EFFECT OF BLENDED LEARNING UTILIZATION ON THE SELF-ESTEEM OF BIOLOGY STUDENTS IN SENIOR SECONDARY SCHOOLS, FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA

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Abstract

This study examine the effect of blended learning utilization on the self-esteem of Biology students in senior secondary schools in the Federal Capital Territory (FCT), Abuja, Nigeria, with particular focus on students' level of self-esteem and gender-based differences in their perceptions. A descriptive survey research design was adopted for the study. The population comprised all senior secondary school Biology students in public secondary schools in the FCT, Abuja. Using a multistage sampling technique, a sample of 381 students drawn from intact classes participated in the study. Data were collected using a structured questionnaire titled Biology Students' Self-Esteem towards Blended Learning Questionnaire (BSSEBLQ)*, which was validated by experts and yielded a reliability coefficient of 0.85 using Cronbach's Alpha method. Data were analysed using mean, standard deviation, and independent samples t-test at a 0.05 level of significance. Findings revealed that Biology students exhibited a high level of self-esteem towards blended learning, as indicated by a mean score of 2.91, which exceeded the benchmark mean of 2.50. The results further showed that there was no statistically significant difference between male and female students in their level of self-esteem towards blended learning,* $t(379) = 0.67$, $p > 0.05$. *This indicates that blended learning positively influences students' self-esteem irrespective of gender. The study concluded that blended learning is an effective instructional approach for enhancing the self-esteem of Biology students in senior secondary schools. It was recommended that Biology teachers and educational stakeholders promote the integration of blended learning strategies in classroom instruction to foster students' confidence, engagement, and inclusive learning experiences.*

Keywords: Blended learning, self-esteem and gender

Introduction

Education serves as a pivotal agent for individual empowerment, national development, and social transformation. At the senior secondary school level, Biology occupies a crucial role as one of the core science subjects designed to deepen students' understanding of living systems, human health, and the environment (Edokpolor & Omoifo, 2023). In Nigeria, Biology not only prepares students for science-based careers but also underpins citizenship competencies in addressing societal challenges such as disease prevention, environmental sustainability, and food security. However, persistent concerns about students' academic outcomes in Biology have drawn attention to psychological and pedagogical factors that influence learning effectiveness.

One such psychological factor is self-esteem, defined as an individual's overall sense of self-worth and competence. Self-esteem is closely linked to academic behaviours, including motivation, resilience, engagement, and academic achievement (Onwunyili, 2023). Students with high self-esteem are more likely to tackle challenging tasks, participate actively in learning activities, and exhibit positive academic attitudes. Conversely, low self-esteem can hinder students' confidence and undermine their ability to perform optimally, particularly in complex subjects such as biology where conceptual understanding and inquiry are critical. In senior secondary school settings across Nigeria, empirical evidence indicates that students' self-esteem and school environment are significant determinants of academic performance (Gegelesho & Kolawole, 2025).

Chukwuemeka, et al (2025) the integration of technology-enhanced instructional approaches, particularly blended learning, has emerged globally as a response to evolving educational demands. Blended learning combines traditional face-to-face classroom instruction with online components and digital resources (Hur-Yagba. & Aregbesola, 2025 & Ojelade, et al., 2020). This hybrid approach offers flexibility, diversified instructional materials, and multiple modes of engagement that can support differentiated learning.

Despite the documented advantages of blended learning in enhancing academic engagement and performance, its impact on students' self-esteem, particularly within the context of biology education in Nigerian senior secondary schools, remains under-explored. Moreover, existing studies on blended learning have predominantly focused on self-efficacy and academic outcomes rather than broader affective constructs such as self-esteem. Self-esteem, distinct from self-efficacy, encapsulates learners' global evaluation of their worth and ability to succeed in academic settings. In blended learning environments, the interplay between digital engagement, peer collaboration, instructional support, and psychological disposition could significantly shape learners' perceptions of competence and self-worth. Therefore, investigating this interplay on biology education can provide crucial insights for educational practice and policy.

Furthermore, gender differences in educational outcomes have long been a subject of scholarly inquiry. Research has shown that male and female students may perceive and respond differently to instructional strategies due to sociocultural norms, learning preferences, and confidence levels. Investigating gender-based differences in self-esteem towards blended learning is therefore important to ensure that instructional innovations support inclusivity and equity. Prior studies in science education indicate gender variations in interest and achievement in subjects like biology when innovative instructional strategies are deployed (Nnoli & Ugwuoti, 2024). However, the specific relationship between gender in blended learning utilization, and self-esteem in senior secondary school biology learners in the Federal Capital Territory, Abuja has yet to be comprehensively examined.

In the context of the Federal Capital Territory (FCT), Abuja, where educational stakeholders strive to enhance classroom outcomes through innovative strategies, understanding how blended learning affects students' self-esteem is vital. This understanding can inform targeted pedagogical interventions that harness the strengths of technology, address learners' psychological needs, and bridge gender gaps. It also responds to broader educational goals of producing confident, self-regulated learners capable of thriving in increasingly digital and complex learning environments. This study, therefore, seeks to examine the level of biology students' self-esteem towards blended learning, identify gender-based differences in students' perceptions of self-esteem, and assess the effect of blended learning utilization on the self-esteem of biology students in senior secondary schools in the FCT, Abuja, Nigeria.

Purpose of the Study

The main purpose of this study is to examine effect of blended learning utilization on the self-esteem of Biology students in Senior Secondary Schools, Federal Capital Territory, Abuja, Nigeria. Territory, Abuja. Specifically, the study aims to:

i. examine the level of Biology students' self-esteem to blended learning in senior secondary schools in the FCT, Abuja.

ii. identify gender-based differences in students' perceptions of self-esteem, towards blended learning in senior secondary schools in the FCT, Abuja.

Research Questions

The following research questions were formulated to guide this study:

i. What is the level of self-esteem exhibited by Biology students towards blended learning in senior secondary schools in the FCT, Abuja?

ii. Are there gender-based differences in the levels self-esteem of Biology students towards blended learning in senior secondary schools in the FCT, Abuja?

Hypothesis

The following null hypotheses were formulated and tested at a 0.05 alpha level:

H_{01}: There is no significant difference between male and female Biology students in their level of self-esteem towards blended learning in senior secondary schools in the FCT, Abuja.

Methodology

This study adopted a descriptive survey research design to examine the effect of blended learning on the self-esteem of Biology students in senior secondary schools, Federal Capital Territory (FCT), Abuja. The design was considered appropriate because it enabled the assessment of students' existing levels of self-esteem towards blended learning and the examination of gender-based differences in their perceptions without manipulating any variables. The population of the study comprised all Senior Secondary School Biology students in public secondary schools within the FCT, Abuja. A multistage sampling technique was employed to select the study sample. At the first stage, public senior secondary schools were selected using simple random sampling. At the second stage, two intact Biology classes were selected from the sampled schools using the lucky dip method. All students in the selected intact classes participated in the study, ensuring adequate representation of both male and female students for meaningful gender comparison. Data for the study were collected using a structured questionnaire titled Biology Students' Self-Esteem towards Blended Learning Questionnaire (BSSEBLQ). The instrument was designed to elicit information on students' perceptions of self-esteem in relation to blended learning. It consisted of two sections: Section A focused on demographic information such as gender, while Section B comprised items measuring students' confidence, sense of competence, participation, and comfort in Biology learning within a blended learning environment. Responses were rated on a Likert-type scale.

The instrument was subjected to content validation by experts in Science Education and Educational Technology to ensure clarity, relevance, and adequate coverage of the self-esteem construct. The reliability of the instrument was determined using the Cronbach's Alpha method, and the obtained coefficient of 0.85 indicated satisfactory internal consistency for the study. The questionnaire was administered to the respondents by the researcher with the support of Biology teachers in the selected schools. Students were adequately informed about the purpose of the study, and ethical considerations such as voluntary participation and confidentiality of responses were strictly observed. Data collected were analyzed using appropriate statistical techniques. Mean and standard deviation were used to determine the level of Biology students' self-esteem towards blended learning, while an independent samples t-test was employed to examine gender-based differences in students' perceptions of self-esteem towards blended at 0.05 significance level.

Results and Discussion

Presentation of Data

This section presents data collected for the study. It involves organizing, summarizing, and displaying information in a clear and meaningful way with aid of tables to enhance understanding of the data.

Table 1: Class of Participants

Gender	Frequency	Percent
SS I	87	22.83
SS II	121	31.76
SSS III	173	45.41
Total	**381**	**100**

Source: Field Survey (2025)

Table 1 shows that the distribution of participants across the three levels at the senior secondary school level. 22.83% (n = 87) were in SS I, 31.76% (n = 121) in SS II, and the majority, 45.41% (n = 173), were in SSS III. This indicates a higher representation of individuals at the SSS III level within the sample. The progressive increase in frequency from SS I through to SSS III suggests a larger proportion of participants in the more advanced level of the study population.

Table 2: Gender of Participants

Gender	Frequency	Percent
Male	198	52
Female	183	48
Total	**381**	**100**

Source: Field Survey (2025)

Table 2 reflects the gender of the participants of the study. The sample consisted of 381 participants, with males representing 52% (n = 198) and females comprising 48% (n = 183) of the

total. This distribution indicates a relatively balanced gender composition within the study's participants. The slight predominance of males suggests that any gender-based analysis should consider this minor difference in group sizes to ensure accurate interpretation of results.

Table 3: Biology Students' Self-Esteem in Relation to the Utilization of Blended Learning

S/N	Research Statement	VHL	HL	LL	VLL	×	δ	Decision
1	Confidence in learning Biology is high when blended learning is used	153	149	54	25	3.13	0.89	High
2	Ability to understand Biology concepts improves through blended learning	166	108	98	9	3.13	0.88	High
3	Sense of competence in Biology learning is enhanced by blended learning approaches	126	158	39	58	2.92	1.02	High
4	I feel comfortable using technology to learn Biology.	174	137	16	54	3.13	1.03	High
5	Willingness to attempt Biology tasks increases under blended learning conditions	137	139	93	12	3.05	0.85	High
6	Often use online resources like videos, quizzes etc for Biology studies	169	109	31	72	2.98	1.13	High
7	Comfort in participating in Biology activities is higher in blended learning environments	121	149	96	15	2.99	0.85	High
8	Self-belief in handling Biology assignments is strengthened through blended learning	163	114	41	63	2.99	1.10	High
9	Confidence in using digital tools for Biology learning is evident during blended learning	75	132	133	41	2.63	0.92	High

10	Feeling of achievement in Biology learning is higher with blended learning methods	116	137	30	98	2.71	1.15	High
11	Blended learning helps makes me feel more independent in studying Biology	60	142	109	70	2.50	0.97	High
12	Blended learning helps me feel smarter	112	150	106	13	2.95	0.84	High
13	Anxiety about learning Biology is reduced when blended learning is adopted	95	116	115	55	2.66	1.01	High
Section Mean						**2.91**	**0.97**	**High**

Source: Field Survey (2025)

Table 3 presents the Biology students' self-esteem in relation to the utilization of blended learning in senior secondary schools. Responses were measured using a four-point Likert scale ranging from Very High Level (4) to Very Low Level (1), with a criterion mean of 2.50. The results indicate that all the 13 items recorded mean scores equal to or above the criterion mean, suggesting that Biology students exhibited a high level of self-esteem in relation to blended learning. The mean scores ranged from 2.50 to 3.13, while the standard deviations ranged from 0.84 to 1.15, indicating moderate variation in students' responses. The highest mean score (M = 3.13, SD = 0.89) was recorded for the statement "Confidence in learning Biology is high when blended learning is used." Similarly high mean scores were obtained for "Ability to understand Biology concepts improves through blended learning" (M = 3.13, SD = 0.88) and "I feel comfortable using technology to learn Biology" (M = 3.13, SD = 1.03), indicating strong positive perceptions of blended learning in enhancing students' confidence and comfort.

The lowest mean score was observed for "Blended learning helps makes me feel more independent in studying Biology" (M = 2.50, SD = 0.97); however, this value still met the benchmark mean, signifying agreement among respondents. Overall, the section mean score of 2.91 with a standard deviation of 0.97 confirms that Biology students demonstrated a high level of self-esteem in relation to the utilization of blended learning.

Based on the findings presented in Table 3, it can be concluded that the utilization of blended learning positively influences the self-esteem of Biology students in senior secondary schools. Consequently, the research question on students' self-esteem in relation to blended learning was answered affirmatively.

Answers to Research Questions

This section presents the analysis and results of data collected in the study, it features (i) answers to research questions and (ii) test of hypotheses.

Research Question One: What is the level of self-esteem exhibited by Biology students towards blended learning in senior secondary schools in the FCT, Abuja?

Table 5: Descriptive Statistics for Data in Relation to Research Question Two

No of Items	Mean	Standard Deviation
13	2.91	0.97

The level of self-esteem exhibited by Biology students toward blended learning in senior secondary schools in the Federal Capital Territory (FCT), Abuja, was assessed using a 4-point Likert scale. As shown in Table 7, the overall mean score across 13 items was 2.91, with a standard deviation of 0.97. Using the benchmark decision rule of 2.50 as the threshold for determining positive versus negative dispositions, the mean score of 2.91 suggests that students generally demonstrate a high level of self-esteem regarding their ability to engage in blended learning. The standard deviation indicates a moderate level of variability among student responses, suggesting some differences in individual perceptions but an overall positive trend. These results imply that most Biology students in the FCT are confident in their capacity to participate effectively in a blended learning environment.

Research Question 2: Are there gender-based the levels of self-esteem, of Biology students towards blended learning in senior secondary schools in the FCT, Abuja?

Table 6: Descriptive Statistics for Data in Relation to Research Question Four

Variable	No of Items	Gender	Mean	Standard Deviation
Self-Esteem	13	Male	2.91	0.96
		Female	2.91	0.98

For gender-based differences in Biology students' levels of self-esteem toward blended learning in senior secondary schools, Federal Capital Territory (FCT), Abuja, descriptive statistics were compared by gender. As shown in Table 6, the mean self-esteem, both male and female students reported an identical mean of 2.91, with standard deviations of 0.96 and 0.98, respectively.

This shows that there are no meaningful gender-based differences in students' perceptions of blended learning. The near-identical mean scores and standard deviations indicate a high degree of consistency between male and female responses.

Test of Hypothesis

Hypothesis 1: There is no significant difference between male and female Biology students in their level of self-esteem towards blended learning in senior secondary schools in the FCT, Abuja.

Table 7: Results of Independent Samples t-test for Hypothesis Two

Gender	N	Mean	SD	*t*	Df	*p*	Decision
Male	198	37.79	4.75	0.67	379	0.95	Not significant
Female	183	37.76	4.95				

Results of an independent samples *t*-test conducted to determine whether there was a statistically significant difference in mean scores between male and female participants were presented on Table 12. The results showed no significant difference between males (M = 37.79, SD = 4.75, *n* = 198) and females (M = 37.76, SD = 4.95, *n* = 183), *t*(379) = 0.67, *p* = .95. These findings indicate that gender did not have a statistically significant effect on the variable being measured, and the null hypothesis was retained. Hence, there is no significant difference between male and female Biology students in their level of self-esteem towards blended learning in senior secondary schools in the FCT, Abuja.

Discussion of Findings

This study investigated the effect of blended learning utilization on the self-esteem of Biology students in senior secondary schools in the Federal Capital Territory (FCT), Abuja, with particular focus on the level of students' self-esteem and gender-based differences in their perceptions. The discussion integrates descriptive and inferential statistical findings in line with the study objectives, research questions, and hypotheses.

Biology Students' Level of Self-Esteem towards Blended Learning. Findings from the descriptive analysis revealed that Biology students exhibited a high level of self-esteem towards blended learning. The overall mean score of 2.91, which exceeded the benchmark mean of 2.50, indicates that students generally perceived themselves as confident, competent, and positively disposed to learning Biology within a blended learning environment. The accompanying standard deviation of 0.97 suggests moderate variability in students' responses, indicating that while individual perceptions differed slightly, the overall disposition towards blended learning remained positive.

Item-level analysis further showed that students reported high confidence in learning Biology, improved understanding of concepts, increased comfort with technology use, and greater willingness to attempt Biology-related tasks when blended learning was employed. These findings suggest that blended learning enhances learners' academic self-worth by providing flexible access to instructional materials, interactive digital resources, and opportunities for self-paced learning. This supports Onwunyili's (2023) assertion that self-esteem is strengthened when students perceive themselves as capable and actively engaged in learning activities. The result also corroborates earlier studies which established that blended learning environments promote positive affective outcomes such as confidence, engagement, and learner autonomy (Chukwuemeka et al., 2025; Hur-Yagba & Aregbesola, 2025). In Biology education, where conceptual difficulty often leads to anxiety and reduced confidence, the combination of face-to-face instruction and digital learning resources appears to mitigate these challenges by offering varied learning pathways. Consequently, the findings affirm that blended learning utilization positively influences the self-esteem of Biology students in senior secondary schools.

The study further examined whether gender differences existed in Biology students' levels of self-esteem towards blended learning. Descriptive statistics showed that both male and female students recorded identical mean self-esteem scores (M = 2.91), with closely related standard deviations (SD = 0.96 for males and SD = 0.98 for females). This initial result suggested minimal variation in self-esteem perceptions between genders. To further validate this observation, an independent samples t-test was conducted. The analysis revealed that male students (M = 37.79, SD = 4.75, n = 198) and female students (M = 37.76, SD = 4.95, n = 183) did not differ significantly in their self-esteem scores, $t(379) = 0.67$, $p = .95$. Since the p-value exceeded the 0.05 level of significance, the difference observed between the mean scores of male and female students was not statistically significant.

This finding indicates that gender does not significantly influence Biology students' self-esteem towards blended learning in senior secondary schools in the FCT, Abuja. The near-identical mean scores and high p-value demonstrate that blended learning provides a psychologically supportive and equitable learning environment for both male and female students. This outcome aligns with Nnoli and Ugwuoti (2024), who reported that innovative instructional approaches in science education can reduce traditional gender disparities in students' learning experiences. The absence of gender-based differences may be attributed to increasing familiarity with digital technologies among both male and female students, as well as the inclusive nature of blended learning environments that allow equal access to instructional content and learning opportunities. This finding is particularly significant in the Nigerian educational context, as it suggests that blended learning can be effectively utilized without reinforcing gender-based inequalities in students' self-perception and confidence. Overall, the findings demonstrate that blended learning utilization enhances Biology students' self-esteem and does so in a gender-neutral manner, thereby supporting inclusive and confidence-building learning experiences in senior secondary schools.

Conclusion

This study examined the effect of blended learning utilization on the self-esteem of Biology students in senior secondary schools in the Federal Capital Territory (FCT), Abuja, with specific focus on students' level of self-esteem and gender-based differences in their perceptions. Findings from the study revealed that Biology students demonstrated a high level of self-esteem towards blended learning, indicating that the integration of face-to-face instruction with digital learning resources positively influences students' confidence, sense of competence, and engagement in Biology learning.

The study further established that gender did not significantly influence students' self-esteem towards blended learning. Both male and female students exhibited comparable levels of self-esteem, and the inferential analysis confirmed that the observed differences were not statistically significant. This suggests that blended learning provides an inclusive instructional environment that supports the psychological well-being of students regardless of gender. Overall, the study concludes that blended learning is an effective instructional approach for enhancing Biology students' self-esteem in senior secondary schools. By promoting learner autonomy, reducing anxiety, and improving students' confidence in handling Biology concepts, blended learning contributes meaningfully to positive learning experiences and outcomes. These findings reinforce the importance of integrating technology-enhanced instructional strategies into secondary school science education in Nigeria.

Recommendations

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

i. Biology teachers in senior secondary schools should be encouraged to adopt blended learning strategies as part of regular classroom instruction to enhance students' self-esteem and engagement.\
ii. Educational authorities should organize regular training programmes and workshops for Biology teachers on effective design and implementation of blended learning environments.
iii. School administrators and government agencies should ensure the availability of essential technological facilities such as computers, internet connectivity, and digital learning platforms to support blended learning.
iv. Curriculum developers should explicitly incorporate blended learning strategies into the senior secondary school Biology curriculum to promote innovative and learner-centred instruction.
v. Schools should create supportive learning environments that encourage students to actively engage with digital tools, collaborate with peers, and build confidence in their learning abilities.

Educational Implications of the Study

The findings of this study have several important implications for science education, instructional practice, and educational policy:

i. The positive influence of blended learning on students' self-esteem highlights the need for teachers to move beyond traditional teaching methods and adopt technology-enhanced strategies that foster confidence and active participation.
ii. Blended learning environments support the development of self-esteem by allowing students to learn at their own pace, access diverse learning resources, and engage meaningfully with Biology content.
iii. The gender-neutral effect of blended learning underscores its suitability as an inclusive instructional approach. Administrators should therefore support its implementation through adequate resource allocation and policy support.
iv. The study provides empirical evidence to support policies aimed at integrating blended learning into secondary school education as a means of improving both academic and affective learning outcomes.
v. The findings open avenues for further studies to explore the long-term effects of blended learning on other affective variables such as motivation, attitude, and interest across different science subjects and educational levels.

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