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The Efficacy of the Blended Learning Instruction: The Correlate Between Peculiarities and Outcomes

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Abstract

Background: Recently, students have learned in environments that welcome innovations like applying technology via blended instruction. In blended structured learning, students actively engage, enhancing learners' outcomes. However, learners have peculiar characteristics that can present difficulties in effectively utilising blended instruction. Studies conducted in Nigeria on students' peculiarities and inventive pedagogy of technology are scanty.

Objective: This paper examined the efficacy of blended instruction, keeping in mind learners' contentment, achievement, and motivation and how these relate to learners' peculiarities (contentment, motivation, and achievement) in a blended instruction climate.

Methodology: The quantitative survey research design was employed in this study. Data were collected from the 2022/2023 semester results and an online questionnaire. The sampling technique that was used in the selection of the sample from the department of science education was multistage sampling. A sample size of 217 students was used for the study. In the biology unit, 120 students were selected, chemistry 80 students, physics ten students, and mathematics seven students. Semester results and the Learners' Peculiarities and Learning Outcomes Questionnaire (LPLOQ) were employed for data collection.

Results: The students' peculiarities examined were relevant for a potent blended instruction climate. Academic achievement of male and female students indicated an equilibrium resulting in a non-statistical disparity between male and female students. This study reported a significant gap between the age groups of students and their achievement. The variables of self-regulation and attitude also

affect the efficacy of a blended instruction climate. Findings in this study also showed that students performed very well in the following computer tests: word processing, e-mail, spreadsheets, and web browsers, except for HTML tools, where they recorded low scores.

Conclusion: The study concluded that for blended learning instructions to be effective, learners' peculiarities of age, attitude, self-regulation, and computer dexterity in computer tests, word processing, e-mail, spreadsheets, and web should be investigated as they affect students in blended classroom instruction. The dependent variables' learning outcomes included contentment, achievement, and motivation.

Unique contribution: This paper has highlighted the peculiarities of learners, which are essential for blended learning instructions to be effective during classroom instruction.

Recommendation: Among other recommendations, it was recommended that teachers check for students' peculiarities when employing blended instruction, as it can affect learning outcomes.

Keywords: Blended learning, efficacy, students' peculiarities, Learning outcomes, motivation, and determinants.

Introduction

A good teacher's task is to assist students in learning. This is done by employing every available good method and strategy in teaching (Ochogwu & Ukume, 2017). Recently, the task of instruction has become learners' centred, involving the presentation of instruction to learners that can make them active participants in the learning process (Nja et al.,2023). Instructors, educators and stakeholders seek techniques to positively influence students' achievement, interest engagement, and self-determination (Naqvi & Al Mahrooqi, 2016). Students now learn in environments welcoming innovations like the application of technology via blended instruction.

Blended learning is an approach to education in which teachers, trainers, and students are provided with innovative solutions by combining conventional classroom instruction with mobile learning and online activities (Rao, 2019). Blended learning occurs when students are presented with a physical instructor, which can happen by seeing the teacher physically or virtually and having online activities (Conrad & Donaldson, 2012). Godev (2014) views blended learning as a carbon copy of a mongrel instruction involving the interaction between the instructor and the learner in a hybrid structure. In blended structured learning, students are actively engaged, and the learners' outcomes are enhanced. Higher education students have gradually imbibed blended learning in their lecture rooms. It involves eye-eye contact between the students and the instructor as well as the use of computer-based instruction or the application of the internet (Lim & Morris, 2009)

Learners have peculiar characteristics that can present difficulties and hinder the effective utilisation of blended instruction. The enormous task for the teacher is to use the technology successfully so that every student's unique learning characteristic is captured. When users of technologies encounter difficulties while using them, the resultant effect is the abandonment of the learning, thereby causing the failure of the technology applied (Hofmann, 2014; Nja et al.,2024). A study was conducted by Oxford Group (2013), and its findings were that 0.16 students disliked blended instruction, and 0.26 were bothered because they could not finish their study. Students are very relevant when learning a course, and hence, their peculiarities impact their capability to learn efficiently in a blended structure. Blended instruction in this study undertook the effectiveness as examined in former research involving students' scores, programme completion, and enrollment. Still, studies on students' effectiveness in terms of their peculiarities and achievements are lacking in Nigerian universities. Students' peculiarities that were examined in terms of their influence on blended instruction in this study were self-regulation, computer dexterity, gender, age, and attitude toward blended instruction. Contentment, achievement, and extrinsic/ intrinsic motivation were the outcomes that the learners investigated. When the predictors of students' learning outcomes are known, it will guide teachers, educators, and curriculum planners to organise the blended learning climate in such a way as to accommodate students' peculiarities.

El-Deghaidy and Nouby (2008) and Kenney and Newcombe (2011) studies compared the effectiveness of blended instruction given students' achievement and reported that students in the blended instruction group achieved more than those in the normal eye-eye group. Blended instruction reduced drop rates in schools, increased learners' contentment, and improved the number of students who completed their programme of study (Garrison & Kanuka, (2004). Demirkol and Kazu (2014) studied the effect of gender on students' achievement in a blended instruction class and found no noticeable difference.

Notwithstanding, blended instruction efficacy can be relied upon by numerous distinct factors, including learners' peculiarities and learning outcomes. Kintu and Zhu's (2016) findings indicated that students' disposition to blended instruction was a predictor of learners' contentment and motivation. This present study aimed to examine the influence of students' peculiarities on their outcomes in a blended instruction classroom.

Research objectives and questions of the study

The research objectives of this study were to;

1. Examine the learners' peculiarities in an efficient blended instruction climate.
2. Investigate the efficacy of blended instruction, keeping learners' contentment, achievement, and motivation in mind, as well as how they relate to learners' peculiarities in a blended instruction classroom.

Research null hypotheses

The following null hypotheses were formulated to guide the study:

Hypothesis 1. There is no significant difference between the academic achievement of male and female students in a blended classroom.

Hypothesis 2. The age of students does not significantly influence their academic achievement in a blended classroom.

Hypothesis 3. Students' peculiarities (attitude, self-regulation and computer dexterity) do not significantly correlate with their learning outcomes (contentment, motivation and achievement.)

Literature Review

The literature review on blended instruction efficacy was presented, considering students' peculiarities and learning outcomes. The researchers observed that Nigerian university students encountered some difficulties using technology during blended instructions. These challenges were peculiar to learners, and they influenced their learning outcomes. This model assesses the efficacy of e-learning on teaching and learning. Selim (2007) reported that e-learning and blended instruction were influenced by teachers' peculiarities, technology, and learners' peculiarities. Learners' peculiarities affected their conduct on the reason to employ technology, influencing their learning outcomes (Heinich, 2001). Berenson et al. (2008) study examined psychological traits and personal types as they affect online learning but not blended instruction. Checking for learners' peculiarities characteristics as it concerns blended instruction and learning outcomes will enrich the literature on the use of technology in teaching. In a study conducted by Lin and Vassar (2009), findings showed that students' success was contingent on their capability to get on with peculiar challenges and peculiar dexterity in computer usage as well as internet manoeuvring. This justifies the approach of this study in delving into students' peculiarities and their computer dexterity in a blended instruction climate. Oxford Group, (2013) study indicated that students' gender affected their academic achievement in school. The study by Nja et al. (2022) and Ukume et al. (2017) reported that students' gender did not affect their learning outcomes. Studies that investigated the influence of gender on learning outcomes in a blended instruction efficacy are lacking or scanty. It is worth noting at this juncture that for e-learning and blended instruction to be successful, the learners must be proficient in using the internet and computers (Picciano & Seaman, 2007).

Many teachers and students lack the skills required for participation in blended instruction. Findings showed that three-quarters of learners (0.75) and 0.72 of teachers do not have the expertise to use the internet and computers, and as such, they fail to use e-learning and blended instruction (Shraim & Khlaif,2010). The use of blended instruction involves enormous use of computers, and computer dexterity is a serious requirement if the desire is to prevent failure in the use of blended instruction (Abubakar & Adetimirin, 2015). Selim's (2007) findings indicated that self-regulatory ingenuity enhances students' performance in e-learning and blended instruction climates.

Students' attitudes toward blended instruction can determine the aftermath of its efficacy because it forms the character purpose that gives rise to keep up in an instructional climate and blended instruction (Selim, 2007). Coldwell et al. (2008) studied the effect of age and sex on learners in an e-learning and blended instruction climate and reported that both boys and girls excelled in their academic performance. The learner's age was also insignificant in their e-learning and blended instruction performance, as all age groups learned equally. This result implies that blended instruction may be a potent pedagogy for male and female students and can be used for all ages of learners.

Blended learning instruction indicated an improvement in performance in the academic achievement and retention of concepts taught in schools (Olatunde-Aiyedun et al.,(2022); Tabassum et al.,(2024). The effectiveness of blended learning in the classroom can be influenced to a larger extent by institutional variables as well as student variables (Al-Ayeda & Al-Tit, 2021)

The outcomes investigated in this study were contentment, achievement, and motivation. Menager-Beeley (2004) study reported that online students who were persistent in their program were those with high motivation to use computers and the internet. Higher grades were recorded for students with high motivation to study online than those with low motivation (Sankaran & Bui 2001). Studies have shown that students' interest was a motivating factor that enhanced students' engagement in learning, which gave rise to the efficacy of the blended instruction climate (Green et al.,2006).

Students' contentment has been recorded as a strong predictor of the efficacy of hybrid and online instruction (Willging & Johnson, 2009). Discontentment can lead to students' lack of competence in the usage. Stacey and Gerbic's (2007) findings indicated that student performance improved greatly when eye-eye instruction was combined with technology (blended instruction). This study, however, dredged into enhanced performance and sought to confirm the possibility of the blended instruction efficacy via scores derived from a blended instruction test. A score from half a hundred to a hundred was accepted as a pass mark. That will form the basis for the decision on the efficacy of the hybrid instruction.

Studies abound on the positive effect of blended learning compared to traditional eye-eye instruction. Still, scanty studies have been conducted on the influence of learners' peculiarities when blended instruction is employed. This study aimed to confirm the students' peculiarities foretelling blended instruction efficacy concerning contentment, outcomes, and motivation. Song et al., (2004) investigated online instruction efficacy determinants and revealed that self-regulation was very relevant to achieving online instruction success. Naaj et al. (2012) study showed that students' contentment was dependent on technology and students' interrelationships and a host of other determinants.

Conceptual model.

The literature reviewed indicated that students' peculiarities are involved in blended instruction efficacy. Not all the peculiarities were significant determinants of efficacy. The conceptual model is shown in Figure 1.

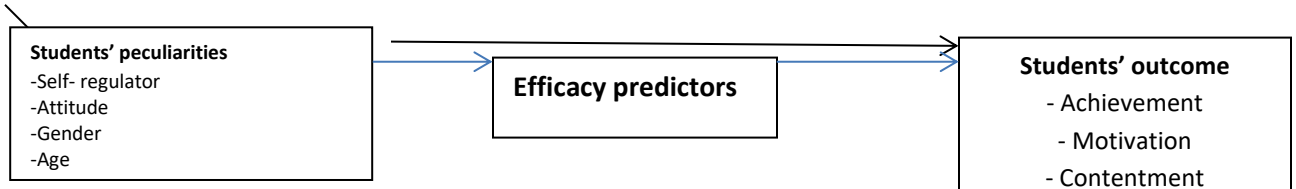

Figure 1. Conceptual Model.

Lim and Morris (2009) examined the influence of instructions on students' outcomes in blended learning, but factors like learners' peculiarities were not considered. This study considered self-regulation and attitudes towards blended learning. Although Kintu et al. (2017) investigated and reported that learners' peculiarities significantly predicted learning outcomes in the blended instruction classroom, it was not conducted in Nigeria. Pinpointing the different categories of students' factors concerning their association with blended instruction efficacy is relevant in this article, bearing in mind the application of inventive pedagogy of technology during classroom practices.

Method

Research design

This study employed the quantitative survey research design. It involves using descriptive statistics for the learners' peculiarities, independent t-tests for gender, and ANOVA for age to ascertain if sex and age were significant in blended instruction efficacy. The efficacy of blended instruction was determined using multiple regression. The study took place in a classroom where teaching was done with eye-to-eye sessions and an online class with a blended instruction structure.

The study undertook the eye-eye instruction at the commencement of the 2nd week of the 2022/2023 academic session, which lasted for three weeks. This was done after the students willingly consented to participate in the research. They were told of the anonymity of the study and that it was purely for research purposes. The online instruction was done on the 5th week of the semester for two weeks. After that, in the 7th week of the semester, the researchers exposed the learners to another round of eye-eye sessions to appraise what they did during the online period. A questionnaire named Learners' Peculiarities and Learning Outcomes (LPLOQ) was administered to students in the Department of Science Education.

Participants

The multistage sampling was employed to select a sample size of 217 students. The Department of Science Education was used for the study. All the units in the department were used for the study. In the biology unit, 120 students were selected, chemistry 80 students, physics ten students, and mathematics seven students. All the students were in their 3rd year. The students who made up this population consisted of 110 men, representing 50.69%, and 107 ladies, representing 49.31%, with a mean age of 20 years.

Instrumentation

The 2022/2023 semester results were used to check for achievement. Barnard, Lan, To, Paton, and Lai's (2009) online questionnaire on self-regulated learning and motivation questionnaire of Deci and Ryan (1982) was used to quantify the variable of self-regulation in the learners' peculiarities and motivation in the learners' outcome variables. The researchers developed a questionnaire to measure the other variables of attitudes and contentment.

Reliability of the instrument

The instrument's reliability was tested using Cronbach's alpha reliability coefficient, the result of which is indicated in Table 1.

Table 1. Results for the reliability of the instrument

Items	**Reliability**
Self-regulation	.85
Target setting	.70
Climate designing	.74
Job blue-print	.83
Time handling	.71
Assistance pursue	.69
Self-assessment	.67
Attitudes towards blended learning	
Students free-will	.85
Standard of pedagogy	.63
Course design	.71
Course affiliation	.88
Interrelationship	.74
Technology dexterity	.72
Motivation	
Interest and pleasure	.90
Presumed expertise	.72
Exertion	.68
Constrain	.65
Importance	.71
Contentment	
Teacher	.67
Course subject matter	.65
Technology	.70
Interrelationship	.74
Eye-Eye sessions	.63
Self-regulation	.85

Data analysis
This study used descriptive statistics, an independent samples *t*-test, a one-way ANOVA, and multiple regression analysis.

Results.
Learners' peculiarities and learning outcomes (Research Question 1 and Hypothesis 1 and 2)
An independent sample t-test was conducted to ascertain the achievement of men and women in blended instruction. The purpose was to investigate the influence of gender on students' achievement in a blended instruction climate.
The results presented in Table 2 showed that the mean score of the male students' achievement score of 63.5 was higher than that of the female students, who had a mean score of 62.00. An independent t-test was conducted to compare the significant levels of the achievement mean scores of male and female students in this study. The independent t-test indicated a non-significant difference in the mean scores between male and female students (t, 215= -.937; p= .349), the p<.05.

Table 2: Mean, standard deviation and independent t-test of influence of gender on achievement(N=217) using SPSS23.

	Gender	N	Mean	Std. Deviation
Achievement	Male	110	63.5	11.337
	Female	107	62.00	11.996

Independent t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	T	df	Sig. (2-tailed)
Achievement	Equal variances assumed	.020	.889	-.937	394	.349
	Equal variances not assumed.			-.927	328.379	.355

The analysed data in Table 3 for the influence of age on the achievement of students showed that the result was significant as $F(2, 216 = 6.682$, $p<.001$. This means that students' ages affected their achievement.

Table 3: Mean, standard deviation, and One-way analysis of variance (ANOVA) of the influence of age on the academic achievement of students (N=217) using (SPSS 26

Age group	N	Mean	Std. Deviation
18- 20years	153	38.42	10.737
21-23years	202	35.25	12.441
24 years and above	41	31.73	8.397
Total	396	36.11	11.606

ANOVA

Source of variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1749.710	2	874.855	6.682	.001
Within Groups	51453.401	214	130.925		
Total	53203.111	216			

Percentages were used to determine the influence of self–regulation on the sub-levels of students' peculiarities. Findings indicated that students' self-regulation was suitable at 78.2% in the sub-levels of target setting, climate designing, job blueprint, time handling, assistance pursuit, and self-assessment. The sub-level with the lowest score was job blueprint, while the highest score was climate designing.

Students' attitudes about blended instructional climate were 82% concerning the sub-level of students' free will, standard pedagogy, course design, course affiliation interrelationship, and technology dexterity. The sub-level score under attitude was course design, with a score of 62%, and the highest attitude score on students' free will was 82%.
Findings about students' computer dexterity, as reported in Table 4, indicated that students' dexterity in word processing was 90.2%, email was 65.4%, spreadsheets scored 67.5%, web browsers had a score of 69.8%, and HTML tools at 45.5%. Students used in this study were, therefore, very efficient in word processing and web browsing. The overall computer dexterity stood at 67.68%.

Table 4 Students' computer dexterity findings

Application	Very limited	Not skilled	Not sure	Skilled	Very skilled
Word processing	4.0	1.9	3.9	36.0	54.2
Email	12	10.3	12.30	40.5	24.9
Spreadsheets	8.5	9.9	14.1	43.3	24.2
Web browsers	6.3	12.9	11	35.7	34.1
Html tools	17.8	7.9	27.9	29.7	15.8

Students' outcomes

Results on students' motivation sub-levels of interest and pleasure average score was 81.5%, presumes expertise was 71.6%, exertion, and importance average score was 80.08%, constrain findings was at 56%. The result of constraining occurred because students' feet were agitated (38.9%) coupled with immersed anxiousness (51%), and 42% felt too much blackjack in the blended instruction know-how. Students' notwithstanding revealed that the average score for importance in blended instruction was 94%.Most of the students thought that online study, when combined with eye-eye, made them learn better(95.1%), resulting in 90.60% of students indicating their interest in being involved in blended instruction. The percentage of those who indicated that they benefited from it was (96%) implying studies done with it were in a relevant way (82.4%). Students' contentment in this study was at 80%, particularly teacher sublevel (84%).

Determinants of blended instruction efficacy (Research question 2 and hypothesis 3)

This study used multiple regression analysis to examine the correlation of students' peculiarities as a determinant factor and learning outcomes as the standard variables. The regression statistics in Table 5 showed that the t values of attitude, for contentment ($t=2.49$, $p<.05$), motivation ($t=1.79$, $p<.05$), and achievement ($t=1.996$, $p<.05$) were all statistically significant. The regression statistics in Table 4 also showed that the t values of self-regulation contentment ($t=2.71$, $p<.05$), motivation ($t=3.112$, $p<.05$), and achievement ($t=2.125$, $p<.05$) were all statistically significant. Another look at that same Table 5 indicated that the t values of computer dexterity for contentment ($t=2.47$, $p<.05$), motivation ($t=1.581$, $p<.05$), and achievement ($t=4.493$, $p<.05$) were all statistically. All the students' peculiarities considered in this study (attitude, self-regulation, and computer dexterity were potent predictors of learning outcomes of contentment, motivation, and achievement.

Table 5: Predictors of blended instruction efficacy

Independent variables	Contentment			Motivation			Achievement		
Students peculiarities	β	t	p	β	t	P	β	t	p
Attitude	.170	2.49	.012	.125	1.79	.041	0.085	1.996	0.046

Self-regulation	.151	2.71	.007	.226	3.112	.001	0.091	2.125	0.034
Computer dexterity	0.105	2.47	0.014	.079	1.581	0.047	0.189	4.493	0.000

*p < .05

Discussion

In this study, the dependent variable was learning outcomes: contentment, motivation, and achievement. The independent variables were students' peculiarities (age, gender, self-regulation, attitude, and computer dexterity). The study sought to find out the correlation between the independent and dependent variables and the variables that predict the effectiveness of blended learning instruction. Participants were drawn from all the units in the Department of Science Education (biology, chemistry, physics, and mathematics) of the University of Calabar, Nigeria. The findings of this study indicated the students' peculiarities, which made the blended instruction climate effective in determining the learning outcomes of students who used the blended instruction.

The students' peculiarities examined were certainly relevant for a potent blended instruction climate. Hypothesis 1 sought to find out the influence of gender on the academic achievement of students in a blended classroom. Achievement concerning the students' gender indicated an equilibrium resulting in a non-statistical gap between males and females. The study of Nja et al. (2022) reported that students' gender did not affect their learning outcomes. This is not unconnected to the fact that intelligence is not a function of sex organs. Demirkol and Kazu's (2014) study on the effect of gender on students' achievement in a blended instruction class also found no noticeable difference. This study was at variance with an earlier study by Oxford Group (2013) that indicated that students' gender affected their academic achievement in school.

This study reported a significant disparity between the age groups of students and their achievement ($p < .05$) . Students within the age group of 18–20 had a mean score of 65%, and those within the age bracket of 21-23 had a mean score of 72% and those within the age group of 24 and above had an average score of 52%. The age group and achievement result was significant as $F(2, 216 = 6.682, p<.001$. The variables of self-regulation and attitude also affect the efficacy of a blended instruction climate. Findings in this study showed that students performed very well in the following computer tests: word processing, e-mail, spreadsheets, and web browsers, except for HTML tools, where they recorded low scores. The result indicated that computer self-esteem was 78.9%, making the blended instruction climate an effective pointer toward students' computer dexterity and self-esteem. Students' contentment concerning the online system and the tools involved indicated the possibility for blended instruction efficacy, except that there are some difficulties concerning allocating course content and homework, presenting homework, and even continuing with the online tutoring.

The result of this study concerning computer dexterity and self-esteem agrees with an earlier study by Hadad (2007) study findings that reported that students' self-concept and competence are satisfactory for effective blended instruction to occur. When students do not possess the required skills in computer operation, they fail in the use of online and hybrid instruction (Shraim & Khlaif 2010). It is worth

noting at this juncture that for e-learning and blended instruction to be successful, the learners must be proficient in using the internet and computers (Picciano & Seaman, 2007). Students with good attitudes concerning e-learning and blended instruction climate had high performance in their study (Selim, 2007).

The study conducted by Coldwell et al., (2008), reported a contrary result showing a non-significant disparity among age groups. Notwithstanding, the study of Coldwell et al. (2008) was on mature students, while this study was on teenagers and adolescents. The study of Loukis (2007) on the effortlessness of utilising computers resulted in learning effectiveness as online devices are determinants of students' contentment and motivation. Students who are highly motivated in whatever they are doing persist in that task and, in this context, online, as Menager-Beeley (2004) reported. This high motivation promotes an efficient blended instruction climate. Islam's (2014) findings pointed out that students' lack of satisfaction with blended learning relates to their inability to use computer tools. Naaj et al. (2012) study concerning the impact of technology on students' contentment was significant. This study, therefore, collaborates with Naaj et al.'s (2012) study that found that computer dexterity determined, to a great extent, the success of blended instruction. The study of Lim and Morris (2009), which examined the influence of instructions on students' outcomes in blended learning, also aligned with this study as they indicated that blended learning enhanced students' performance. This study collaborated with the study of Olatunde-Aiyedun et al. (2022) and Tabassum et al. (2024), as their studies on blended learning instruction indicated an improvement in performance in the academic achievement and retention of concepts taught in schools. The effectiveness of blended learning in the classroom is influenced to a larger extent by institutional and student variables (Al-Ayeda & Al-Tit, 2021).

Conclusion

In this age of technology, a creative teaching strategy is necessary if the teacher desires to achieve prescribed learning outcomes. The use of technology and eye-to-eye instruction calls for blended instruction. This study investigated the students' peculiarities that impact the blended instruction climate. The students' peculiarities that formed the independent variables were age, gender, attitude self-regulation, and computer dexterity. The learning outcomes that were the dependent variables included contentment, achievement, and motivation.The independent variables of attitude, self-regulation, and computer dexterity influenced students' learning outcomes of contentment, motivation, and achievement. The variables of age and gender only examine their influence on students' achievement. These factors of contentment and motivation, as they are influenced by age and gender, are a gap in this study that needs to be filled by new studies to determine their effectiveness in a blended instruction climate.

Recommendations

From the findings of this study, the following recommendations were made:

1. Teachers are advised to check for students' peculiarities when employing blended instruction, as it can affect learning outcomes.
2. Factors of contentment and motivation as it is influenced by age and gender on blended learning should be investigated.

3. High schools and tertiary schools are enjoined to advocate for the use of blended instruction and, as such, should install computers and viable internet services on campuses.

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