deviation of Interest Scores of Students Taught Technical drawing using Social Constructivism Instructional Technique and those Taught Using Cognitive Constructivism Instructional Technique

Group	N	Mean	SD
Cognitive Constructivism	110	83.40	5.87
Social Constructivism	110	83.00	4.84

Table 2 shows the mean and standard deviation of interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The cognitive constructivism group had interest mean score of 83.40 with a standard deviation of 5.87 while the social constructivism group had interest mean score of 83.00 with a standard deviation of 4.84. The cognitive constructivism group had a slightly higher standard deviation, indicating more variation in how students responded in terms of interest. The result showed that cognitive constructivism group had higher interest than social constructivism group on technical drawing.

Research question three

What is the difference between the mean retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique?

To answer research question three, mean and standard deviation was used to analyse the post test and retention scores of students as shown in Table 3

Table 3: Mean and Standard Deviation of Post-test and Retention Scores of Students Taught Technical drawing using Social Constructivism Instructional Technique and those Taught Using Cognitive Constructivism Instructional Technique

Group	N	Post-test		Retention		
		Mean	SD	Mean	SD	Mean difference
Cognitive Constructivism	110	30.11	3.63	29.64	4.00	0.47
Social Constructivism	110	27.19	7.81	27.13	7.14	0.06

Table 3 shows the mean and standard deviation of post-test and retention scores of students taught technical drawing using social constructivism instructional technique and those taught

using cognitive constructivism instructional technique. The cognitive constructivism group had retention mean score of 30.11 with a standard deviation of 3.63 at the post-test while the social constructivism had achievement mean score of 27.19 with a standard deviation of 7.81. The cognitive constructivism group had retention mean score of 29.64 with a standard deviation of 4.00 at the retention while the social constructivism group had retention mean score of 27.13 with a standard deviation of 7.14. The standard deviation (SD) for social constructivism (7.81) was significantly larger than for cognitive constructivism (3.63), indicating greater variability in retention scores among students in the social constructivism group. Mean difference scores of 0.47 and 0.06 for the cognitive constructivism and social constructivism group respectively, this indicated that cognitive constructivism group are more retentive than social constructivism group.

Testing of Hypotheses

HO_1: There is no significant difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

The result is presented in Table 4

Table 4: ANCOVA of Mean Academic Achievement Scores of Students Taught Technical drawing using Social Constructivism Instructional Technique and those Taught using Cognitive Constructivism Instructional Technique

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	462.947a	1	462.95	12.56	0.01
Intercept	178946.32	1	178946.32	4854.85	0.01
Methods of Teaching	462.95	1	462.95	12.56	0.01
Error	7961.61	216	36.86		
Total	187553	218			
Corrected Total	8424.555	217			

The result in Table 4 showed the ANCOVA of mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The result revealed that the F-ratio of 12.56 with 1 degree of freedom and p-value of 0.01 was obtained for academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique., since the p-value of 0.01 is less than 0.05 level of significance. This indicated that there was a significant difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The null hypothesis is therefore rejected.

HO_2: There is no significant difference between the mean interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

The result is presented in Table 5

Table 5: ANCOVA of Mean Interest Scores of Students Taught Technical drawing using Social Constructivism Instructional Technique and those Taught using Cognitive Constructivism Instructional Technique

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	8.800a	1	8.8	0.304	0.58
Intercept	1522892.8	1	1522892.8	52610.077	0.000
Methods of Teaching	8.8	1	8.8	0.304	0.58
Error	6310.4	218	28.95		
Total	1529212	220			
Corrected Total	6319.2	219			

The result in Table 5 showed the ANCOVA of mean interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The result revealed that the F-ratio of 0.304 with 1 degree of freedom and p-value of 0.58 was obtained for mean interest scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique., since the p-value of 0.58 is greater than 0.05 level of significance. This indicated that there was no significant difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The null hypothesis is therefore accepted.

HO_3: There is no significant difference between the mean retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

The result is presented in Table 6.

Table 6: ANCOVA of Mean Retention Scores of Students Taught Technical drawing using Social Constructivism Instructional Technique and those Taught using Cognitive Constructivism Instructional Technique

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	342.434a	1	342.434	10.268	0.002
Intercept	175604.819	1	175604.819	5265.48	0.000
Methods of Teaching	342.43	1	342.434	10.27	0.002
Error	7203.64	216	33.350		
Total	183308.00	218			

Corrected Total	7546.07	217

The result in Table 6 showed the ANCOVA of mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The result revealed that the F-ratio of 10.27 with 1 degree of freedom and p-value of 0.002 was obtained for retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique., since the p-value of 0.002 is less than 0.05 level of significance. This indicated that there was a significant difference between the mean retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. The null hypothesis is therefore rejected.

Discussion of Findings

The findings from research question one revealed that students taught using the Cognitive Constructivism Instructional Technique (CCIT) achieved higher academic performance compared to those taught using the Social Constructivism Instructional Technique (SCIT). This aligns with Oviawe (2021a), who found that adaptive instructional strategies significantly improved students' performance in Technical drawing. Similarly, Eze *et al.* (2020) reported that students taught auto-mechanics using computer-based instruction (CBI) outperformed those taught using Lecture/Discussion Teaching Method (L/DTM) in both achievement and retention.

The findings on hypothesis one test also indicated a significant difference in academic achievement between students taught using SCIT and CCIT, further reinforcing the effectiveness of Cognitive Constructivism in technical education. This result is in agreement with Oviawe *et al.* (2021b), who found that the assessment-for-learning method significantly impacted students' academic achievement in carpentry and joinery trade in technical colleges.

The finding on research question two indicated that students taught using Cognitive Constructivism exhibited higher interest in Technical drawing than those taught using Social Constructivism. This finding supports Nwaodo (2016), who found that Reda's problem-solving model stimulated students' interest in metalwork more effectively than Rusbult's model, likely due to its cognitive content.

The finding on hypothesis two revealed that there was no significant difference between the mean academic achievement scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique. This aligns with Eze *et al.* (2020), who found that interest levels among students remained similar across various IQ levels when using computer-based instruction (CBI) as compared to Lecture/Discussion Teaching Method (L/DTM).

The finding on research question three revealed that cognitive constructivism group are more retentive than social constructivism group in technical drawing. The findings is in agreement with the study of Hassan *et al.* (2017), who found that students taught woodwork using a challenge-based learning approach had higher retention scores than those taught using an activity-based learning method.

The finding on hypothesis three revealed that there was a significant difference between the mean retention scores of students taught technical drawing using social constructivism instructional technique and those taught using cognitive constructivism instructional technique.

This is consistent with Musa *et al.* (2019), who found that meta-learning approaches significantly enhanced both academic achievement and content retention in engineering trade students.

Conclusion

The study determine the influence of social and cognitive constructivist instructional approaches on learning outcomes of technical drawing students in technical colleges in Niger State, Nigeria. The study found that students taught using the cognitive constructivism instructional technique achieved higher mean academic achievement scores than those taught using the social constructivism technique. This suggests that cognitive constructivism is a more effective method for improving academic achievement in technical drawing. Although both instructional techniques led to high levels of interest among students, the cognitive constructivism group exhibited slightly higher interest levels compared to the social constructivism group. This indicates that cognitive constructivism fosters a slightly stronger interest in technical drawing among students. The study also found that cognitive constructivism group demonstrated better retention of knowledge compared to the social constructivism group. The mean difference between post-test and retention scores was more significant for students taught using cognitive constructivism, indicating its effectiveness in ensuring long-term retention of concepts.

Recommendations

The following recommendations were made based on the findings of the study;

1. Teachers in technical colleges should adopt cognitive constructivism instructional technique for lesson delivery that will assist the learners develop physically, intellectually, emotionally, morally and socially in a manner that he/she will be able to exploit his potentials maximally.
2. Technical college teachers should motivate and stimulate student interest that will enhance their enrolment and increases student performance in technical drawing.
3. The school administrators should create different windows of opportunities for students in order for both gender to be part of the mainstream of development in woodwork industry.

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