Effects of Floating Facilitator and Peer Tutor Instructional Approach on Students’ Psychomotor Achievement in Electrical Installation and Maintenance in Technical Colleges in Ondo State, Nigeria

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Abstract

This study investigated the effects of floating facilitator and peer tutor instructional approaches on students’ psychomotor achievement in electrical installation and maintenance in technical colleges in Ondo State, Nigeria. The design used was quasi-experimental design. Purposive sampling technique was used to select 171 students from four technical colleges. Two technical colleges each were randomly selected to peer tutor as group A and the other two colleges to floating facilitator as group B. The instrument used for data collection was Electrical installation and maintenance Psychomotor Test (EPT). The treatment group A used the peer tutor approach while treatment group B used the floating facilitator approach. The treatment lasted for six weeks for the groups concurrently each topic covering two weeks. The data obtained were analyzed descriptively and inferentially. The mean and standard deviation were used to answer the research questions while all the null hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA) statistics and partial eta square for the effect size. The results obtained showed that peer tutor approach had a significant effect on students psychomotor achievement compared to floating facilitator approach. There was a significant influence of gender on the psychomotor achievement of male and female students also, there was a significant influence in ability level of students in their psychomotor achievement, from the post hoc test, the significance lies between the average and low ability level. These findings imply among others that given a conducive learning environment provided
through the use of peer tutor approach, the psychomotor achievement of students will be greatly improved. Based on the findings of this study, some recommendations and suggestions for further research were made.

INTRODUCTION

The increasing global transformation in industry, technology and education in modern time has caused knowledge and skills in technology electrical installation and maintenance to become increasingly indispensable in everyday life (Ogbuanya & Usoro, 2013). Most technological changes depend on electricity and most appliances cannot operate without electricity. It is on this regard that Federal Republic of Nigeria established technical college. Technical college is a post-primary institution equivalent to senior secondary school. A technical college in Nigeria is established to prepare individuals to acquire practical skills and basic scientific knowledge. Upon graduation, technical college students are expected to secure employment, set up their own business so as to be self-reliant or further their studies (Federal Republic of Nigeria (FRN), 2013). According to United Nations Educational, Scientific and Cultural Organisation and International Labour Organization (UNESCO & ILO, 2002) technical education should aim at lifelong learning. Technical education provides workplace skills apart from academic skills namely; creativity, problem-solving, collaborative and high order thinking skills so as to increase students flexibility and job mobility. It is based on that the content of the training in the technical college programme is 40% theory and 60% practical (FRN, 2004). Technical colleges train students in various trades which include radio and television, refrigeration and air conditioning, electrical installation and maintenance work among others.

Electrical installation and maintenance is one of the trades offered in technical colleges where students after graduation are expected to provide services to electricity consumers and they are trained formally taught in technical colleges. Electrical installation and maintenance comprise three modules namely: domestic and industrial installation, cable jointing and battery charging and winding of electrical machine (National Business and Technical Examinations Board (NABTEB), 2004). The programme aimed at equipping the electrical installation and maintenance students with skills that will make them proficient in installing, operating, maintaining and repair of electrically energized systems such as in residential, commercial and industrial buildings. Also, Electrical wiring of direct current and alternating current motors and generators; control electrical distribution panels as well as usage of equipment and meters for testing (Cosmas, 2010; Gupta, 2013). This is because most technological changes depend on electricity and most appliances cannot operate without electricity. Electrical installation and maintenance ought to be taught effectively, as anything less would not only wreck danger and havoc to the lives of electricity users but also spell unemployment and poverty to the trainees (Ogbuanya & Usoro, 2013).
As it prepare them for work and thinking skills in solving real electrical problems is a better way of preparing them for work. Moreover, employers are no longer interested in workers who can perform only a prescribed set of tasks or operate equipment but want workers who can continuously grasp new information and acquire new skills, which can improvise, solve open-ended problems and work effectively in teams (Center for Occupational Research and Development Inc, 1999).

At graduation, most of the students are deficient in employability skills, workplace skills and job generation competencies (Ogbuanya & Usoro, 2009). The result of NABTEB examinations shows poor performance of technical students (Aina, 2000). Analysis of NABTEB conducted examinations in May/June for electrical installation and maintenance students in Government Technical Colleges of Ondo State from 2004 to 2013 revealed that in 2004 7.35% passed with five credits including English and Mathematics. 13.25% in 2005, 4.28% in 2006, 8.06% in 2007, 2008 had a percentage of 2.85, 2009 had 5.66%, for 2010 it was 8.24%, in 2011 the percentage was 3.15, 2012 had 8.18% but for 2013 it was 23.38%. Technical colleges in Ondo State had a poor quality of training and ineffective training impact on students and poor linkage to the labour market (Akinsuroju, 2012). Many variables identified for poor performance of students include the instructional system, inadequate supply of instructional materials and technical workshops, insufficient or lack of training equipment, tools, and consumable materials, insufficient funding, poor public image among others (Okoh, Ayowei, & Onyeluka, 2011). The ineffectiveness of the training according to Akinsuroju (2012) is due to lack of adequate workshop, training materials, qualified teachers and teaching methodology. From the data, there has been considerable improvement in the students’ performance due to improvement in the supply of training materials, textbooks and employment of qualified teachers. Although many factors could be responsible for students’ poor performance in any subject, the instructional systems used by the teachers are the main factors (Ogbo, 2011). Accordingly, Ogwo (2005) noted that technical teachers should realize the need for a better understanding of what method to use in teaching and learning situations as they constitute major contributory role in student’s acquisition of knowledge and skills. These teachers mostly use the lecture and demonstration teaching methods which do not allow participation by students thereby creating room for more jobless electrical installation and maintenance graduates (Abdullahi, 2010). The traditional instructional approach used in the application of skill and knowledge to problems in electrical installation and maintenance had created gaps between the technical colleges and the world of work.

Instructional approach is a process where teachers use a variety of teaching strategies to communicate and interact with students academically. Teachers engage students by using a variety of instructional approaches in order to meet individual learners need. For successful teaching to occur, researchers have shown that a variety of pedagogical approaches that focus on providing activities for students to perform should be applied to enhance their performance (Eberlein, et al., 2008; Raymond, 2013). Hence, technical subjects which include electrical installation and maintenance demands changing from teacher centered learning instructional approach to student-centered
Problem-based learning is one of such student-centered learning instructional approach.

Problem-Based Learning (PBL) is an instructional approach which assumes significant real-world situations, providing resources, guidance and instruction to learning as the students develop content, knowledge and problem-solving skills. Problem-based learning is a strategy that consists of carefully selected and designed problems that demand from the learner acquisition of critical knowledge, problem-solving proficiency, self-directed learning strategies and team participation skills (Afolabi & Akinbobola, 2009). In other words, PBL is a learning strategy which emphasizes critical thinking and deeper understanding of electrical installation and maintenance through the use of real electrical problems. From research teachers and other educational stakeholders are motivated to focus on real world problems, support inquiry-based learning, provide opportunities for collaborative learning approaches to learning and focus on teaching students how to learn (Pacific Policy Research Center, 2010).

In PBL, the teacher’s role is to facilitate, identify a problem that is purposely complex and vague yet intriguing enough to excite students to inquire about it while the problem should be appropriate for the course content. The student’s role in PBL is to collaborate in small teams, to explore the issues related to the problem, List what they know and what they need to know, do individual research on what they agreed to know, collate what they learnt in each team and present their team's finding to the whole class (Landsberger, 2011).

Problem-based learning enables students to develop a higher level of thinking and problem-solving skills. Problem-based learning provides an environment in which students can draw upon prior knowledge, learn within the real world context and reinforce the knowledge through the independent and small group. Problem-based learning enables the engineering profession deal with uncertainty and solve complex problems in the field sometimes with incomplete data (Mills & Treagus, 2003; National Academic Engineer (NAE, 2004). In a PBL setting, students think to solve problems and make decisions based on evidence and reasoning which may be needed due to changes in technology. Studies undertaken overseas indicated that PBL can help students achieve more than the conventional teaching method (Simaranjeet, Kamisahn, & Siti, 2005; Dehkordi & Heydarnejad, 2008). Problem-based learning as constructive learning environment has been selected as a useful instructional alternative to conventional (lecture and demonstration) teaching method. It also has positive impact on students learning (Loynes, Rickers, & Schmidt, 2006; Akinoglu & Tandogan, 2007; Dod in Walker & Leary, (2009), Bilgin, Senocak, & Sozibilir, 2009).

Problem-based learning has different models such as fixed facilitator, peer tutor and floating facilitator, tutorless group, large class and jigsaw. In PBL, models are used to describe organization of class sessions and to provide a structure for carrying out each of the problem unit (Raine & Symons, 2005). Some of the factors to be considered in choosing a model for the organization of class session include class size, the
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intellectual maturity of students, course learning objectives, instructor’s preference and availability of peer facilitators (Woods, 2005). To provide a structure for carrying out each of the problem units, most PBL models have problem-solving steps ranging from four to eleven. According to Schmidt and Moust (2000), Ames, Linden and Feldhusen has five steps, Birch has six steps, Gallagher has six steps, West has three phases, Stephein, Gallagher and Workman have seven steps while Maastricht has seven steps. In each of the models, some class time will be devoted to group reporting, debates and class discussion. Due to the flexibility of class size, heterogeneous nature of the class and a teacher teaching electrical installation and maintenance for each class, floating facilitator model and peer tutor model will be considered in this study, using the Maastricht seven steps to carry out each problem unit.

Floating facilitator is a PBL model for organizing the class session. A facilitator is a teacher who leads the class in a debate based on the material to be covered. A facilitator sees to it that each group works effectively and collaboratively by helping to manage and support the group decision. The facilitator leads the class to discuss the material and shares personal insights from real world examples. Facilitation is a task that requires initiating group session in a smooth and organized way (Execution for System, 2010). In floating facilitator model, teacher rotates through groups, asks questions, directs discussion and checks understanding (Mark, 1996). The floating facilitator model makes the facilitator move around from group to group. Floating facilitator model uses a class size where students are assigned to small groups of four each. Facilitator’s role differs from the regular teachers’ role. Rather than being a content expert who provides the facts, the teacher as a facilitator is responsible for guiding students to identify the critical problem and to find ways to learn from those areas in appropriate breadth and depth. The teacher acts as a facilitator, moves around (floats) among the groups by asking questions, probing for understanding and directing discussion, motivate and bring students to the right path whenever the students are off-track. Floating facilitator model is suitable for small to medium classes due to the role of the teacher (Sahid, 2011). The teacher allocates a significant portion of each class meeting for group work. While students work in groups, the floating facilitator circulates among them, monitor their progress, participate in the discussions to assist them towards a solution and reform the entire large class when needful (Virginia Commonwealth University, 2013). At the next class meeting, the class as whole reviews each small group learning issue.

The peer tutor model enables a student of high ability to lead each group. A peer tutor is an effective strategy that engages students and promotes academic success (Dennis, Canas, & Ortega-Medina, 2007). Peer tutor model involves a class size where students are grouped into 6-8 per group and one of the students act as the teacher. A peer tutor is the acquisition of knowledge and skill through active help and support among status equals or matched companions (Topping, 2005). High ability students act as a dedicated peer tutor for each group to assist the teacher who act as the facilitator. Peer tutor model is suitable for the medium class to large class (Chung & Chow, 2004). In the peer tutor model, it is the responsibility of the students to
organise their time to enable the group to meet regularly and function efficiently. The peer tutor serves as a role model for fellow students and provides valuable insight to the teacher on how well each group is working and identifies any problem. These two models floating facilitator and peer tutor should be able to enhance the thinking, communication, team spirit and problem-solving skills in electrical installation and maintenance. Each of these PBL models will be applied in this study so as to ascertain which of the two will be more effective in the acquisition of practical skills.

Practical skill is in psychomotor domain. Psychomotor deals with the development of muscular skills and coordination including the use of senses and the brain. Psychomotor emphasizes motor skill, manipulation of materials, objects or any performance task requiring neuromuscular coordination Krathwohl, Bloom and Masia in (Fakorede, 2011). Psychomotor could be a performance task as simple as using a screwdriver to fasten a screw or as complex as using series of tools and instruments to detect and repair electric machine faults which require critical thinking. Different taxonomy has been developed and used over the years in an attempt to define psychomotor skills among which are; Seymour, Hauenstenin, Simpson, Harrow, Cratty, Dave and Hoover (Okwelle, 2013). The psychomotor achievement of students is the translation of their performances in practical test into scores which indicates the skills they have acquired through training especially in electrical installation and maintenance. The capacity of students to engage themselves meaningfully in any educational task depends on their ability level.

Ability level enables students to understand and transfer understanding from one situation to another. Ability level is the characteristic mode of functioning that a student exhibits in intellectual activities in a highly consistent and persuasive way (Adeyemo, 2010). The ability level of students is a construct of their academic achievement (Aremu, 2001). Alant (2004) studied students’ intellectual ability and discovered that students of varying ability levels performed differently depending on the type of instructional method but Salami (2000) discovered that students performance depends on their cognitive ability. Therefore, ability level is the rate at which a student performs a specific task. Eze (2002) observed that high ability students outperform their average and low ability counterparts in respect of achievement in the physical chemistry units. The expectation appears to be that those classified as high ability learners would achieve higher than their average and low ability counterparts in most college subjects. However, there are indications that with the myriad of college subjects and teaching techniques that abound, this expected trend in achievement do not always hold. While Udoetuk (2007) observed that students’ ability level is a significant factor in their academic achievement with the high-level students benefitting more from particular teaching methods than their low ability counterparts in Electrical/Electronics, Oyenuga (2010), however, observed that no ability group achieved better than the other. This inconsistency on the extent to which students of different academic abilities benefit from particular teaching methods underscores the need for this study to explore the effect of Floating facilitator on students ability in electrical installation and maintenance work. Some of the factors that influence ability are teaching and training facilities, traditionalism,
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insufficient finances, laziness, inadequate knowledge and inadequate facility for the instructional program (Okorie, 2001). Each of the factor affects the achievement of students. Hunt, Wanderley, and Kirk (2000) and Anene (2005) stated that achievement is quantified by a measure of students’ academic standing about those of other students tested with the same instrument. Therefore, psychomotor achievement of students in electrical installation and maintenance work could depend on the teaching methodology and motivating factor (either intrinsic or extrinsic), ability and gender.

Although studies reported that gender had no significant influence on achievement (Udofia, 2009; Usoro, Akpan & Ekpo, 2010). Mbaba (2006) and Ugbonabo (2009) reported otherwise. There is, therefore, the need to find out the effects of floating facilitator and peer tutor instructional approaches on gender in electrical installation and maintenance. Though, literature abounds regarding the efficacy of floating facilitator model and peer tutor model (Heller, Keith, & Anderson, 1992), these models to teaching do not seem to be popular among electrical installation and maintenance teachers. It becomes necessary to provide information and evidence on the effects of these modes of instruction (floating facilitator and peer tutor) on students’ psychomotor achievement, gender and ability level in electrical installation and maintenance in technical colleges in Ondo State.

**Research Questions**

The following research questions were formulated to guide this study

1) What is the effect of floating facilitator and peer tutor instructional approaches on students’ psychomotor achievement in electrical installation and maintenance?

2) What is the influence of gender (male and female) on students’ psychomotor achievement when taught with floating facilitator and peer tutor instructional approaches in electrical installation and maintenance?

3) What is the influence of ability level on students’ psychomotor achievement when taught with floating facilitator and peer tutor instructional approaches in electrical installation and maintenance?

**Hypotheses**

The following null hypotheses were formulated and tested at 0.05 level of significance

H01: There is no significant difference between the effect of floating facilitator and peer tutor instructional approaches on students’ psychomotor achievement scores in electrical installation and maintenance.

H02: There is no significant difference on the influence of gender (male and female) on students’ psychomotor achievement when taught with floating facilitator and peer tutor instructional approaches in electrical installation and maintenance.
Ho3: There is no significant difference on the influence of ability level on students’
psychomotor achievement when taught with floating facilitator and peer tutor
approaches in electrical installation and maintenance.

METHODS

Design of the Study
The study adopted quasi-experimental design. Specifically, the pre-test post-test non-
equivalent treatment group design was adopted for the study. According to Gall, Gall
and Borg (2007), quasi experimental research design permits the use of intact classes.
This design was adopted because it was not possible for the researchers to randomly
sample the subjects and assign them to groups without disrupting the academic
programme and the timetable of the technical colleges involved in the study. Hence,
the design was considered to be quite suitable for conducting this study. The design is
illustrated below

Group A:  O₁  X₁  O₂

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Group B:  O₁  X₂  O₂

Where:
X₁ = Peer tutor treatment group
X₂ = Floating facilitator treatment group
O₁ = Pre test for both groups
O₂ = Post test for both groups
--- = Non equivalent treatment groups

Area of the Study
This study was carried out in Ondo State of the South-Western zone of Nigeria. The
state is noted to be the only state in the zone where technical colleges have a separate
ministry called Ministry of Adult, Technical and Vocational Education. Ondo state
has five state technical colleges offering Electrical Installation and Maintenance
Works. These technical colleges are Government Technical College, Owo, Government
College, Okeigbo.

Population for the Study
The population for this study comprised all 188 second year students of 2015/2016
session in Electrical Installation and Maintenance of Technical Colleges in Ondo
State. Records show that they were 188 in number as at November 2015. This information was obtained from the Director School Service Ministry of Adult, Technical and Vocational Education Akure, Ondo State. This consists of 159 males and 29 females.

Sample and Sampling Techniques

Purposive sampling technique was used to select four out of the five technical colleges in Ondo State. The reason for the selection is that the four colleges have had their electrical installation and maintenance department has been accredited by National Board for Technical Education, Kaduna. The total number of students in the four schools was 171 second year 2015/2016 Electrical installation and maintenance students made up of 143 males and 28 females.

Simple random sampling by balloting was used to select two colleges each as experimental group for floating facilitator model and the remaining two colleges as experimental group for peer tutor model. Intact class in each of the two colleges for peer tutor instructional approach was labeled experimental group A and intact class in each of the two other colleges for floating facilitator instructional approach was labeled as experimental group B. The four colleges were mixed in a sack and selected randomly, the first two colleges picked was labeled experimental group A while the other two colleges was labeled experimental group B. Technical colleges in Owo and Okitipupa formed the group A treatment group that used peer tutor instructional approach, while Oke-igbo and Iwaro-Oka formed group B treatment group that used floating facilitator instructional approach.

Instrument for Data Collection

The instrument the researchers used for collecting data comprises a response instrument captioned Electrical Installation and Maintenance Psychomotor Test (EPT). The EPT was adapted from NABTEB examination practical questions which were generated from the topics treated in the experiment and developed by the researchers. Dave psychomotor taxonomy was used to ensure content validity of the. The EPT was a process performance test which was used to test the students’ practical skills in electrical installation and maintenance. A 4 point rating scale was used as a scoring guide for raters in rating the students. The time taken to complete each task determined the score of each student. For each task, any student that completed the task in less than ten minutes scored 4 marks. For the task completed between ten to fifteen minutes 3 marks; when a task is completed between fifteen to twenty minutes such student scored 2 marks, while 1 mark is for any of the task the student could not complete within the stipulated time. Hence, the maximum score of student is 120 marks while the minimum was 30 marks. The EPT consists of practical question tests.
Validation of the Instrument

The EPT with its appropriate rating scale, floating facilitator lesson plan and peer tutor lesson plan was face validated by five experts. The validates included one lecturer from Industrial Technical Education department, University of Nigeria, Nsukka; one lecturer from Federal University of Technology, Minna; one measurement and evaluation experts from Faculty of Education, University of Nigeria, Nsukka; one lecturer from Federal College of Education (Tech) Akoka, Lagos and one electrical installation and maintenance teacher from the technical college.

In the face validation exercise, the validates were served with a copy of each of the instrument for validation. Based on their corrections and suggestions, preliminary screening and revision of the instrument was done by the researchers.

Reliability of the Instrument

The reliability of the Electrical Installation and maintenance Psychomotor Test (EPT) was established after corrections suggested by the experts have been incorporated into the final draft of the instrument. Trial testing of the instrument was carried out for the purpose of obtaining the stability which took an interval of six weeks.

Inter-rater reliability was used to determine the scorer reliability of the EPT. Three teachers used the scoring guide to rate the students in the pilot tested class on industrial installation to enable the researchers to establish the degree of consistency of the scores given to the same student by three different raters. The lesson plan and EPT were trial-tested on equivalent sample of electrical installation and maintenance students in Government Technical College Ado Ekiti and Ikole-Ekiti of Ekiti State respectively. Government Technical College Ado-Ekiti used the floating facilitator lesson plan while Government Technical College Ikole-Ekiti used the peer tutor lesson plan, this lasted for six weeks. The intact classes of second year electrical installation and maintenance practice students in Government Technical College, Ado-Ekiti and Ikole Ekiti were not part of the study. They were therefore used to test the reliability of the instrument, since they use the same NABTEB syllabus and the colleges were part of the technical colleges in old Ondo State.

The floating facilitator lesson plan and peer tutor lesson plan was trial tested to see how effective it will be in following the PBL criteria and to know if the ill structured problem helped in achieving the specific objectives. The EPT was administered on same students and rated simultaneously by three teachers of the department using the scoring guide. Thereafter, the inter rater coefficient was established for the EPT by using Kendall’s coefficient of concordance which was 0.98. According to Sidney and Catellan in Raymond (2013), Kendall coefficient of concordance can be used for assessing agreement among different raters on an issue or test, this is with a view to assess the consistency of the raters arriving at a common or near common scores/agreement. Three different instructors in Electrical Installation and Maintenance Practice were involved in the administration of the EPT instrument in
their various colleges hence; there is the need to assess the consistency or the coefficient of agreement among different ratters.

**Experimental Procedure**

The study was conducted during the normal school lesson period after the permission to conduct the study has been obtained from the college principals. Electrical teachers teaching in the same college and who have been assigned to teach industrial installation for year two were used in each group. After identifying the teachers, they were trained together for five days by the researchers on how to use the lesson plan and their role as floating facilitator and the role of the peer as a tutor at the Ministry headquarters office in Akure. Thereafter, the teachers returned to their classes and train the students on their role in a Problem Based Learning environment and each teacher grouped the student making each group heterogeneous, in ability level and gender. Since the experiment required two groups for treatment, two colleges were selected for each of the experimental group through simple random sampling. The students in each of the four intact classes constituted the sample (171 students) used for the study.

The ability level of the students were classified by their teacher and coded into three using the following criteria as agreed by the teachers during the training:

1. **High Ability:-** was for those who had 70 and above in the electrical installation examination for the previous term conducted in their college
2. **Average Ability:-** for those that scored 40 to 69% in the electrical installation examination for the previous term conducted in the college by their teachers
3. **Low Ability:-** was for the students who scored below 40% in the electrical installation examination for the previous term conducted in the college by their teachers

Floating facilitator model lesson plan and peer tutor model lesson plan was used to cover the six weeks and served as guide to the teacher. The lesson plan was based on the industrial installation topics in NABTEB syllabus for year two students. The lesson plans were the experimental treatment used by each group for the study. Floating facilitator group used floating facilitator lesson plan, while peer tutor group used peer tutor lesson plan.

Electrical installation and maintenance Psychomotor Test (EPT) pre-test was administered to both experimental groups before the experiment commenced by the teacher in each group and scored using the scoring guide. In the pre-test, EPT questions were distributed along with the material and equipment for the practical while the teacher used the rating scale to rate each student.

After the pre-test had been administered, the regular Electrical and Maintenance Work class teachers in the various colleges started the experiment. The teacher in each group gave the students in their respective group and college five days training based on the training they had received earlier. The training enabled the students to know
what was required of them either as a group member, tutor or tutee and the teacher as a facilitator. The teachers used the appropriate instructional procedure that was developed from the test blueprint for their group. This guiding principle was the outcome of five days training received during the pre-experimental conference organized by the researchers. During the training, the researchers discussed with them what would be required of them during the experiment. The experiment was done during the normal college hours using the college time table for classes. The duration of the experiment was conducted in ten weeks. The first week was for the teacher to administer the pre test to the students and to train the students, while the students use the lesson on conduit for two weeks to see how each model works. Thereafter, the experiment took its full course for six weeks; each lesson plan topic took two weeks to complete. At the end of the experiment, the teachers administered the post test to the students in the two groups. The pre-test and post test psychomotor achievement questions was the same in content for both groups. The data collected for the pre-test and post test on the instruments was kept separately for the two groups, which was used to answer the research questions and hypotheses for the study.

Control of Extraneous Variables
The extraneous variables which might have occurred during the experiment were controlled in order to ensure valid and reliable results. These variables included those arising from the teacher, inter group, instructional procedure and test takers interaction.

Teacher Variable
The researchers did not do the actual teaching of the experimental groups in the various colleges. The actual teaching was done by the regular Electrical Installation and Maintenance teachers of the various colleges. In order to ensure total errors that might arise from teacher variable did not affect the findings of the study, the researchers organized five days training on how to use the lesson plan for all the teachers that participated in the study before the commencement of the experiment. The training took care of the teacher’s individual differences by giving them the same pattern of instruction to be used for the study. A uniform lesson plan was used by the teachers for the study in each of the groups.

Inter-group Variables
Since the participants in intact classes are non equivalent groups, Analysis of Covariance (ANCOVA) was used for data analysis to take care of the initial differences between the groups in order to eliminate the errors of non equivalence.
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**Instructional Procedure Variable**

The extraneous variable which might arise from instructional procedure was controlled by ensuring that the instructional procedure is the same for the teachers in all the colleges used for the study. The same lesson plan covering the same content was provided for the teachers in each group.

**Subject Interaction**

In each of the colleges that were used for the study, the researchers used an intact class. This was to avoid the experimental group students from mixing up with each other so that they will not exchange ideas. The subject teachers were used to teach the class.

**Treatment Bias**

Students in both groups (Floating facilitator and peer tutor) were not informed or made to understand anything about the research process so that student will not exhibit their natural behaviours during the experiment. In addition, the test question papers were withdrawn from the students and teachers immediately after the pre-test to avoid students becoming test wise.

**Irregular Participation and Experimental Mortality**

In order to ensure that the students participate fully and that they do not ‘kill’ the purpose of this experiment, the researchers ensured that roll call of the students was taken in each sampled colleges before the commencement of each lesson and during tutorial group sessions. Students were advised not to miss any of the lesson periods. With this, the researchers were able to control irregular participation and experimental mortality.

**Method of Data Collection**

The teacher that taught each group administered the pre-test on the students in the treatment groups, before treatment using EPT. During the EPT post-test, equivalent test item was used which was carried out by same teachers who taught each group. The teacher rated the students in both pre and post-test for EPT which was based on the specific tasks using the EPT scoring guide.

**Method of Data Analysis**

Data collected was analyzed using descriptive and inferential statistics. Mean was used to answer all the research questions while standard deviation was used to interpret the mean. The pre- test post- test mean difference score of each of the
treatment group was computed to determine the effect of floating facilitator and peer tutor on psychomotor achievement and partial eta square to interpret the strength of the different effect size. Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 levels of significance. Analysis was carried out using the Statistical Packages for Social Sciences Version 20 (SPSS 20).

RESULTS

Research Question 1

Data obtained from EPT administered to students in floating facilitator and peer tutor instructional approaches were analyzed and the results used to answer this research question. Summary of result obtained for the two groups is shown in Table 1.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Pretest/Posttest Mean difference score</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>N</td>
<td>x̄</td>
<td>SD</td>
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<tr>
<td>A</td>
<td>59</td>
<td>59</td>
<td>31.19</td>
<td>0.99</td>
</tr>
<tr>
<td>B</td>
<td>112</td>
<td>112</td>
<td>35.40</td>
<td>3.67</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>171</td>
<td>33.94</td>
<td>3.63</td>
</tr>
</tbody>
</table>

Data presented in Table 1 shows the pretest and posttest Electrical installation and maintenance Psychomotor Achievement Test (EPT) mean scores in experimental group A and B. A one-way between-groups Analysis of Covariance was conducted to compare the effectiveness of two different treatments designed to improve the psychomotor achievement of students in Electrical Installation and Maintenance. The independent variable was the type of treatment (floating facilitator, peer tutor) and the dependent variable consisted of scores on the EPT administered after treatment was completed. Students’ scores on the pre-test of the EPT were used as the covariate in this analysis. The students who were taught using peer tutor instructional approach (Group A) had a pre-test EPT mean scores of 31.19 with a standard deviation of 0.99 and post-test mean achievement scores of 107.61 with a standard deviation of 6.90. This gives a pre-test/post-test mean difference score as 76.42. The students who were exposed to the floating facilitator model (Group B) had a pre-test mean achievement score of 35.40 with a standard deviation of 3.67 and post-test (EPT) mean score of 104.21 with a standard deviation of 5.26. This gives a pre-test/post-test mean difference of 68.81. Peer tutor group and floating facilitator group did better in EPT
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though the mean difference score for peer tutor is higher compared to the students who were taught using floating facilitator. This provides support that the peer tutor instructional approach improved EPT than the floating facilitator model. The partial eta square for the two treatments was .13 which was large. This suggests that the effects size on students who were exposed to peer tutor and floating facilitator was strong.

Research Question 2

Data obtained from EPT administered to research subjects in floating facilitator and peer tutor models were analyzed and the results used to answer this research question. Summary of result obtained for the two groups is shown in Table 2

Table 2: Pre-test and Post-test Mean Scores for Male and Female Group taught with Floating Facilitator and Peer Tutor Instructional Approaches on Electrical Installation and Maintenance Psychomotor Test (EPT).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Pretest/Posttest</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>x̄</td>
<td>SD</td>
<td>N</td>
</tr>
<tr>
<td>Male</td>
<td>143</td>
<td>34.06</td>
<td>3.61</td>
<td>143</td>
</tr>
<tr>
<td>Female</td>
<td>28</td>
<td>33.36</td>
<td>3.74</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>33.95</td>
<td>3.63</td>
<td>171</td>
</tr>
</tbody>
</table>

Data presented in Table 2 shows the pretest and posttest mean psychomotor scores for students based on their gender. A one–way between-groups Analysis of Covariance was conducted to compare the influence of male and female participants. The independent variable was gender (male, female) and the dependent variable consisted of scores on the EPT administered after treatment was completed. Students’ scores on the pre-test administration of the EPT were used as the covariate in this analysis. The males in the floating facilitator groups and peer tutor groups had a pre-test mean score of 34.06 with a standard deviation of 3.61 in Electrical installation and maintenance Psychomotor Test (EPT); while their post-test mean psychomotor score were 106.09 with a standard deviation of 4.52. This resulted to a pre-test and post-test mean difference score of 72.03. Females in the floating facilitator and peer tutor instructional approach had a pre-test mean score of 33.36 with a standard deviation of 3.74 while their post-test mean psychomotor score was 105.38 with a standard deviation of 10.43. This gives a pre-test and post-test mean difference score of 68.39. The partial eta squared for gender was .07. This indicated that the strength of the effect size was moderate on gender.
Research Question 3
Data obtained from EPT administered to research subjects in floating facilitator and peer tutor models were analyzed and results obtained used to answer this research question. Summary of result obtained for the three groups is shown in Table 3

Table 3: Pre-test and Post-test Psychomotor Mean Scores of Students in Electrical Installation and Maintenance by their Ability Levels.

<table>
<thead>
<tr>
<th>Ability Level</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Mean difference</th>
<th>Mean difference</th>
<th>Mean difference</th>
<th>Mean difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>x̄</td>
<td>SD</td>
<td>N</td>
<td>x̄</td>
<td>SD</td>
</tr>
<tr>
<td>High</td>
<td>35</td>
<td>32.80</td>
<td>3.60</td>
<td>35</td>
<td>104.91</td>
<td>7.29</td>
</tr>
<tr>
<td>Average</td>
<td>100</td>
<td>34.46</td>
<td>3.57</td>
<td>100</td>
<td>106.37</td>
<td>5.40</td>
</tr>
<tr>
<td>Low</td>
<td>36</td>
<td>33.63</td>
<td>3.63</td>
<td>36</td>
<td>103.08</td>
<td>6.05</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>33.95</td>
<td>3.63</td>
<td>171</td>
<td>105.38</td>
<td>6.08</td>
</tr>
</tbody>
</table>

Data in Table 3 shows the mean psychomotor scores of students’ ability levels for the two experimental groups. A one-way between-groups Analysis of Covariance was conducted to see whether ability level is acting as moderator variable in influencing the effectiveness of the two treatments to improve the psychomotor achievement of students in Electrical Installation and Maintenance. The independent variable was the ability levels (high, average, low) and the dependent variable consisted of scores on the EPT administered after treatment was completed. Students’ scores on the pre-test administration of the EPT were used as the covariate in this analysis. The high ability level in the floating facilitator and peer tutor groups had a pre-test psychomotor mean score of 32.80 with a standard deviation of 3.60; while their post-test psychomotor mean score was 104.91 with a standard deviation of 7.29. This resulted in a mean difference of 72.11. The high ability level group scored higher with 0.2 than the average ability group and 2.66 higher than the low ability group. Average ability level students in the floating facilitator and peer tutor group had a pre-test psychomotor mean score of 34.46 with a standard deviation of 3.57; while their post-test psychomotor mean score was 106.37 with a standard deviation of 5.40. This resulted in a mean difference score of 71.91. The average ability group performed better with 2.26 than the low ability group. The low level ability students in both floating facilitator and peer tutor groups had a psychomotor mean score of 33.63 with a standard deviation of 3.63; while their post-test means score was 103.08 with a standard deviation of 6.05. The low level ability students mean gain score was 69.45. Hence, the mean score differences imply that floating facilitator and peer tutor
Effects of Floating Facilitator and Peer Tutor Instructional Approach

Instructional approaches has higher effect on mean psychomotor achievement scores of the high and average ability groups than the low ability group. The partial eta squared for ability level was .05 which indicated that the strength of the effect size was small. The influence of ability is small.

**Hypotheses**

**Table 4**: Summary of Analysis of Covariance (ANCOVA) of Students Psychomotor Achievement in Electrical Installation and Maintenance by Treatment

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>PartialEta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>820.224</td>
<td>2</td>
<td>410.112</td>
<td>12.628</td>
<td>.000</td>
<td>.131</td>
</tr>
<tr>
<td>Intercept</td>
<td>11138.725</td>
<td>1</td>
<td>11138.725</td>
<td>342.977</td>
<td>.000</td>
<td>.671</td>
</tr>
<tr>
<td>Pretest</td>
<td>372.243</td>
<td>1</td>
<td>372.243</td>
<td>11.462</td>
<td>.001</td>
<td>.064</td>
</tr>
<tr>
<td>Treatment</td>
<td>801.374</td>
<td>1</td>
<td>801.374</td>
<td>24.675</td>
<td>.000</td>
<td>.128</td>
</tr>
<tr>
<td>Error</td>
<td>5456.068</td>
<td>168</td>
<td>32.477</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1905226.000</td>
<td>171</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>6276.292</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*a. R Squared = .131 (Adjusted R Squared = .120)*

The results presented in Table 4 shows F-calculated values for treatment on students’ psychomotor achievement in electrical installation and maintenance. A one-way between-groups Analysis of Covariance was conducted to compare the effectiveness of two different treatments designed to improve the psychomotor achievement of students in Electrical Installation and Maintenance. The independent variable (floating facilitator, peer tutor) and the dependent variable consisted of scores on the EPT administered after treatment was completed. Students’ scores on the pre-test administration of the EPT were used as the covariate in this analysis. After adjusting for pre-test scores on psychomotor achievement in electrical installation and maintenance F (1, 168) = 24.68, p = .00, partial eta squared = .13, the F-calculated for treatment was 24.68 with a significance of F at .000 which is less than .05 and partial eta squared of .13. Therefore the null hypothesis was rejected at 0.05 level of significance. With this result, there was a significant difference in electrical installation and maintenance psychomotor achievement score of students taught with floating facilitator model and those taught with peer tutor model. There was strong significance difference between the effects of floating facilitator and peer tutor instructional approaches on students’ psychomotor achievement scores in electrical installation and maintenance as indicated by the partial eta squared of .13.
Ho2:

Table 5: Summary of Analysis of Covariance (ANCOVA) of Students Psychomotor Achievement in Electrical Installation and Maintenance by Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>449.249*</td>
<td>2</td>
<td>224.625</td>
<td>6.476</td>
<td>.002</td>
<td>.072</td>
</tr>
<tr>
<td>Intercept</td>
<td>19929.801</td>
<td>1</td>
<td>19929.801</td>
<td>574.598</td>
<td>.000</td>
<td>.774</td>
</tr>
<tr>
<td>Pretest</td>
<td>8.025</td>
<td>1</td>
<td>8.025</td>
<td>.231</td>
<td>.631</td>
<td>.001</td>
</tr>
<tr>
<td>Gender</td>
<td>430.399</td>
<td>1</td>
<td>430.399</td>
<td>12.409</td>
<td>.001</td>
<td>.069</td>
</tr>
<tr>
<td>Error</td>
<td>5827.043</td>
<td>168</td>
<td>34.685</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1905226.000</td>
<td>171</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>6276.292</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .072 (Adjusted R Squared = .061)

The data presented in Table 5 is a one–way between-groups Analysis of Covariance was conducted to compare the influence of male and female participants. The independent variable was gender (male, female) and the dependent variable consisted of scores on the EPT administered after treatment was completed. Students’ scores on the pre-test administration of the EPT were used as the covariate in this analysis. After adjusting for pre-test scores, there was significant difference between male and female on post-test scores on students psychomotor achievement in electrical installation and maintenance, \( F (1, 168) = 12.41, p = .001, \) partial eta squared = .069. The \( F \)-calculated for gender was 12.41 with a significance of \( F \) at .001 and partial eta squared value of .069. The significance value .000 was less than .05 therefore; the null hypothesis was rejected at .05 level of significance. The result then indicates that there significant influence of gender (male and female) on students psychomotor achievement score in electrical installation and maintenance is moderate based on the partial eta squared.
Table 6: Summary of Analysis of Covariance (ANCOVA) of Students Psychomotor Achievement in Electrical Installation and Maintenance by Ability Level

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>301.132a</td>
<td>3</td>
<td>100.377</td>
<td>2.805</td>
<td>.041</td>
<td>.048</td>
</tr>
<tr>
<td>Intercept</td>
<td>20029.620</td>
<td>1</td>
<td>20029.620</td>
<td>559.809</td>
<td>.000</td>
<td>.770</td>
</tr>
<tr>
<td>Pretest</td>
<td>5.642</td>
<td>1</td>
<td>5.642</td>
<td>.158</td>
<td>.692</td>
<td>.001</td>
</tr>
<tr>
<td>Ability Level</td>
<td>282.281</td>
<td>2</td>
<td>141.140</td>
<td>3.945</td>
<td>.021</td>
<td>.045</td>
</tr>
<tr>
<td>Error</td>
<td>5975.161</td>
<td>167</td>
<td>35.779</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Corrected</td>
<td>6276.292</td>
<td>170</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1905226.000</td>
<td>171</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .048 (Adjusted R Squared = .031)

The data presented in Table 6 is a one–way between-groups Analysis of Covariance was conducted to compare the influence of students’ ability level. The independent variable was the ability levels (high, average, low) and the dependent variable consisted of scores on the EPT administered after treatment was completed. Students’ scores on the pre-test administration of the EPT were used as the covariate in this analysis. After adjusting for pre-test scores, there was significant difference between ability levels on post-test scores on students psychomotor achievement in electrical installation and maintenance, $F (2, 167) = 3.95$, $p = .02$, partial eta squared = .05. There was a small influence between ability levels scores on students psychomotor achievement as indicated by a partial eta squared .05. The F-calculated for ability level was 3.95 with a significance of F at .02 and a partial eta squared of .05. The significance value was less than .05 hence, the null hypothesis was therefore rejected at .05 level of significance. With this result, there was small significant influence of students’ ability level on psychomotor achievement when taught with floating facilitator and peer tutor model in electrical installation and maintenance. To enable the researchers to know which of the influence of the students ability level is significant, a post hoc using Scheffe was conducted as indicated in Table 7.

**DISCUSSION**

The data presented in Table 1 provided answer to research question one, findings revealed that students in each group performed well as supported by Omeje (2014), Afolabi and Akinbobola (2009), Bilgin, Senocak and Sozibilir (2009). Students taught electrical installation and maintenance with peer tutor had a higher mean psychomotor achievement score difference than those taught with floating facilitator in Electrical installation and maintenance with a strong effect size. At the same time, Analysis of Covariance was used to test the first hypothesis, Table 4 at the F-value (24.68),
Theresa C. Ogbuanya and Ifeoluwa Reuben Akinduro

significance of $F (.000)$, confidence level of .05 and partial eta squared, there was strong significant difference between mean psychomotor achievement scores of students taught electrical installation and maintenance with floating facilitator and those taught with peer tutor instructional approach. This finding corresponds with the findings of Dennis, Canas and Ortega-Medina (2007), who sees peer tutor as an effective strategy that engages students and promotes success. Also, Omeje (2014), who confirmed that floating facilitator had low achievement than fixed facilitator this was further collaborated by Akinoglu and Tandogan (2007).

The data presented in Table 2 provided answer to research question 2. Findings revealed that both male and female students recorded improved psychomotor achievement in Electrical installation and maintenance and with a moderate effect size. This gives credence to Maigida (2013) who said irrespective of gender, learner will record improved performance in achievement. From the findings, male students had higher mean difference scores than female students in the Electrical installation and maintenance. This findings appear to support the views of Mbaba (2006), Ugbonabo (2009) who believed that male students perform better than female students. Analysis of Covariance was employed to test the second hypothesis in Table 5. At the calculated F-value 12.409 with a significance of $F$ at .001, confidence level of .05 and partial eta squared of .07, there was moderate significant mean difference between the influence of gender on students psychomotor achievement when taught using floating facilitator and peer tutor instructional approach. This is supported by Raymond (2013) who found that there was gender effect on students skill achievement in electronics work. This result contradicts Omeje (2014), Afolabi and Akínóbólá (2009), Ugwuadu and Nzéwi (2012), Oyenuga (2010) and Fatokun (2006) who found that that there was no significant influence of gender on their various subjects. Analysis of Covariance (ANCOVA) was employed to test the fourth hypothesis in Table 8. At the calculated F-value of .287 with a significance of $F$ at .593, confidence level of .05 and partial eta squared of .002, there was no significant interaction effect of gender influence on students psychomotor achievement in electrical installation and maintenance. This result is supported by Fakorede (2011) who said there is no interaction effect between treatment and gender.

The data presented in Table 3 provided answer to research question three. Findings revealed that high ability group outperform their average and low ability group. The findings is in tandem with Eze (2002) findings who observed that high ability students outperform their average and low ability counterparts in respect of achievement in physical chemistry unit. Udoetuk (2007) also supports that students in high ability benefit more from a particular teaching methods than their low ability counterparts in electrical/electronics, this is collaborated by Salami (2000), Igboko (2004) and Olayinka, Oyenuga and Owoso (2011). It then indicates that the floating facilitator and peer tutor instructional approaches is not defective hence, high ability students perform better than others. However, the findings differ from the views of Oyenuga (2010) who observed that no ability group achieved better than the others. Analysis of Covariance was used to test the third hypothesis in Table 6 at the calculated F-value 3.945, significance of $F$ .001, confidence level of .05 and partial eta squared of .05,
Effects of Floating Facilitator and Peer Tutor Instructional Approach.

there was small significant difference between the ability level of students on psychomotor achievement when taught using floating facilitator and peer tutor to teach electrical installation and maintenance. Table 8 provided answer to hypothesis five where Analysis of Covariance was used to test the interaction effect between treatment and ability level with a calculated F-value 7.121, signifignicance of F .001, confidence level of .05 and partial eta squared of .08, there was moderate significant difference between in the interaction effect.

Implications of the Study

The findings of this study have implications for teachers, students, parent and curriculum planners. The study found out that the floating facilitator and peer tutor instructional approaches were both effective in enhancing students’ psychomotor achievement in electrical installation and maintenance although, peer tutor had stronger effect. The implication of this finding to curriculum planners is that they should develop appropriate curriculum that will make provision for the adoption of the floating facilitator and peer tutor instructional approaches for teaching electrical installation and maintenance to technical college students placing more emphasis on peer tutor instructional approach. Another implication from this study is that such curriculum developed will need to specify students and teachers activities that will aim at improving students’ psychomotor.

The peer tutor instructional approach has been found in this study to be more effective in enhancing students’ psychomotor achievement in electrical installation and maintenance. The implication to electrical teachers as well as other technical teachers is that there is need to adapt the use of peer tutor in technical colleges in order to improve students’ psychomotor achievement. More importantly, teachers need to put in place a heterogeneous ability group in their use of peer tutor approach.

Moreover, one of the important finding emerged from this study was that gender had small influence on psychomotor achievement and no significant interaction effect. This finding implied that female students should be encouraged to study electrical installation and maintenance like their male counterpart. Parents also should not be bias in allowing their female children to study the trade.

CONCLUSION

Given that electrical installation and maintenance in technical colleges equips graduates with skills to install, operate, maintain and repair electrically energized systems in residential, commercial and industrial buildings, the need to find out the best approach of teaching to assist technical college electrical installation and maintenance students to learn and improve their skills is paramount. Consequent upon this, the study determined the effects of floating facilitator and peer tutor instructional approaches on students’ psychomotor achievement in electrical installation and maintenance. It was found that the use of peer tutor instructional approach is more effective in improving students’ psychomotor achievement, gender and ability level of
electrical installation and maintenance than floating facilitator. It then therefore mean that peer tutor instructional approach is a dependable option for teaching and learning in the technological development as it promotes active and efficient learning which can lead to the acquisition of necessary skills for employment.

REFERENCES


A commissioned paper presented at the capacity building workshop for lecturers in Nigeria, Organized by ETF held at Abeokuta on 24th Aug, Akwa and Ikot Osura on 21st September and Auch on 2nd Nov.


