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Research Paper

Gender Differences in Practical Skills Achievement and Retention Scores of Students' Exposed to Fabrication and Welding Craft Practice Using Problem-Based Teaching Method in Technical Colleges in Delta State, Nigeria.

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Abstract
The poordemonstrationof practicalskillsachievement and knowledge retention of both male and female students in technical colleges in Nigeria has been of great issue of concern to the researchers in the field of education industry. It is anticipated that the application of the appropriate instructionaltechniquesin teaching and learning processes in technical colleges wouldultimately enhancestudents' overallpractical skills achievement. It is therefore imperative that teachers in technical colleges would adopt teaching methodology that could intensifypracticalskills achievementof students in technical colleges. Controversial reports on male and female practical skills achievement of students necessitated the study todetermine the gender differences on practical skills achievement and retention scores of students' exposed to fabrication and welding craft practice using problem-based teaching method in technical colleges in Delta State. Four research questions guided the study and two null hypotheses were tested at 0.05 level of significance. The study adopted the Quasi-experimental research design of pretest, posttest non-randomized control group. Populationof the study was 90 National Technical Certificate (NTC) year 11Fabrication and Welding Craft Practice (FWCP)students from the six state owned technical colleges in Delta State were study. A sample of 69 was purposively carefully chosen to comprise the experimental and control groups based on schools that offer FWCPand have both male and female students. Instrument for data collection wereFabrication and Welding Craft Practice Practical Test(FWCPPT) and the lesson plans for experimental and groups respectively. The instruments- FWCPPT and the lesson plans were face and content validated by four experts two experts from the Department of Technology and Vocational Education and two experts from Measurement and Evaluation Unit of the Department of Educational Foundations- all in Nnamdi Azikiwe University Awka. Experimental groups were exposed to problem-based teaching (PBTM) while thecontrol groups were exposed to lectureteaching method. The reliability coefficient of Fabrication and Welding Craft Practice Practical Test (FWCPPT) was established using Kuder Richardson 21 Formula, and the reliability coefficient of 0.85 was obtained. Arithmetic mean was used to analyze data related to research questions while Analysis of Covariance (ANCOVA) was used to test the null hypotheses.Findings revealed that male and female students taught fabrication and welding craft practice using PBTM achieved higher post test scores than those taught with lecture teaching method. Also the findingsrevealed that there was no significant difference in the post test mean scores and also in the mean retention scores of male and female students taught FWCP using PBTM. Based on thefindings, it was concluded that adoption ofproblem-based teachingmethod is an effective and efficient mode of instruction with the capacity of improving students' practical skills and retention ability of both male and female students in the subject. Consequently, it was recommended among others that FWCP teachers at technical colleges'level should use PBTM which is more practically orientedand encourages activeparticipation of students' in classroom teaching and learning processes.

***Keywords**: Problem-Based Teaching Method, Gender, Practical skills Achievement, Retention Scores,Fabrication and Welding Craft Practice and Technical Colleges.*

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I. INTRODUCTION

Education is often conceived as a systematic action of imparting relevant knowledge, skills and habits to the learners in their preparation for meaningful life and contribution to better society.Technical and Vocational Education will be effective in proportion as it trains the individual directly and specifically in the thinking habits and the manipulative habits required in the occupation (Okoro, 2013). Thus providing quality technicaleducationleads not only to enhance enrolment but also ensures that males and females are fully able to realize the benefit and value of education. Most importantly, adopting anappropriate teaching method that takes into account the relationship and interaction between boys and girls according to the United States Agency for International Development, USAID, (2008) will ultimately address four dimensions: equality of access; equality in the learning process; equality of educational outcomes and equality of external results.Educational opportunities for both sexes are supposed to be equally distributed.

Gender refers to the biological and physiological reality of being male or female (Igbo, Onu & Obiyo, 2015). Also, Igbo et al, described gender as a behaviour pattern and attitude perceived as a masculine and feminine within a culture. Additionally, Uwameiye and Osunde (2005) defined gender as a psychological term, which describes behaviours and attributes expected of individuals on the basis of being a male or female. It is a social and cultural construct which distinguishes the difference in the attributes of men and women, boys and girls and accordingly refers to the roles of men and women (Santrock, 2010). However, over the years, education has focused on closing the enrolment gap between male and female students in technical colleges, while insufficient attention has been paid to the differences in their practical skills achievement.Thus, adopting an approach that takes into account the relationship between male and female students in technical colleges will not only lead to improving equality of students' enrolment, but could also address equality of educational outcomes among male and female students in technical colleges.

Technical colleges are to produce graduates with vocational and practical/technical skills leading to the production of artisans and craftsmen who will be self-reliance; gainfully employed as lower level sub-professionals; work as self-reliance individuals; andcould havecapacities for further studies in polytechnics, Colleges of Education (Technical) and Universities. In order to achieve these goals, technical college curriculum was split into different trades with corresponding modules so as to enable learners choose and accomplish trade of their interest successfully.According toUwaifo, (2010) the future of any nation lies on the knowledge, skills, and abilities which the citizens are expected to acquire from technical education. Thus, knowledge and practicalskills acquired from these technical trades could help the graduates to secure employment especially in fabrication and welding engineering craft practice.

Fabrication and weldingcraft practice is a skill-based programme designed to equip the trainees with knowledge, attitude and skills to carry out sheet metal work, gas welding, arc welding, metal forging, drilling and cutting jobs in all types of general metal work operations and produce simple finished structural steel work projects (National Board for Technical Education, NBTE, (2001).Welding is used as a fabrication process in every industry. It is a principal means of fabricating and repairing metal products. The processes are efficient, economical and dependable as a means of joining metals together.The goals of fabrication and welding engineering craft practice trade in Nigeria technical colleges are to produce competent craftsmen and master craftsmenwith sound practical and theoretical knowledge, who should be able to carry out various types of welding processes and fabrication design (National Board for Technical Education (2001). The trainees on completion of the fabricationandweldingengineering craft practicecould compete favourably with anyother technical colleges in the world. Thus justifying the goals of the programme. It is becomes imperative that the training would requires a good teaching strategy capable of facilitating development in thinking ability as well as manipulative/ practical skills.

Practical skills achievement aredistinctive aspect of technical colleges programme described as an act of doing, making, manipulating and practicing the theoretical knowledge gained with the uses of materials, tools and equipment. As craftsmen and technicians pass through technical college programmes, it is expected that such programme should equip them to function well in the society. The NBTE (2013) stressed that the ultimate objective of the programme offered in the technical colleges are to enable trainees perform all the requisite practical skills and demonstration of good knowledge of the theoretical concepts of the trade as specified in training modules before they are certified.Martin, Gillian & Nicola (2018) notedthat it was unfortunate thatmost of these skills are not being acquired by technical college graduates. Okorie,(2000)explained that, to possess technical skill is to demonstrate the habit of acting, thinking and behaving in a specific activity in such a way that the process becomes natural to the individual through repetition or practice. Thus, one can estimate how much a learner has learnt the content of an instruction by simply knowing the learner's academic retention ability.

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Retention has to do with the ability to recall and apply earlier learnt behaviour. Accordingly, Andriotis (2017) maintained that knowledge retention is the process by which novel information is transferred from one short term to long term memory. It is a learning that continues beyond the initial unit or alesson that is assessed with test administered in two or more weeks after the information has been taught and tested. This implies that a student who recurrences an acquired piece of knowledge with less mistake is said to have retained the material taught. Okwelle, Dighobo and Patrick (2018) discovered that for long time retention of knowledge to be achieved, motivation and interest of the learners must be sustained through the usage of appropriate teaching method. Such method should be capable of equipping the students with critical thinking skills. Thus, the ability of students to retain learnt skills for a long period of time would enable Fabrication and welding engineering craft personnel to remain relevant in today's world of work without being gender bias.

Despite of the advocacy that technical teachers should employ student-centered method(s) in the teaching, yet most technical teachers at the technical college level still use conventional method such as lecture in the teaching of fabrication and welding craft practice and this has been contributory cause of students' failure in the subject (NABTEB, 2015); (Umar, Abdullahi & Hassan, 2015). Lecture teaching method (LTM) is a teacher-centered method which makes the learner a passive recipient of information. LTM according to Eze, Ezenwafor and Onwusa (2020) is the art of telling factual information, principles and theories to audience without minding whether the audience understands the information being or not, and that learners are expected to add flesh on the principles or the theories on their own through personal research. There is little or no students'active participation, students are merely required to listen and understand the information being given and that is why is also called teacher centered (Eze, Ezenwafor & Obidile, 2018). Additional, it is an instructional method where ateacher who possesses the knowledge on a given topic delivers all relevant information to students verbally. During a typical LTM, an instructor stands before a class and present information for the students to learnt (Kelley, 2018). Although most studies criticize the use of lecture teaching method but some studies found it effective. From the literature, lecture teaching method seems to be the most widely used in the teaching of fabrication and welding craft practice at technical college level. Unfortunately there are still poor performance in public examination. It becomes imperative to employ student–centerd instructionalteaching such as problem-based teaching method to see if students' performance in subsequent examination will improve.

Problem-based teaching method (PBTM) is a pedagogical approach in which students work on a complicated, ill-structured problem or issue and attempt to develop solutions. It is a student-centered instructional method that empowers learners to integrate theory and practice and apply knowledge and skills develop viable solution to problem (Sada, Mohd, and Adnan& Audu, 2014). According to Soares, Casa Nova, and Bulaon, (2013) stated that problem-based method is a teaching method that is based on practical approach, where problem solving is incorporated in a learning environment. Consequently, Hung,(2013) described that the core idea of PBTM focuses on real-world problems capture students' interest and provoke serious thinking as the students acquire and apply new knowledge in a problem-solving context. The teacher plays the role of facilitator,working with students to frame worthwhile questions, structuring meaningful tasks, coaching both knowledge development and social skills, and carefully assessing what students have learned from the experience.PBTM could be used in diversity of educational settings from technical to higher education Hmelo-Silver, (2013).

Problem-based teachingmethod isone of the most important practice of the constructivist learning teaching concept Savin-Baden and Major, (2004). Problem-based learning exposes students to a complicated situation or incident and encumbers them with the role of possession of the problem or of responsibility for the incident. Students are given opportunity to describe the real problem and learn howessential to work out aneffective solution by means of research project. Also, problem-based method represents a learning based on experience, which calls for the active use of both the mind and skills of the individuals. It is adidacticmethodtargeting to upskill students in learning how to learn and to increase their capacity for learning.However it emphases on the problem, from teaching objectives to students' behaviour and from the method to be used up for measurement and evaluation procedures.

- One of the goal of PBTM is to help students grow flexible knowledge, effective solving skills, self-directed learning, active collaboration skills and intrinsic motivation. Thus, the problem presented is a vehicle for the development of problem solving skills which arouses the cognitive process and allows new knowledge to be obtained through self-directed learning.
- The second goal of emerging effective problem-solving skills refers to the ability to apply appropriate metacognitive and reasoning strategies. Different approaches may be appropriate for different domains and for different problems. First, learners must have a metacognitive awareness of what they do and do not understand. Second, they must be able to set learning goals for themselves, classifying what they need to learn more about for the problem they are solving.

- Thirdly, they must be able to plan how to achieve their goals. As they implement their plan, learners must evaluate whether or not their goals have been attained.
- Fourth goal of being a good collaborator means effectively participating in a small group. This includes establishing common ground, resolving discrepancies, negotiating the actions that a group is going to take, and coming to an agreement (Ogunbowale, 2004). This involves open exchange of ideas and meeting of all group members.
- The fifth goal of PBTM is to help learners become inherently motivated, which occurs when learners work on a task or job for their own interest. Determining what is appealing is easy for medical students; they all share the goal of becoming physicians. Determining appropriate problems for less well-informed students requires that problem designers understand what is stimulating for a varied group of students with changing levels of prior knowledge, and provides a reasonabletask without being overwhelming (Blumenfeld, Kempler, & Krajcik, 2006).

Accordingly, Walsh, (2005) stated the basic steps for PBTM practices are as follows: tomeeting the problem and defining it, determining what one knows and what he needs to know and putting his thoughts into order, gathering and sharing information, producing potential solutions and hypotheses and determining the learning issues, Walsh further stated,the application of the new knowledge to the problem and re-evaluation, identifying the best solution, explaining the problem and its solution briefly andevaluation and presentation of new learning.Similarly, getting into contact with the external world and other people so as to discover concepts and to use his abilities, approaching problems and their solutions with new and original ideas,inquisitive during the process, giving positive input to constructive criticisms.Thus, PBTM addresses the need to promote lifelong learning through the process of inquiry and constructivist learning (Schmidt, Henk, Rotgans, Jerome; Yew&Elaine, 2011*).*

PBTM is considered a constructivist approach to instruction because it emphasizes collaborative and self-directed learning while being supported by tutor facilitation (Schmidt, Henk, Loyens, Sofie, Van Gog, Tamara; Paas & Fred, 2007). Hung,Yew, Elaine (2011) elaborate on the cognitive constructivist process of PBTM as follows:

- Learners are presented with a problem and through discussion within their group, activate their prior knowledge.
- Within their group, they develop possible theories or hypotheses to explain the problem. Together they identify learning issues to be researched. They construct a shared primary model to explain the problem at hand. Facilitators provide scaffolding, which is a framework on which students can construct knowledge relating to the problem.
- After the initial teamwork, students work independently in self-directed study to research the identified issues.
- The students re-group to discuss their findings and refine their initial explanations based on what they learned.

In PBTM approach, the role, which students undertake in learning, has completely changed. Students who structure information actively have replaced passive receivers. Students working in groups need to organize their prior knowledge and describe problem situations. According to Walsh, (2005) noted that students should be inquisitive about things they do not understand, the design of a problem-solving plan and how to identify the resources needed. Walsh summarize the problem situations to include the followings:

i. Analyzing the problem situation by understanding the structure of the problem broadly.
ii. Developing practical solutions to the problem.
iii. Undertaking a decision-making role in debates within the group.
iv. Cooperating with the instructor and friends and determining the learning goals, which need researching for the solution to the problem.
v. Identifying the resources and strategies, which will be able to convey to the learning goals.
vi. Assessing the conclusions one draws from the data obtained, that is, the learning products.
vii. Checking both the learning goals and the learning media.
viii. Presenting his opinions in a clear and understandable way in which the other group members can conceive.
ix. Evaluating different views impartially.
x. Being aware of his roles and responsibilities individually.
xi. Exhibiting behaviour of a type, which defends new ideas and situations and gets them across to the other members.
xii. Congratulating and appreciating the other group members on account of their convenient suggestions leading to the solution.
xiii. Developing the knowledge infrastructure for the solution to the problem

xiv. Being able to set certain targets, which may be useful in using suitable research procedures and directing the group.
xv. Carrying out observations and practices taking into consideration the processes used by the implementers of the field or the discipline related to the problem.
xvi. Becoming the instructor of each other by teaching what they have learned to the other group members.
xvii. Being courageous in focusing on a new problem and on its potential solution.
xviii. Getting into contact with the external world and other people so as to discover concepts and to use his abilities.
xix. Approaching problems and their solutions with new and original ideas.
xx. Being inquisitive during the process.
xxi. Giving positive input to constructive criticisms.
xxii. Joining group work on time and on a regular basis.
xxiii. Evaluating his and his friends' contribution to the group work in the course of it.
xxiv. Finding out important resources for the solution to the problem and sharing them.
xxv. Turning the work into a report and presenting it to the class.

However, the application of PBTM in teaching and learning may likely eradicate the controversial issue of gender differences in terms of practicalskills achievement to avery reasonable extentAjai and Imoko (2015). However, it was buttressed that both male and female students should be given equal opportunities in education and allowed to participate activity in teaching and learning situations. Several studies have been conducted to certain the effect of gender on academic performance and retention of students in many subject areas using different teaching methods. However, not much has been done in the area of fabrication and welding craft practice in technical colleges, especially using PBTM. It is therefore becomes necessary to ascertain the gender differences in practical skills achievement and retention scores of students' exposed to fabrication and welding craft practice in technical colleges using PBTM.

Problem Statement

There have been persistent reports of inequality in the practical skills achievement of male and female students in fabrication and welding craft practice in technical colleges in Nigeria. From the reports in the statistics made available by NABTEB which shows that only 27% of the female students that did the exam passed at credit level and above in year 2016 while 92.7% of male students had credit pass. In year 2017, 30% female students passed at credit level while 81% of male students passed at credit level and above in NABTEB conducted examinations. This persistent disparity in practical skills achievement could be as a result of the use of conventional teaching method such as (lecture teaching method) adopted by teachers (NABTEB, 2017). It has become worrisome to the researchers. Hence, there is need for the study to determine the gender differences in practical skills achievement and retention scores of students' exposed to fabrication and welding craft practice in technical colleges using PBTM.

Purpose of the Study

Thus the main purpose of this study was to determine thegender differences on practical skills achievement and retention scores of students' exposed to fabrication and welding engineering craft practice through problem-based teaching method in technical colleges in Delta State**.** Specifically, the study sought to determine the:

1. Mean practical skills achievement scores of male and female students taught fabrication and welding craft practice using problem based teaching method.
2. Mean practical skills achievement scores of male and female students taught fabrication and welding craft practice using lecture teaching method.
3. Mean retention scores of male and female fabrication and welding craft practice using PBTM
4. Mean retention scores of male and female students taught fabrication and welding craft practice using lecture teaching method.

Research Questions

The following research questions guided the study.

1. What are the mean practical skills achievement scores of male and female students taught fabrication and welding craft practice using PBTM?
2. What are the test mean practical skills achievement scores of male and female students taught fabrication and welding craft practice using lecture teaching method?
3. What are the mean retention scores of male and female fabrication and welding craft practice using PBTM?
4. What are the mean retention scores of male and female students taught fabrication and welding craft practiceusing lecture teaching method?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance

1. There is no significant difference between the post-test mean practical skills achievement scores of male students and female students taught fabrication and welding craft practice using PBTM
2. There is no significant difference between the mean retention scores of male and female students taught fabrication and welding craft practice using PBTM.

II. METHOD

Research Design

The design of the study was quasi-experimental design. Specifically, the study used pretest, post-test and non-randomized control group design. According to Nworgu (2015), quasi-experiment is an experiment that does not allow for randomization of subjects to experimental and control groups. Intact-classes were therefore used to avoid disruption of normal class lesson.

Area of the Study

The study was conducted in Delta State. Delta State is located in the south-south geo-political zone of Nigeria. It is bounded in the North by Edo State, in the East by Anambra State in the south-east by Bayelsa and the south flank is the Bight of Benin of the Atlantic Ocean. Covers about 160 kilometres in the state coastline.

Population of the Study

The population of the study was 128 National Technical Certificate (NTC 11) students offering fabrication and welding craft practice in Government owned technical colleges in Delta State.

Sample and Sampling Technique

The sample of the study was made up of 70 National Technical Certificate (NTC 1I) students. Purposive sampling technique was based on availability of professionally qualified staff, standard workshop and facilities for teaching, regular electricity supply and willingness of regular teachers to participation as research assistants.

Instrument for Data Collection

The instrument were developed by researchers and used for the data collection in this study. Fabrication and Welding Craft Practice Practical Test (FWCPPT). The 45 multiple choice test items were used as pre-test and after the treatment, the instrument were reshuffled and the colour of the paper changed before administering it as post–test and retention post-test.

Table of specifications was used to allocate questions on the FWCP to content areas. Items in the FWCP were constructed with strict adherence to the application of levels of revised edition of Anderson and Krathwohl (2001) Bloom's taxonomy of educational objectives as follows: remember, understand, apply, analyze, evaluate and create.

Validation of the Instrument

The instruments for data collection were face and content validated by three experts. Two experts from the Department of Technology and Vocational Education and two from the Measurement and Evaluation unit of the Department of Educational Foundations all in: Nnamdi Azikiwe University, Akwa. The experts' were requested to scrutinize the test items for clarity, suitability of the language and coverage of the content area. All observations and suggestions were noted and corrected to prepare the final copy for the study. Content validity of the instrument was ensured by adopting the taxonomy of educational objectives

Reliability of the Instrument

The reliability of the FWCPPT instrument for this study was established using test-retest method. Copies of the FWCPPT were administered to 15 NTC I1 fabrication and welding technology students drawn from government science and technical college Benin City, Edo State who were not part of the population. The instrument was face and content validated by three experts. Kuder Richardson 21 formula was used to determine the reliability co-efficient of the instrument is of 0.87 was obtained, which the researchers considered adequate for the study.

Experimental Procedure

The researchers sought and obtained permission from the authorities concerned for the involvement and participation of their students and teachers in the study. The fabrication and welding lesson plans that were used for the study were developed by the researchers. The experimental procedure adopted for conducting this study was presented as follows.

Training of Research Assistants

An orientation programme was organized for the four participating fabrication and welding craft practice teachers in the first week. Separate sessions were organized for the two groups of teachers. One group was trained on the use of PBTM in teaching fabrication and welding while LTM was employed using charts and real objects during the training session.

Administration of Pre-test.

In the first week, the researchers visited the schools for the study for familiarization/orientation and administered the pre-test. The instrument FWCPPT were administered on both experimental and control groups through the help of the research assistants in the four schools in the first week. The administration lasted for one hour for each school. The teacher collected the scripts and marked. The scores were recorded and the treatment began in the second week.

Treatment (Teaching of Students)

The treatment lasted for a period of five weeks. The teaching of the topics for both control and experimental groups commenced in the second week of the experiment following normal school time-table schedule covering five working days. The subject teachers in both technical colleges assisted the researchers in teaching the lessons to prevent bias that may be introduced by teacher effect. The area of interest are gas welding equipment/principles, arc welding equipment /principles, wielding joints and safety precautions during welding etc. The experimental groups were taught using practical works in workshop (replica to industrial environment work place). The classroom teacher acting the role of facilitator,working with students to frame worthwhile questions, structuring meaningful tasks, coaching both knowledge development and social skills, and carefully assessing what students have learned from the experience.The control groups were taught using demonstration teaching method only in normal classroom.

Administration of Post-test

FWCPPT items which were used during the pre-test stage were also used for the post test. However the FWCPPT items was reshuffled (or re-arranged differently from that of pretest in order to make the test look different) to students. This was done for both experimental and control groups. The post-test was administered on the fifth week by the class teachers (research assistants). The experimental group were tested on practical works in the workshop. The control group wrote the examination conventionally and the research assistants supervised the examination, marked the scripts, and the marks were recorded.

Method of Data Collection and Data Analysis.

Data collected were analyzed using mean scores and standard deviation. The Analysis of Covariance (ANCOVA) was employed to test the hypotheses at 0.05 level of significance.In testing the hypotheses, if p-value was less than the level of significance (0.05), the null hypothesis was rejected but if the p-value was greater than or equal to the level of significance at (0.05), the null hypothesis was accepted. Data analysis was done using Statistical Package for the Social Sciences (SPSS) version 20.

III. RESULTS

Table 1.

Mean practical skills achievement scores of male and female students taughtfabrication and welding craft practice using PBTM

Gender	No	Pre-test		Post-test		Mean Gain/Loss
		Mean X_1	SD	Mean X_2	SD	XG/L
Males	51	32.32	3.46	55.23	7.46	23.11
Females	19	28.15	4.56	54.57	7.90	25.18

Table 1 shows the pre-test mean scores of male and female students as 32.32 and 28.15 and their post–test mean scores as 55.23 and 54.67 with mean gain scores of 22.91 and 26.52 for male and female students respectively. The standard deviation for male is 3.46 and the posttest is 7.46. The standard deviation obtained indicate that there was greater variety in students' post-test practical skills achievement scores for both male and female in their pretest scores. However, the post-test standard deviation of practical skills scores of the malewas larger than of female showing greater heterogeneity of among students. This showsthat practical skills

achievement scores of male and female students taught FWCPusing PBTM were close in value even though the mean gain of 23.11 for their male counterparts and the female colleagues is 25.18. In summary, both male and female students taught FWCP using PBTM performed higher in their post test scores.

Table 2.
Mean practical skills achievement scores of male and female students taught fabrication and welding craft practice using lecture teaching method.

Gender	No	Pre-test		Post-test		Mean Gain/Loss
		Mean X_1	SD	Mean X_2	SD	XG/L
Males	51	31.15	8.36	67.35	8.89	36.20
Females		29.53	5.68	61.75	6.78	31.22

Table 2 shows the pre-test mean scores of male and female students as 31.15 and 29.53 respectively and their post-test mean scores as 32.35 and 31.71 respectively with mean gain scores of 36.20 and 31.22 for male and female students respectively. The standard deviation for male is 8.36 and the posttest is 8.89. The standard deviation obtained indicate that there was greater variety in students' post-test practical skills achievement scores for both male and female in their pretest scores. However, the post-test standard deviation of practical skills scores of the male was larger than of female showing greater heterogeneity of among students. This shows that practical skills achievement scores of male and female students taught FWCP using PBTM were close in value while the mean gain of 22.91 for their male counterparts and the female classmates is 26.52. This shows that achievement scores of male and female students taught FWCP using lecture teaching method were close in value. Also, both male and female students taughtFWCP using lecture teaching method had low post test scores.

Table 3.
Mean retention scores of male and female students taughtfabrication and welding craft practice using PBTM.

Gender	No	Pre-test		Post-test		Mean Gain/Loss
		Mean X_1	SD	Mean X_2	SD	XG/L
Males	51	55.23	4.68	63.42	6.43	8.19
Females	19	54.17	4.55	63.15	6.37	8.48

Table 3 shows the pre-test retention mean scores of male and female students as 55.23 and 54.67 and their posttest mean retention scores as 63.42 and 63.15 with mean gain of 8.19 and 8.48 respectively. The standard deviation for male is 4.68 and that of female is 5.55. The standard deviation obtained indicate that there was greater variety in students' post-test achievement scores in both male and female than their pretest scores This shows that retention scores of male and female students taught FWCP using PBTM were close in value. Also that both male and female students taught FWCPusing PBTM achieved high retention scores.

Table 4. Mean retention scores of male and female students taughtfabrication and welding craft practice using lecture teaching method.

Gender	No	Pre-test		Post-test		Mean Gain/Loss
		Mean X_1	SD	Mean X_2	SD	XG/L
Males	51	32.35	4.50	39.55	6.75	7.40
Females	19	31.71	4.67	28.76	5.86	4.05

Table 4 shows the pre-testretention mean scores of male and female students as 32.35 and 39.55 and posttest are 39.55and 28.76 with mean gain scores of 7.40 and 4.05 respectively. The standard deviation for male is 4.50 and that of female is 4.67. The standard deviation obtained indicate that there was greater variety in students' post-test retention scores in both male and female than their pretest scores This shows that retention scores of male and female students taught FWCP using lecture teaching method were close in value. However, both male and female students' taught FWCP using lecture teaching method were close in value. However, both male and female students taught FWCP using lecture teaching method had mean loss in their retention scores.

Table 5

ANCOVA summary of male and female students' practical skillsachievement scores in fabrication and welding craft practiceusing PBTM

Source	Type III sum of squares	Df	Mean square	F	P-value	Decision
Corrected model	8937.859[a]	2	3963.924	48.821	.000	Do not reject
Intercept	2801.843	1	2801.843	34.595	.000	
Posttest	7933.4339	1	7933.449	96.578	000	
Gender	283.384	1	283.384	3.508	.069	
Error	5663.637	67	83.890			
Total	234572.000	70				
Corrected total	14581.476	69				

Table 5 shows that the obtained value of F(1.67) = 3.508 is not significant at 069 for the gender main effect (P>0.05). This shows that there was no significant difference in the post test mean achievement scores of male and female students taught fabrication and welding craft practice using PBTM. The null hypothesis was therefore not rejected.

Table 6.
ANCOVA summary of male and female students' retention scores in fabrication and welding craft practiceusing PBTM

Source	Type III sum of squares	Df	Mean square	F	P-value	Decision
Corrected model	10561.965[a]	2	5230.972	207.887	.000	Do not reject
Intercept	947.8811	1	947.8811	39.061	.000	
Posttest	10460.738	1	10460.728	427.707	.000	
Gender	.791	1	791	0.36	.861	
Error	1655.898	67	27.053			
Total	282469.000	70				
Corrected total	12139.843	69				

Table 6 shows that the obtained value of F(1.67) = 0.36 is not significant at .861 for the gender main effect (P>0.05). This shows that there was no significant difference in the mean retention scores of male and female students taught fabrication and welding craft practiceusing PBTM. The null hypothesis was therefore not rejected.

IV. DISCUSSION

The study revealed that male and female students taught fabrication and welding craft practiceusing PBTM performed higher in their post–test scores than their counterparts taught with lecture teaching method. This result is in line with the findings of Ajai and Imoko, (2015):Eze and Osuyi, (2018)which stated that male and female students taught using conventional method. This might be as a result of practical exercises which they obtained during the instruction. Also the study revealed that there was no significant difference in the post –test scores of male and female students taught metal work using PBTM. Although male and female students taught with PBTM had higher post-test scores, their post-test scores did not differ significantly. This indicates that PBTM was effective to both male and female students. This result is in line with the finding of Akpotohwo, and Ehimen (2014) which stated that gender was not significant in the academic performance of students using PBTM. However, this result is contrary to the findings of (Eze, Ezenwafor & Obidile, (2016). which revealed that there was a significant difference in the mean achievement scores of male and female students using PBTM.

The study also found that male and female students taught fabrication and welding craft welding using PBTM retained more knowledge than those taught using lecture teaching method. The study also revealed that although male and female students taught fabrication and welding craft welding using PBTM had higher retention scores, their retention scores did not differ significantly. This indicates that both male and female students taught fabrication and welding craft practiceusing PBTM retained more knowledge of FWCPconcepts than their counterparts who were taught using lecture teaching method. This is in line with the findings of (Eze, Ezenwafor & Obidile. (2016); (Kassab, Abu-Hijeh, Al-Shboul& Hamdy (2005) which revealed that gender was insignificant in the knowledge retention of students using PBTM.

V. CONCLUSION

Based on the findings of this study, it was concluded that PBTM has the capacity for improving students' practical skillsachievement andretention abilityin fabrication and welding craft practiceirrespective of gender. Therefore, PBTM should be adopted for teaching practical skillsin fabrication and welding craft practice in technical colleges in Delta State.

VI. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. A teachers at technical colleges' should adopt PBTM which is more practical oriented and more stimulating to students'academic performance and retention ability in fabrication and welding craft practice.
2 Government, through the Ministry of Education should ensure the provision of adequate instructional materials at technical colleges' level to facilitate the use of PBTM in the teaching of fabrication and welding craft practice.
3. Curriculum planners of technical colleges programme should collaborate with fabrication and welding craft practice experts to develop a workable fabrication and welding craft practice curriculum that will accommodate teachers' integration of problem-based approaches in the instructional delivery

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