



## ERGONOMICS PRINCIPLES AS STRATEGY FOR PROMOTING STUDENTS' ACQUISITION OF PSYCHO-PRODUCTIVE SKILLS IN BUILDING CONSTRUCTION TRADE IN TECHNICAL COLLEGES IN EDO STATE, NIGERIA

Jane Itohan Oviawe<sup>i</sup>

PhD, Department of Vocational and Technical Education,  
Ambrose Alli University, Ekpoma,  
Edo State, Nigeria

### Abstract:

This study examined the effect of Ergonomic principles on students' acquisition of psycho-productive skills in Building Construction Trade in Technical Colleges using non-equivalent control group quasi experimental research design. The sample for the study comprised of 80 (60 males and 20 females) randomly selected from the six technical colleges in Edo State, Nigeria. The instruments for data collection were Psycho-productive Skills Performance Test (PSPT) in Building Construction operations, Building Construction Interest Inventory (BCII) and lesson plans. Three experts validated the instrument. The reliability of the instrument was determined using Kuder Richardson 21 (KR-21) formulae and a reliability coefficient of .89 was obtained. Mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at .05 level of significance. Findings from the study revealed among others that Ergonomic principles were effective in enhancing technical college students' acquisition of psycho-productive skills in Building Construction Trade. Based on the findings of this study, it was recommended among others that Ergonomics principles should be incorporated as an instructional technique into the technical college Building Construction Trade curriculum for effective instructional process.

**Keywords:** ergonomics principles, psycho-productive skills, building construction trade, technical colleges

### 1. Introduction

Ergonomics is the study of persons in relation to their occupied conditions, especially in the design of tools, equipment and furniture to help an individual work efficiently. It

<sup>i</sup> Correspondence: email [janeoviawe@aauekpoma.edu.ng](mailto:janeoviawe@aauekpoma.edu.ng); [janeoviawe98@gmail.com](mailto:janeoviawe98@gmail.com)

removes barriers to quality, productivity and safe human performance by fitting products, tasks and environments to people (Kogi, 2002). Ergonomics is the systematic study of people at work with the objective of improving the work situation, the working condition and the tasks performed (Mokdad, 2005). According to Thatcher, James and Todd (2005), Ergonomics is a science that aims at studying about human abilities and limitations and then applies the knowledge to improve people's interaction with products, system and environments. In the context of this study, Ergonomics involve the systematic study of interaction with equipment and tools used in applying productive skills in Building Construction trade.

Ergonomics is beneficial to people in various way. To Kadiri (2008) the benefits of Ergonomics are: (i) could enhance workers/learners performance and adjustment to their work environment; (ii) improves safety and health of the workers/learners in the workplace; (iii) improves productivity and quality of work; (iv) reduces absenteeism of the workers/earners; (v) reduces occupational injuries and illness; and (vi) reduces medical cost and workers' compensation associated with cumulative trauma disorder. The knowledge of Ergonomics helps the teacher to manage physical learning environment for effective instructional processes (Mevey, 2001). The use of Ergonomics is guided by certain principles which are techniques of doing work effectively.

To Kadiri (2008), Ergonomics principles are methods of preventing work hazards, stress and fatigue in the workplace. Bridger (2003) posited that Ergonomics principles are strategies or techniques which enable an individual to perform tasks efficiently in the workplace. In the context of this study, Ergonomics principles are new methods or techniques that could be employed in teaching and learning psycho-productive skills in Building Construction trade to enable students to perform tasks effectively in the school workshop. It also involves strategies to motivate and sustain students' interest in practical Building Construction trade. The principles of Ergonomics employed in this study are: comfortable environment; organizing and keeping materials in easy reach; safety in the workplace; and good and comfortable working posture (Macleod, 2006).

Comfortable work environment is one where work is conducted with less distress. According to Macleod (2008), principle of comfortable environment is an environment where work activities can be performed effectively by an individual. Physical environment where workers perform their work should be friendly or conducive by making them neat, descent, devoid of dangerous materials, stimulating and attractive for maximum productivity and efficiency of work. Comfortable environment when performing task tends to motivate the workers/learners to work efficiently without stress and pains (Tepper, 2008). Friendly or favourable environment makes learning easy and sustain the interest of the students in performing practical activities in the technical workshop. In this study, comfortable environment for Building Construction trade involving suitable land space for practical Building Construction, adequate and appropriate tools and equipment in the technical workshop by the students for practicing operational skills in Building Construction works.

Edo State Technical colleges have suitable learning environment and technical workshops for learning Building Construction practical activities. The nature of Building Construction works demands that technical colleges should have workshops and laboratories with modern and functioning tools and equipment. Technical workshops remain the most used facilities in a technical college as they provide central places where all practical demonstrations and activities are carried out. The provision of such facilities underscores the main objective of technical colleges of providing vocational skills to the students. Inadequate provision of tools, machines, materials, equipment and improper methods of instruction of Building Construction trade and other technical subjects affects the students' negatively. The use of ergonomic principle of comfortable environment will assist to sustain student interest in the study of Building Construction trade and enable them to acquire psycho-productive skills in Building Construction works (Sagus, 2008).

Principle of organizing and keeping materials in easy reach involves adequate provision, organizing and keeping the working materials such as equipment and tools within the comfortable reach of the workers or students (Kanep & Legg, 2007). An easy way to make user friendly is to keep frequently used items very close to the worker/learner. Organizing and keeping materials for easy reach in the technical workshop/laboratory involves arranging all requisite resources including human, workshop/laboratory inputs and facilities in a systematic order such that when they are being used or applied in the technical workshop/laboratory, the operation will be without interruption (Olaitan & Mama, 2001). In the context of this study, this principle implies that all the tools, equipment and machines used to perform operational skills in Building Construction are organized and kept safe in the technical workshop/laboratory store for easy reach. This will minimize repetitive movement in the workshop while performing practical activities in Building Construction works. Obsolete tools, equipment and machines used for instruction are not organized in order of utilization. Ogbuanya and Onatunde (2015) asserted that most of these tools, equipment and materials are scattered in the school workshops and premises and are not easily reached to students for performing task easily in the technical workshop/laboratory.

Another principle of ergonomics is the principle of good neutral postures. According to Macleod (2006), neutral postures are good working postures needed by the workers/students to perform tasks in the workplace. Good working posture is the comfortable position of an individual while performing tasks in the workplace (Apadiji, 2016). Good working posture is fundamental when performing tasks with machines, equipment and tools in any organization or industry (Mokdad, 2005). Executing jobs with good working postures reduces fatigue, stress, accidents and get the most out of productivity. Good working posture in Building Construction works implies that comfortable working postures of learners' in mixing of mortars by hand, moulding of blocks, laying of blocks, rendering of walls, wall and floor tiling, pointing to walls, creating openings in walls (lintel and arches), conducting slump test (workability test on concrete), placing concrete in positions, application of admixture to concrete, compaction,

curing of blocks and concrete and fixing of concrete joint materials among others will result in improving workmanship. It is predicated upon the teaching of skills and also demanding the professional use of hands. It is designed to equip students with skills required towards the production of educated persons who can effectively work with their brain and hands.

The wrong postures of the students in carrying out Building Construction activities expose them to injuries and pains. To this end, Kadiri (2008) suggested that in handling and using tools and equipment in performing Building Construction operations result to drudgery, fatigue, poor performance and inefficiency. The ergonomics principles are applied or combined in a lone task to guarantee utmost output and efficiency of work. If principles are employed in practical activities, it will aid the students of Building Construction works to attain psycho-productive skills which will facilitate their productivity in the ever-dynamic workplace.

Psycho-productive skills are acquired and requisite skills for executing jobs in the school workshop or construction site professionally. To Osinem and Nwoje (2015), they are manipulative or technical skills needed for performance in any given occupation which could be acquired through observation, training and learning. Psycho-productive skills are manipulative skills or motor skills which are required to perform certain activities efficiently (Osinem, 2018). Olaitan and Ali (1997) posited that psycho-productive skills involve acquired abilities for performing tasks adequately with the muscles in response to sensory stimuli. They further stated that the ability of an individual to perform well arises from a repetitive process in which skill holders engage in their jobs, and this becomes part of the individual to the extent that the performance becomes automatic. This implies that the individual is never reminded before performing the skill step-by-step until the final product is obtained. A psycho-productive skill entails the application of the 3-Hs: head, heart and hand in the expression of dexterousness to complete tasks successfully. Psycho-productive skills entails thinking habits, process habit, manipulative habits and performance which is essential a facet of lifelong learning.

Psycho-productive skills entail manual agility needed by students of Building Construction trade for manoeuvring of tools and equipment and the step-by-step process of applying them to achieve the functioning skills in Building Construction works through the utilization of ergonomic principles. According to Oviawe (2019), the operations in Building Construction works involves the skills required in accomplishing given tasks in mixing of mortars by hand, moulding of blocks, laying of blocks, rendering of walls, wall and floor tiling, pointing to walls, creating openings in walls (lintel and arches). It also involves slump test (workability test on concrete), placing concrete in positions, application of admixture to concrete, compaction, curing of blocks and concrete and fixing of concrete joint materials. Students are expected to acquire the skills required in Building Construction operations.

Building Construction trade is a skill-oriented educational programme that equips learners with saleable skills for self-employment and also paid employment (Oviawe &

Uwameiye, 2018). Building Construction trade was used in teaching students to acquire psycho-productive skills through the use of ergonomics principles. There are operational skills which were practiced step-by-step to enable the students to acquire psycho-productive skill for self-reliance. The activities performed by the students in the workshop were evaluated by teachers of Building Construction trade after the instruction processes.

Instruction is the process of teaching and impacting knowledge, skill and attitude to the students. Teaching is a systematic activity deliberately engaged in by somebody to facilitate the learning of the intended worthwhile knowledge, skills and values by another person and getting the necessary feedback (Offorma, 2017). To Kirkpatrick (2004), it is the art of providing knowledge, skill and attitudes to a person or giving a person instruction and training. Instruction of Building Construction trade in technical college involves the three domains of learning namely: affective, cognitive, and psychomotor. It involves the use of tools, equipment, machines and materials, effective demonstrations of skills acquisition by the instructor and effective teaching of curriculum. In the context of this study, instruction is the process of helping Building Construction trade students to learn psycho-productive skills through the use of ergonomic principles. These students have various levels of abilities (low and high). Teaching the students to acquire psycho-productive skills Building Construction with the use of ergonomic principles ensures conducive learning environment which motivates students' interest and active participation in learning practical skills. It also encouraged low ability students to perform the operational skills in Building Construction works successfully.

Ability is the natural tendency or competence to do something effectively. Ogbuanya and Onatunde (2015) stated that the ability level of students differs in terms of academic performance. Students' ability levels are classified as low or high. Low academic achievers are students whose academic performance in tests and tasks are always high while low academic achievers are those with low performance in tests and tasks. The differences in students' academic performances are more easily discerned when all the learners in a class do the same task at the similar time than when each student uses different materials to work individually. The learners of Building Construction trade in technical colleges conducted the activities in the school workshop at the equivalent time while the teachers observed their performances and rate their scores.

In Nigeria, Technical colleges are the principal, post-primary vocational institutions where students are trained to acquire skills in various occupations. They are designed to prepare students to acquire practical skills, basic scientific knowledge and attitudes required as craftsmen at the National Technical Certificate (NTC) level and master craftsmen at the Advanced National Technical Certificate (ANTC) level for various sector of the economy. Technical college provides academic and training in a number of courses which include general education, technological/engineering courses (automobile trade, building and woodwork trade, business trade, computer trade,

electrical/electronics trade, mechanical trade) hospitality trade, printing trade, and textile trade (FRN, 2014). Among the building and woodwork trade is Building Construction trade. Training in Building Construction trade are to be conducted to the extent that it gives its recipients a productive ability with which they can secure and hold employment and be able to profit by it.

Building Construction trade at technical colleges is geared towards the graduation of craftsmen who have skills, knowledge and attitude to meet the requisite needs and demand of the industries and the society at large. It deals with the acquirement of skills and techniques in blockmoulding, blocklaying and concreting works/occupations to enable an individual to earn a living (Oviawe & Uwameiye, 2018). These authors added that graduates of this programme are expected to possess work skills for success in mixing of mortar by hand, laying of bonds, cavity wall construction, rendering, tiling, tuck-pointing to walls, and construction of semi-circular arch. However, these objectives seem not to have been achieved. But the observation of Oviawe and Uwameiye (2018) revealed that graduates of Building Construction trade acquired little or no skills in practicing what they have learnt from technical colleges; and most of the graduates remain jobless in the society.

Oviawe and Uwameiye (2018) stated that half-baked Building Construction craftsmen often cause more damages and havocs to build works contracted to them. The interaction of the researcher with the students revealed that most of the technical college students of Building Construction trade in the study area have low interest and negative attitude towards Building Construction practical activities. These students perceive Building Construction trade as strenuous and dirty trade, full of drudgery and fatigue. This result to students' absenteeism, poor academic performance and lack of skill acquisition. Oviawe and Uwameiye (2018) commenting on the negative interest of students and lack of skills acquisition posited that though the technical college curriculum emphasized acquisition of basic skills and knowledge in all occupation areas such as Building Construction trade, most graduates are not capable of demonstrating productive skills in Building Construction when required to do so.

Interest is the attraction which offices or compels a person to respond to a given stimulus it is an aspect of the affective domain that entails an individual's readiness to like or dislike something, event or activity. Interest can be stimulated in a person by actions that tend to suit his/her needs. Imoko and Agwagah (2006), interest is a subjective feeling of concentration or persisting tendency to pay attention and enjoy some activity or content. Though a number of learners may be academically and physically proficient of learning, they may certainly not learn pending when their interest is aroused. Once learners' interests are aroused, they will keep learning so long the teacher is able to sustain their interest in the subject matter. This is because interest is a precursor of attention, once there is unswerving interest, attention is certain, and learning is guaranteed. Researchers (Anyagh & Ok'wu, 2010; Iyekekpolor, 2017; Oviawe & Adeola, 2017) have identified several variables responsible for students' low interest and poor

academic performance. Such variables include curriculum, learning environment, incompetent teachers, lack of students' interest, perception that the subject matter is difficult, psychological fright of the subject, and poor teaching methods among others.

The students' inability to acquire psycho-productive skills could be traced to the conventional methods such as lecture method which teachers of Building Construction trade used to deliver instructions in the classroom and their inability to expose the students to practical Building Construction. These conventional methods are teacher-centred; appears full of drudgery and strenuous to the students. This may affect the interest of the students in Building Construction trade negatively, exposes them to hazards, stress and fatigue. Hence, the need to apply alternative instructional strategies that will motivate and sustain students' interest in practical Building Construction works and also foster their skill acquisition. This study was conducted to find out the effect of ergonomic principles on students' acquisition of psycho-productive skills in Building Construction trade in technical colleges in Nigeria.

## **2. Materials and Method**

The design of the study is quasi-experimental research design, specifically, non-equivalent pre-test, post-test control group design since intact classes were used in examining the effects of ergonomics principles on Building Construction trade students' performance in technical colleges in Edo State. The use of intact classes was to avoid threat of selection bias among the students and to avoid re-arranging and re-grouping which could disrupt the normal lessons.

The population for the study comprised of all the 604 vocational II Building Construction trade students from the six technical colleges in Edo State, Nigeria in 2016/2017 academic session (Edo State Board for Technical and Vocational Education, Benin City, 2017). The choice for Vocational II students was because vocational I students were still new at the colleges and vocational III were about to write their final examinations, thus the students do not need any distractions.

Simple random sampling technique was used for sample selection. Out of the six colleges, four colleges were randomly selected, two each were assigned to the experimental (61 students) and control groups (56 students) to reduce interaction effect. The sample consisted of 117 vocational II students in four intact classes from the selected technical colleges used for the study. The colleges have similar facilities and quality of teachers.

The instruments used for data collection were the researcher developed 20-items Building Construction Performance Test (BCPT) that tested students' knowledge, comprehension, application and Building Construction skills and short answers questions based on the NBTE (2008) curriculum; and 20 items Building Construction Interest Inventory (BCII) adapted from Reading Interest Inventory (RIS). To adapt the BCII for students, some words on the instrument were adjusted and replaced with

Building Construction. For example, such sentence as *"I learn best by reading my textbooks"*, was slightly amended to read *"I learn best by reading my Building Construction text books"*. *"I feel satisfied whenever I pass my exams"* read *"I feel satisfied whenever I pass my Building Construction trade exams"* and so on. Items of BCTII were scored on a five-point Likert type scale (Strongly Agree (SA) -5, Agree (A) -4, Undecided (U) -3, Disagree (D) -2, and Strongly Disagree (SD) -1), where low scores indicated a low level of student interest. Finally, two sets of lesson plan (Ergonomics principles and lecture-based teaching methods) prepared by the researcher based on the vocational II NBTE (2008) curriculum was used for teaching the experimental group and control group.

BCPT, BCII and lesson plans were face validated by three experts from Technical Education, Educational psychology and Test and Measurement respectively. Their comments and suggested were used for modification of items in the BCII that was finally used in the study. BCPT and BCII were used for pre-test and post-test. The pre-test was used to partial out initial differences in the two groups and also to control selection bias which is a threat to internal validity.

The instruments were trial tested using two classes from the two other technical colleges within the study population that did not participate in the study. The reliability of BCPT was established using Kuder Richardson's formula 21 ( $K_{R-21}$ ) because the items in the instrument are dichotomously scored. The internal consistency of the BCPT yielded the reliability coefficient of .79. Cronbach Alpha statistic was used to establish the reliability of BCII because the items of the instrument are polychotomously scored and it yielded the reliability coefficient of .87.

The raw scores of students from BCPT and BCII were used for data analysis. Research questions were answered using Mean and standard deviation while hypotheses were tested using Analysis of Covariance (ANCOVA) at .05 level of significance. Pre-test performance and interest scores were used as covariates to the students' post-test scores. The ANCOVA served as a means of controlling the extraneous variables from dependent variables thereby dealing with the threats of initial differences across the groups; and increasing the precision of the experimental results. Acceptance and rejection of the null hypotheses depended on this alpha level and the degree of freedom in relation to the calculated F-value. Acceptance mean of achievement score was 50 per cent in this study.

## 2.1 Experimental Procedure

The researchers sought for cooperation of the Principals and the Building Construction trade teachers in each of the technical colleges used for the study to enable them to conduct the research in their technical colleges. The researchers explained the purpose of the research to them and requested for their assistance in conducting the experiment. The regular teachers were coached on the lesson plan and notes prepared for the experiment two weeks before commencement of the study. The Ergonomics principles lesson plan and notes were used by teachers in the experimental groups to teach their students while teachers in the control group taught their students using the normal lecture-method. The



regular teachers were allowed to teach both groups to take care of hawthorn effect which might result when the students are aware that they are engaged in an experiment, while the researchers mainly supervised the teaching and testing processes. To ascertain the pre-existing differences in Building Construction trade performance and interest between groups, the BCTPT and BCTII were administered as a pre-test to the students and the results were used as covariate measures to the post-test scores. Both the test and the teachings for Building Construction trade in the experimental and control groups were held for 40 minutes per lesson during the normal school timetable schedule. Then the researcher with the assistance of the teachers finally administered the post-test (BCTPT and BCTII) to the students under a uniform testing atmosphere. The results of both the pre-test and post-test were collated and subjected for analysis to answer the research questions and to test the null hypotheses. The class lasted for six weeks. The experiment came to an end with the post-test. Adequate control measures were taken to eliminate all the extraneous variables that would have otherwise threatened the validity of this study. The following precautions were taken in the course of the experiment: (i) attendance was taken at the beginning of every class session so that scores of students who would have missed any of the sessions was not used during data analysis; (ii) the two groups were given equal number of treatment; (iii) to prevent the subjects from being familiar with the questions of the pre-test and post-test, the items were re-arranged; and (iv) the time allowed for the pre-test and post-test was the same.

### 3. Results and Discussion

**Research Question 1:** What is the effect of psycho-productive skills performance on students' academic performance in Building Construction trade?

**Table 1:** Mean and Standard Deviation of Pre-test and Post-test Scores of Experimental and Control Groups in the Performance

Groups	N	Pre-test		Post-test		$\bar{X}$ Gain score
		$\bar{X}_1$	SD <sub>1</sub>	$\bar{X}_2$	SD <sub>2</sub>	
Experimental	61	20.87	8.85	82.87	12.09	62.00
Control	56	20.48	10.23	30.45	9.97	10.00

Table 1 shows that the experimental group had a Mean score of 20.87 and a standard deviation of 8.85 in the pre-test; and a Mean score of 82.87 and a standard deviation of 12.09 in the post-test making a pre-test, post-test Mean gains of the experimental group to be 62.00. The control group had a Mean score of 20.48 and a standard deviation of 10.23 in the pre-test; and a Mean score of 30.45 and a standard deviation of 9.97 in the post-test making pre-test, post-test Mean gains of the control group to be 10.00. With this result, the students in the experimental group performed better in the performance test than the

students in the control group. Hence, the application of ergonomic principles in psycho-productive skills in Building Construction trade is more effective than the conventional teaching method on students' academic performance.

**Research Question 2:** What is the difference in the Mean interest scores of students' taught Building Construction trade using psycho-productive skills and those taught using conventional teaching method?

**Table 2:** Mean and Standard Deviation of Mean Interest Scores of Experimental and Control Groups

Groups	N	Pre-test		Post-test		$\bar{X}$ Gain score
		$\bar{X}_1$	SD <sub>1</sub>	$\bar{X}_2$	SD <sub>2</sub>	
Experimental	61	45.20	7.75	61.54	7.28	16.33
Control	56	37.25	6.91	42.07	7.28	4.82

Table 2 shows that the experimental group had a Mean interest score of 45.20 and a standard deviation of 7.75 in the pre-test; and a Mean score of 61.54 and a standard deviation of 7.28 in the post-test making a pre-test, post-test Mean gains of the experimental group to be 16.33. The control group had a Mean score of 37.25 and a standard deviation of 6.91 in the pre-test; and a Mean score of 42.07 and a standard deviation of 7.28 in the post-test making pre-test, post-test Mean gains of the control group to be 4.82. With this result, the students in the experimental group performed better in the Interest Inventory than the students in the control group. Hence, the use of ergonomic principles in psycho-productive skills is more effective than the conventional teaching method in improving students' interest in Building Construction trade.

**Hypothesis 1:** There is no significant difference in the Mean performance scores of students taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using the conventional teaching method.

Table 3 shows that the F-calculated value of method to be 149.351 with associated probability value of .000 was obtained with regards to the Mean performance score of students taught Building Construction trade using Ergonomics principles in psycho-productive skills and conventional teaching method. Since the associated probability .000 was less than .05 set as level of significance, the null hypothesis which stated that no significant difference in the Mean performance scores of students taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using the conventional teaching method was rejected. Thus, there was a significant difference in the Mean performance scores of students taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using the

conventional teaching method with those taught using Ergonomic principles in psycho-productive skills having a higher mean gain.

**Table 3:** ANCOVA of the significant difference in mean performance scores of students' taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using conventional teaching method

Sources of Variations	Sum of Squares	DF	Mean Square	Fcal-value	Sig.
Corrected Model	13611.058 <sup>a</sup>	2	6805.529	218.226	.000
Intercept	2290.294	1	2290.294	73.441	.000
Pre-test Performance	2543.697	1	2543.697	81.566	.000
Methods	4657.612	1	4657.612	149.351	.000
Error	3555.164	114	31.186		
Total	336244.2000	117			
Corrected Total	17166.222	116			

Significant at  $F < .05$

**Hypothesis 2:** There is no significant difference in the Mean interest scores of students' taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using conventional teaching method.

Table 4 shows that the F-calculated value of 643.263 with associated probability value of .000 was obtained with regards to the Mean interest score of students taught Building Construction trade using Ergonomics principles in psycho-productive skills and conventional teaching method. Since the associated probability .000 was less than .05 set as level of significance, the null hypothesis which stated that no significant difference in the Mean interest scores of students taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using the conventional teaching method was rejected. Thus, there was a significant difference in the Mean interest scores of students taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using the conventional teaching method with higher Mean interest gain in favour of students taught Building Construction trade using Ergonomic principles in psycho-productive skills.

**Table 4:** ANCOVA of the significant difference in mean interest scores of students' taught Building Construction trade using Ergonomic principles in psycho-productive skills and those taught using conventional teaching method

Sources of Variations	Sum of Squares	DF	Mean Square	Fcal-value	Sig.
Corrected Model	80274.342 <sup>a</sup>	2	40137.171	322.276	.000
Intercept	60330.058	1	60330.058	484.412	.000
Pre-test Performance	38.910	1	38.910	.312	.577
Methods	80113.841	1	80113.841	643.263	.000
Error	14197.880	114	124.543		
Total	485050.000	117			
Corrected Total	94472.222	116			

Significant at  $F < .05$

#### 4. Discussion of Findings

The findings of this study revealed that Ergonomic principles as instructional techniques are more effective in exposing students to psycho-productive skills in Building Construction trade than the conventional teaching method. The high mean score by the experimental group revealed that the objective of the instructional technique was realized, and a good mastery of the topics and skills achieved, and this enabled the students in the experimental group to perform better. Testing the hypothesis 1, the findings revealed that a significant change in the Mean performance scores was found to exist among the Building Construction trade students' taught with Ergonomics principles and conventional teaching method in favour of the experimental group. Students exposed to Ergonomic principles performed better because of the different techniques that apply to their various natural diversities prevailing in the classroom were addressed during the experiments. The teachers used the techniques involved in Ergonomics principles by introducing student-centred discussion by before the planned presentation to lower the anxiety of highly anxious students. This was done to bring to bay the desired pre-requisite information, skills or behaviour to the knowledge of the students. Teachers also choose sets of instructional techniques to compensate for the lack of information, skills or ability known to exist among students, such as supplementing the content with additional learning resources and activities which caused the students to critically reflect and examine the materials presented to them during lesson. This is in line with the assertion of Ogbuanya and Onatunde (2015) that if the teaching style employed closely matches the student preferred style of acquiring knowledge, learning will be easier, more natural, and achievement will improve. Conversely, learning will be difficult.

On the effect of Ergonomics principles on students' interest in Building Construction trade, the findings of this study revealed that the instructional technique had a positive effect on the students in the experimental group in that it spurred the students' interest in Building Construction trade. This could be attributed to the varieties of skills and techniques involved in using Ergonomics principles that aroused and sustained the interest of the students in the experimental group more than those in the control group. This finding is in line with those of Okigbo and Okeke (2011); Oviawe and Adeola (2017) who earlier reported that students are likely to be more engaged in the learning activities that appeal to their interest. Similarly, Imoko and Agwagah (2006) had earlier posited that students' interest can be improved through the use of appropriate teaching technique is in line with the findings of this study. The findings of this study confirmed the outcome of Chumo (2014) that students' build commitment to learning, interest and enthusiasm about practical activities.

## 5. Conclusion and Recommendations

The need to find innovative instructional strategies that could assist students' of Building Construction trade in learning practical activities stimulate their interest and promote their psycho-productive skill acquisition is paramount as productive skill acquisition is fundamental in all occupational areas of vocational education. Based on the findings of this study, it was concluded that the application of ergonomics principles in exposing students to psycho-productive skills in Building Construction trade is more effective in improving students' academic performance and interest in Building Construction practical activities. The researcher is hopeful that if Ergonomics principle is incorporated into the instruction of Building Construction trade, it will improve on learning, reduces absenteeism, enhances basic knowledge, attitude and psycho-productive skills acquisition in Building Construction practical activities for self-reliance. Consequently, more people will be trained and equipped to take up occupations in Building Construction trade and become employers of labour instead of hoping solely on paid employment thereby reducing unemployment in Nigeria. Based on the findings of this study, the following recommendations were made:

1. Building Construction teachers should adopt and apply of ergonomic principles for teaching Building Construction trade to technical college students.
2. Government and stakeholders should collaborate in providing comfortable learning environment, tools, equipment, consumable materials, current and relevant textbooks required for teaching Building Construction practical activities.
3. Government should collaborate with the Ministry of Education and the workplace to organize conferences, seminars and workshops to enlighten and expose Building Construction teachers to innovative instructional strategies such as ergonomic principles in order to improve students' psycho-productive skills and motivate their interest in practical activities.

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Jane Itohan Oviawe  
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