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Students Achievement and Interest in Elementary Structural Design: The Fixed Vs Floating Facilitator Approaches of Problem Based Learning

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ABSTRACT

The purpose of this study was to investigate the effect of fixed vs floating facilitator approaches of Problem-Based Learning (PBL) on students' achievement and interest in Elementary Structural Design (ESD). The design was quasi-experimental with a pretest-posttest nonequivalent 2 × 2 factorial design. The participants (78) were randomized to treatment conditions. The researchers conducted a repeated-measures analysis of variance and univariate analysis of variance to compare changes across the treatment groups. Results show that using the fixed facilitator model of PBL approaches is more effective in improving students' achievement, while both models increase students' interest in elementary structural design (ESD). Also, the study revealed that there was no influence attributable to gender on students' achievement and interest in ESD. Hence, the fixed facilitator instructional model was advocated for technical teachers to foster students' achievement and interest in ESD in Nigeria.

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Problem based learning; achievement; interest; elementary structural design; fixed facilitator; floating facilitator

Introduction

Elementary Structural Design (ESD) is a subject through which technology education students learn about the problems and behaviour of structures under the effect of different types of forces. At the college of education level in Nigeria, Elementary Structural Design (ESD) is a compulsory course for all the students undergoing technical education teacher preparation for the award of the Nigerian Certificate in Education (NCE) in Nigeria (National Commission for Colleges of Education [NCCE], 2008). ESD serves as an introductory course to the basic knowledge of structural principles related to structural behaviours', theory of structures, choice of structural materials and the design and analysis of 'the structure.

ESD aims to equip technical education students with the basic understanding of the concepts of ESD clearly and reason them mathematically; solve extended problems with good judgment in the choice of tools and materials and in checking solutions; make connections between different terminologies of the same idea and use elementary

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structural design to model realistic situations from technology education and the world of work. However, contrary to expectations, the level of students' achievement and interest in this all-important subject in recent times has not been encouraging (National Commission for Colleges of Education (NCCE, 2008).

For instance, between 2013 and 2017, the college of education students in South East had poor results with only 13.95% pass in 2014, 16.29% pass in 2015, 22.22% pass in 2016, while 18.35% passed in 2017. This continuous poor achievement undoubtedly reduces students' interest, leads to poor knowledge retention in ESD and has other adverse effects on the entire programme objectives. Therefore, there is a need to be much more concerned now in light of the rampant occurrence of structural failure that is witnessed today in Nigeria and other countries of the world. Because of other causes of structural failures, such as the use of sub-standard structural materials and use of non-professionals and quacks, poor workmanship resulting from lack of knowledge and skill by technicians and other professionals concerning adequate supervision of projects have been noted as the chief causes of structural failure (Akande et al. (2016).

Some researchers, including Bjorklund (2004) and Ogbu (2008), have stressed that the leading cause of poor achievement in technical subjects in Nigeria, ESD inclusive, results from inappropriate teaching methods, among other factors. Similarly, Oyelami (2000) stated that there had been a series of complaints about ineffective teaching among technical teachers in Nigeria. In a bid to 'cover' the course outline, most technical teachers use those methods that demand little effort on their part (Efunbanjo, 2001). Conventionally, most technical teachers use the lecture method, which posits the teacher as a fountain of knowledge and the students as mere listeners and note-copiers (Anaekwe, 1996). This method, according to Anaekwe, denies the students the opportunity to adopt a problem-solving approach to issues; as a result, their achievement and interest in learning are hampered.

However, some active learning and student-centred teaching and learning approaches, such as Case-based learning, Cooperative learning and Problem-based learning, have been recommended for teaching technical subjects (Federal Republic of Nigeria [FRN], 2013; NCCE, 2008; UNESCO, 2006). In line with this, some recent studies such as Orji and Ogbuanya (2018), Olelewe and Agomuo (2016) and Bakare and Orji (2019) have sought and advocated for the use of more efficacious methods of teaching technical education subjects. Specifically, McBroom & Orji (2015), Orji and Ogbuanya (2018) and McBroom & McBroom, 2001) advocated for problem-based learning (PBL) approach of teaching.

PBL is a student-centred, self-directed, integrated and contextual mode of learning. According to Rhem (1998), PBL can be defined as an instructional strategy where students confront problems and strive to find meaningful solutions. PBL is an instructional method through which fundamental knowledge is mastered by solving real-world problems. PBL has been widely perceived by many to confer advantages in promoting critical thinking, retention of knowledge, independent learning and interpersonal skills (Aytona, 2011; McBroom & McBroom, 2001; Richard, 2006). PBL is a pedagogical strategy that simultaneously develops problem-solving strategies and disciplinary knowledge-based skills by placing students in the active role of problem solvers.

There are various models of PBL approaches found in the literature. For instance, Raine and Symons (2012) outlined three standard models of PBL. They are the fixed facilitator or medical school model (or structured); floating facilitator model (or guided);

and hybrid (which combines traditional lecture with PBL model). The present study is based on fixed and floating facilitator models. These two models are chosen because the processes of their applications are in line with the problem-solving skills needed for effective learning of ESD. In the fixed facilitator model, the students are split up into groups of about 5–10. The teacher (facilitator) guides the students through their discussions of the problem. It is the responsibility of the teacher and the students to organize their time so that the group meets regularly during formal classroom sessions and functions efficiently. Typically, in the fixed facilitator model, there is little or no class time. The students do the work in their groups and with the facilitator, guiding every step of the group activity.

On the other hand, in the floating facilitator model, the teacher (facilitator) allows the students to work independently but moves around at intervals, from group to group, listening to the students and probing their understanding. According to İpek and Çalık (2008), the floating facilitator Model has the following features: more structured format, degree of instructor input into the learning issues, resources and student group work; instructor rotates through groups asking questions, guiding discussion when appropriate and checking to understand, a group size of 4–5 students, groups report on findings followed by whole-class discussion or mini-lectures, may be suitable for extensive, introductory-level courses or courses in which a facilitator is available to assist. In this model also, some class time is equally devoted to group reporting. Raine and Symons (2012) emphasized that this model is more structured, has a more significant degree of instructor input in preparing the learning issues and resources, which the students must follow independent of the teacher for group work, and facilitator rotates through groups asking questions when appropriate and checking groups that have problems.

Neville (2009) stated that the term 'model' is used in PBL in two senses: To provide a structure for carrying out each problem unit (for example, the fixed facilitator model) and to describe an instructional model (organization of class sessions, etc.). According to Wells et al. (2009), the factors to consider when choosing a model includes the following: class size, intellectual maturity of the learners, student motivation, course objectives and learning outcomes, instructor preferences and availability of teaching assistants or peer facilitators. Hence, these factors justified the choice of fixed and floating facilitator models in this study. The PBL models discussed above are student-centred learning, whereby learning is done in small student groups with the teacher as facilitator. Facilitation in whatever model is strictly based on meta-cognitive processes geared towards enhancing students' interest and achievement.

Besides the influence of teaching approaches and other related problems, gender has also been considered another important factor that mediates between cognitive achievement, interest and student retention of knowledge in elementary structural design. Some research reports, including those of Ezugwu (2010), Ogbu (2008) and Serkan (2011), indicated inconsistent findings on the influence of gender on students' achievement in technical and science subjects. Available literature has not been able to identify a single direction of difference in performance in elementary structural design between male and female students. Although some researchers have found boys achieving better than girls, especially on higher-order knowledge, a few others saw girls outperforming boys. In contrast, some others established no significant difference, particularly during early education. For instance, Olelewe et al. (2021) study showed no gender difference among electrical installation and maintenance work students when a team innovative pedagogy approach was used.

Furthermore, about twice as many girls as boys expressed no interest in mathematics at junior secondary school level (11–15) years old. Alio and Harbor-Peters (2000) found significant gender effects in their study in favour of males. Nwadi (2016) found no significant gender effects in his study and thus concluded that gender effects on students' learning remain a continuous topical issue. The inconsistencies in previous findings on the influence of gender on student achievement might be attributed to the adoption of passive instructional approaches that do not effectively improve students' capability to compete in a given course of study.

Expectantly, previous problem-based learning studies such as Orji and Ogbuanya (2018) and Afolabi and Akinyemi (2009) have shown that male and female students taught using PBL did not significantly differ in achievement scores. This indicates that in a PBL environment, male and female students are capable of competing and collaborating in a given course of study. Thus, performance is a function of orientation, not gender. Also, studies have shown that students exposed to problem-based learning approaches show a high level of academic and interest, which might be the reason for its effectiveness in enhancing students' achievement in many disciplines (Anyafulude, 2013; Applin et al., 2011; Fatade et al., 2013; Orji & Ogbuanya, 2018). The researcher, however, doubts its efficacy in ESD since less is known about its effectiveness on college of education student's achievement and interest in selected concepts of ESD. Therefore, this study tends to investigate the effect of fixed and floating facilitator of PBL on students' achievement and interest in selected concepts of elementary structural design. Specifically, the following research questions were formulated to determine if a significant difference exists

1.In the mean achievement scores on Elementary Structural Design Achievement Test (ESDAT) between students exposed to fixed facilitator and those exposed to the floating facilitator models of PBL approach?

2.In the mean interest scores of students exposed to the fixed and floating facilitator models of PBL approach?

3.In the mean achievement scores on ESDAT between male and female students exposed to fixed facilitator and floating facilitator models of PBL approach?

4.In the mean interest scores on ESDII between male and female students exposed to fixed facilitator and floating facilitator models of PBL approach?

Methodology

The study adopted a quasi-experimental design. Specifically, a pretest-posttest nonequivalent 2 × 2 factorial design was used. Quasi-experiment was used in this study because complete randomization of subjects to experimental groups was not possible (Borg et al. (2007).

The participants for this study include all the 73 (45 males and 28 females) National Certificate in Education (NCE II) students of Elementary Structural Design in Federal Colleges of Education Technical Umunze and Enugu State College of Education Technical Enugu who met the inclusion criteria. The sample size was confirmed to

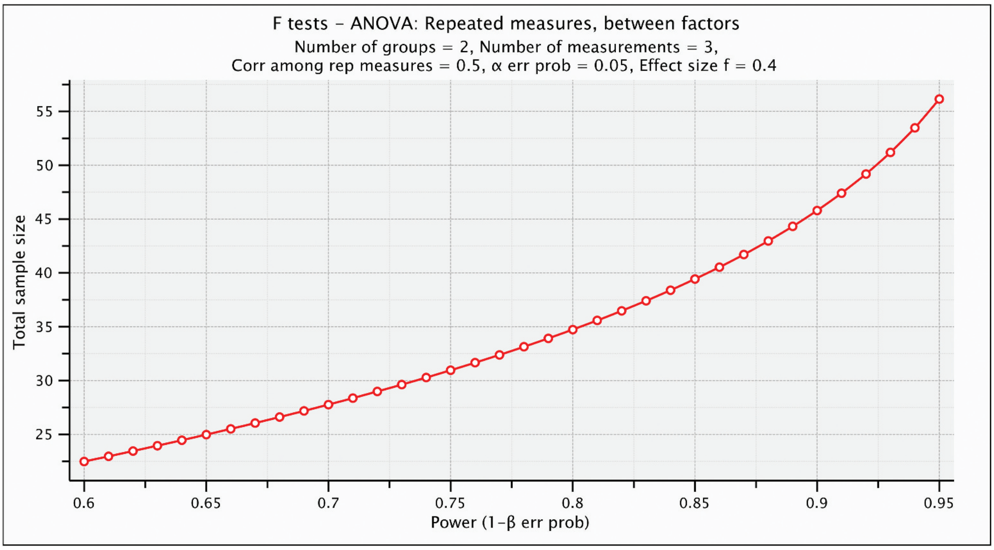

Figure 1. Effect size determination.

be acceptable for the study using GPower 3.1 software based on effect size f = 0.4, alpha (a = .05), power (1–b = .98) and statistical test (F tests – ANOVA: repeated measures, between factors) (Faul et al. (2007) (See Figure 1). Informed consent was obtained from the students and lecturers in writing. No sample was taken because of the manageable size of the population. However, the two classes from the two colleges were assigned to the treatment groups through balloting by the researchers.

Two instruments were used for this study. These include Elementary Structural Design Achievement Test (ESDAT) and Elementary Structural Design Interest inventory (ESDII). The ESDAT is a 40 multiple choice test covering structural forces, stress and strain, shear force and bending moments and was prepared by the researchers. This test served as a pre-test, post-test and follow-up in this study. A table of specifications was used to ensure that the test items have content validity and a fair and representative sample of questions in all the domains. In addition, Elementary Structural Design Interest Inventory (ESDII) is a 25-item instrument with five-point response options (1 = Strongly Disagree to Strongly Agree = 5) prepared by the researcher to ascertain students' interests in accomplishing tasks in elementary structural design concepts. The researcher carried out a trial testing in order to determine the reliability of ESDAT. The reliability of Elementary Structural Design Achievement Test (ESDAT) was determined using Kuder–Richardson Formula 20 (K-R 20). An internal consistency reliability estimate of .86 was obtained for ESDAT. Furthermore, a test of internal consistency was carried out for the elementary structural design students' interest inventory (ESDII) using Cronbach's Alpha. An internal consistency reliability estimate of .89 was obtained.

Before the commencement of treatment, the researcher trained the research assistants, who are regular classroom teachers, to ensure standard uniformity. The purpose of this study was made known to the research assistants and trained on the process of PBL. In order to be sure that the research assistants have mastered the skills, at the end of the training exercise, the researcher organized a mock session where the research assistants taught while the researcher monitored. This ensures that treatment is implemented as planned and each component is delivered comparably to all study participants over time.

Before administering treatment, the research assistants administered the pre-test ESDAT and ESDII to the students to determine their baseline equivalence before the commencement of the experiment. The research assistants formed teams of 5–6 students in different schools to optimize interaction among students having various characteristics, in line with the demands of problem-based learning approach. The two schools were assigned to the two experimental groups. The regular classroom teacher in the two schools instructed the experimental groups with the different PBL approaches. Regular contacts were made weekly with the lecturers to address practical or implementation difficulties and review treatment procedures. A total of three lesson plans were designed based on the two models of problem-based learning approach. Succinctly, the treatment for the ESD course lasted for eight weeks. However, the last three weeks (two lesson periods of two hours per period per week) focused on topics that had abstract concepts, namely, structural forces, stress and strain, shear force and bending moments, which were the specific interest of the study. Hence, ESDAT covered only the topics taught within these three weeks. The first instrument ESDAT covered only the topics stated above and served as a pre-test, post-test and follow-up in this study. Hence, the students were given all the content of ESD, but the last three weeks of treatment focused only on the stressed areas as stated.

After the administration of treatment, the post-test ESDAT and ESDII were administered. These students in their various schools were exposed to the same testing conditions during the test administration. Finally, four weeks after the post-test, a reshuffled version of ESDAT and the ESDII was administered as a follow-up test. The researcher compared the first and second administrations of the test to ascertain the difference that the exposure to the new teaching approach has made on students' achievement, interest and follow-up in Elementary Structural Design concepts.

Some measures were adopted to reduce the incidence of extraneous variables that may mar the experiment's outcome. The researcher made sure that their regular Elementary structural Design Teachers taught the students to eliminate experimental bias. To reduce the pre-testing effect, the researcher ensured that the test duration was not exceeded. The research assistants collected the question papers immediately after the pre-test administration. In contrast, the follow-up test was reshuffled before it was administered. The researchers ensured that the participating schools had a reasonable attendance policy with consequences for missing school to control attrition. The research assistants gave extra course credits to participants for active participation in the study. The researchers also used tokens to encourage participants' regular attendance and commitment to the program.

Data were analyzed using SPSS (version 20) and the level of significance was set at 0.05 for all tests. A 2 (group) x 3 time of testing (pre-test, post- test and follow-up test) repeated measures analysis of variance (ANOVA) was used to find out the actual improvements that have occurred during the intervention among the individual participants across treatment groups. In order to test for pretreatment group equivalence (pre-test –

Time 1) and differences by gender, the researchers used univariate ANOVA, while percentages were used to check participants' demographic characteristics equivalence Table 1.

Results

A 2 group x 3 repeated measures ANOVA was conducted to test the hypothesis between students exposed to fixed facilitator and those exposed to the floating facilitator models of the PBL approach. At Time 1, in Table 2, there were no baseline differences in ESDAT scores between participants in the two groups ($F[1,71] = 2.735$, $p = 0.718$ and η_p^2 =.002). At Time 2, the post-intervention results revealed a significant mean difference between fixed and floating groups from Time 1 to Time 2 ($F[1,71] = 27.170$, $p < 0.001$ and η_p^2 =.714). Follow-up tests the significant increase in ESDAT score that was retained after four weeks ($F\ [1,71] = 39.948$, $p < 0.001$, η_p^2 =.752) in the treatment group 1 but not in group 2.

Going forward, a similar analysis was also conducted to ascertain if there was a significant difference in the mean interest scores of students exposed to the fixed and floating facilitator models of PBL in elementary structural design. At Time 1, in Table 3, there were no baseline differences in ESDII scores between participants in the two groups

Table 1. Participant demographics.

Class		N	Percentage (%)
Tertiary Institution	[a]FCE(T) Umunze	36	49.3
	[b]ESCET Enugu	37	50.7
Gender	Male	45	61.7
	Female	28	38.4
Age	15–18 yrs	24	32.9
	19–20 yrs	29	39.7
	21–24 yrs	20	27.4
Study Hour	0–2 hrs	25	34.2
	2–5 hrs	30	41.1
	Above 5hrs	18	24.7

N = Sample, % = percentage, [a]FCE(T) Umunze = Federal College of Education (Technical) Umunze; [b] ESCET, Enugu = Enugu State College of Education (Technical) Enugu State.

Table 2. A 2 Group x 3 repeated measures analysis of variance (ANOVA) summary statistics on elementary structural design students' academic achievement by treatment conditions.

Measure	Assessment	Fixed group M±SD	Floating group M±SD	95% CI	*df*	F	Sig	η_p^2
ESDAT	Pre-test	28.50 ±3.44	28.84 ±4.44	27.36–30.32	1,71	2.735	.718	.002
	Posttest	86.69 ±7.97	41.08 ±5.18	32.68–89.39	1,71	27.170	.000	.714
	Follow-up	84.47 ±5.44	42.62 ±4.22	34.54–86.31	1,71	39.948	.000	.752

M = mean; SD = standard deviation; Df = degree of freedom; ESDAT = Elementary Structural Design Achievement Test.

Table 3. Mean interest scores of groups taught with fixed facilitator and floating facilitator models on elementary structural design interest inventory (ESDII).

Measure	Assessment	Fixed group M±SD	Floating group M±SD	95% CI	*df*	F	Sig	η_p^2
ESDII	Pre-test	48.14 ±3.96	49.73 ±4.29	46.79–86.31	1,71	.433	.104	.037
	Posttest	83.39 ±7.93	68.84 ±6.62	63.29–86.07	1,71	28.63	.000	.987
	Follow-up	77.86 ±9.17	66.76 ±5.92	61.45–80.97	1,71	13.46	.001	.932

M = mean; SD = standard deviation; Df = degree of freedom; ESDII = Elementary Structural Design Interest Inventory.

Table 4. Summary statistics for univariate analysis of variance (ANOVA) of treatment groups by gender.

Measures	Assessment	Male (n = 45) M±SD	Female (n = 28) M±SD	*df*	F	Sig
ESDAT	Pre-test	29.13 ±3.89	27.93 ±4.02	1,71	.826	.208
	Posttest	59.91 ±29.73	69.46 ±28.89	1,71	1.304	.182
	Follow-up	61.36 ±27.17	66.32 ±28.04	1,71	.004	.456
ESDII	Pretest	48.82 ±4.07	49.14 ±4.42	1,71	.321	.751
	Posttest	75.62 ±15.43	76.64 ±14.30	1,71	.195	.778
	Follow-up	71.44 ±14.26	73.50 ±14.01	1,71	.000	.549

M = mean; SD = standard deviation; Df = degree of freedom; ESDII = Elementary Structural Design Interest Inventory; ESDAT = Elementary Structural Design Achievement Test.

(F[1,71] = .433, p = 0.104 and η_p^2 =.037). At Time 2, the post-interest results revealed significant increases from Time 1 to Time 2 (F[1,71] = 28.631, p < 0.001 and η_p^2 =.987) for both groups. At follow-up, there was also a significant increase in ESDII scores after four weeks (F[1,71] = 13.461, p < 0.001 and η_p^2 =.932) in treatment group 1 but not in group 2.

A univariate ANOVA was conducted to test the hypothesis that there is a significant difference in the mean achievement scores on ESDAT between male and female students exposed to fixed facilitator and floating facilitator models of PBL approach. As indicated in Table 4, there was no significant difference in the achievement scores of participants with regard to gender at time 1 (F[1,71] = .826 and p = .208), time 2 (F[1,71] = 1.304 and p = .182) and time 3 (F[1,71] = .004 and p = .456). See Table 4

In addition, a univariate ANOVA was also conducted to test the hypothesis that there is a significant difference in the mean interest scores on ESDII between male and female students exposed to fixed facilitator and floating facilitator models of PBL approach. As also shown in Table 5, there was no significant difference in the mean scores of participants with regard to their interest at time 1 (F[1,71] = .321 and p = .751), time 2 (F[1,71] = .195 and p = .778), time 3 (F[1,71] = .000 and p = .549). The scores were obtained at baseline (Time 1), post-test and follow-up meetings.

Discussion

This study explored the effectiveness of two models of PBL approach (fixed and floating facilitator) in the achievement and interest of students in elementary structural design. The results have shown that students taught elementary structural design topics using the Fixed facilitator model performed significantly better with a higher mean score in the ESDAT than the Floating facilitator model. This result further shows that students' score in elementary structural design seems to depend on instructional methods. This finding supports the view of Orji (2015), Orji and Ogbuanya (2018) and Bakare and Orji (2019) that teacher's method can greatly affect students' achievement and skills acquisition. This finding also agrees with the views of Adesoji (2008), Sahin and Yorek (2009), Yusra (2002) and Afolabi and Akinyemi (2009) that problem-based learning prepares students to be metacognitively aware, giving them opportunities to plan, monitor and evaluate their learning processes. According to their submission, PBL is an instructional strategy that significantly affects students' achievement in school. Therefore, the observed significant difference in the mean elementary structural design achievement scores for the instructional group (fixed facilitator), in this study, would be attributed to students' improved participatory learning, leading to an understanding of the fundamental concepts in the identified difficult elementary structural design topics. The relative superiority of the Fixed facilitator approach over the Floating facilitator approach in enhancing students' achievement would be attributed to the fact that, as instructional approaches, the Fixed facilitator approach ensures active participation of students rigidly under the guide and facilitation of the teacher in the teaching-learning process more than the floating facilitator approach. The Floating facilitator approach often subjects the learners to struggle to understand the facts handed down to them by the teacher.

The result also revealed that problem-based learning significantly enhanced students' interest in elementary structural design. Both groups made significantly higher mean scores in their interest inventory in elementary structural design. This result is similar to the findings of Rotgans and Schmidt (2014), who found that situational interest increased significantly after the problem was presented; Hong et al. (2003), who found that problem-based learning enhances students' interest in a computer class. This result also supports the findings of Segers et al. (2003). They found an increase in students' interest in learning science after engagement in a problem-based learning environment. The result of this study is also similar to the work of Hendricks and Fasse (2012), which revealed that problem-based learning students had higher levels of interest than control-group students. The result of this study is also similar to the work of Olelewe et al. (2021) and Zhang et al. (2020), which revealed that innovative pedagogy improved students' learning outcomes. Therefore, it is essential to say that students' opportunity to participate actively in a PBL environment has been found to improve their achievement and interest. This is maybe due to the strong relationship between achievement, interest and retention.

As shown in Table 5, the result of this study revealed that students' gender has no significant influence on their achievement and interest in elementary structural design. The result of this study is contrary to the findings of other studies on the influence of gender on students' achievement, which agree that it makes a positive change in their achievement. For example, Ezugwu (2010), Adedeji (2007) found that gender significantly influences students' achievement. They asserted that gender was a significant source of variation in the overall performance of students. On the other hand, the finding of this study is in line with the findings of Orji (2015), Orji and Ogbuanya (2018) and Han and Teng (2005). They found that gender does not significantly influence students' achievement. This could be attributed to equal opportunity, which learning in problem-based learning affords to all students. Therefore, it is possible that exposure to the models of problem-based learning environment that made students benefit equally in elementary structural design achievement irrespective of their gender could have been responsible for the non-significant difference in the influence of gender on students' interest.

Limitations of the study

Despite the positive outcome, this study also possessed some shortcomings. First, considering that the sample used was small, one may wonder whether a larger sample may produce different results. Some researchers believe that a small sample size usually has low statistical power. However, it should be noted that power calculation using G*power computer software was done to confirm the sufficiency of the chosen sample and its representativeness of the analyzed population, as shown in Figure 1. The study is limited by the homogeneity of the participants, who were ESD students only. This restricts the generalization of the findings to other categories of students. Thus, caution should be employed in applying the results of this study to other categories of students who may not have similar characteristics with the participants of this study. Finally, given that the follow-up meeting was done four weeks after the intervention, some might ask whether students' improved achievement and interest continued overtime after a long period. However, the researcher has considered a situation where future studies could be carried out with a follow-up assessment of four to seven months or more when implementing PBL.

Conclusion

This study found that the use of the fixed facilitator model of PBL approaches is more effective in improving students' achievement, while both models increase students' interest in elementary structural design (ESD). Also, the study revealed that there was no influence attributable to gender on students' achievement and interest in ESD. This simply means that the effectiveness of fixed facilitator model of PBL approach on students' achievement and interest in ESD does not depend on gender. Hence, irrespective of sex, learners will record improved achievement, interest and retention when the fixed facilitator approach is employed for teaching ESD. These results, therefore, showed that the fixed facilitator model is a viable teaching approach for ESD. Since the fixed facilitator approach provides students with a learnable tool for creative thinking, if the fixed facilitator approach is used to teach ESD to NCE (Technical) students, the technicians trained will graduate with skill and competencies in designing, construction and maintenance needed in the field of work.

Recommendations

The following recommendations were made:

1.Given the efficacy of a fixed facilitator instructional model in fostering students' achievement and interest in ESD, it is instructive that Nigerian technical teachers should adopt this approach in teaching elementary structural design.

2.Granted that the fixed facilitator model is relatively new and has been found to be effective in promoting achievement and interest and retention in elementary structural design, they should be included in the curriculum of elementary structural design of pre-service teachers to popularize their use among the teachers in schools.

Disclosure statement

The disclosure statement has been inserted. Please correct if this is inaccurate.

Notes on contributors

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Dr. Ogwo is a Professor and Chair, Department of Career & Technical Educator Preparation, State University of New York (SUNY), Oswego. He is an erudite scholar as well as an experienced consultant with broad experiences in workforce development, development program design, implementation, and evaluation. He taught online/live classes undergraduate and graduate-level classes on research and program evaluation in career & technical education (CTE) and has graduated/coached 45 Master's degree and 15 Doctoral-degree Technical Vocational Education and Training (TVET) students. Dr. Ogwo has published/authored/edited six textbooks, 10 book chapters, 44 journal articles, and nine technical reports. He was the coordinator of, Occupational Competency Assessment Program (Recognition of Prior learning of students) that facilitated examinations in over 60 occupational competency areas (using various qualitative and quantitative evaluation methods). Dr. Ogwo has also managed several development projects in Nigeria aimed at introducing sustainable educational policy and innovations using endogenous empowerment techniques that enable beneficiaries to tackle various future development challenges. Within the 25 years of academic and consultancy experiences, he has developed expertise in policy development, as well as designing, developing, and implementing customizable intervention/development programs for upskilling the workforce in various occupational areas. Dr. Ogwo worked on different intervention/development related projects with many development agencies namely, World Bank, African Development Bank, UNESCO, UNICEF, International Labor Organization (ILO), HP, African Technology Policy Studies Network (ATPS), and Tertiary Education Trust Fund (TETFund) which affords him invaluable experiences in program compliance practices. Dr. Ogwo had undertaken varied international academic/professional/consultancy activities in the following countries: Botswana, Democratic Republic of Congo (DRC), Germany, France, India, Italy, Jamaica, Kenya, Mozambique, Namibia, Nigeria, Tanzania, South Africa, Uganda, United Kingdom, and United States of America. His research interests are in policy development and change management, informal sector economy, emotional intelligence, non-formal education, training program development, workforce and quality assurance in vocational/technical education, youth development, Instrument development (research & evaluation studies).

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