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Research Article

Impact of Perceived Learning Support and Student Engagement on Remedial Student Science Success in the University Placement Examination during COVID-19 Pandemic

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This study aims to examine the relationship between learning support, student engagement, and science achievement of remedial students in the university placement examination during the COVID-19 pandemic. This preliminary quantitative research adopted a correlational design. The participants of this study were 216 students who received their remedial education through an online method in Nigerian settings. Two instruments were used for data collection: student engagement scale and learning support scale. The data were analyzed using correlation and hierarchical regression analyses. The results revealed that learning support aspects, including teacher, peer, and parent support, and student engagement dimensions, such as emotional, behavioural, cognitive, and agentic, were positive predictors of students' science success. This study has implications for preservice and in-service teacher education, especially educating the teachers on how to actively collaborate with parents in inspiring their children to be engaged and successful scholars. Insightful suggestions were made.

1. Introduction

There is an escalating quest for university enrollment all over the world. However, a large number of university entrants are usually identified as academically unprepared for university-level courses annually [1, 2]. To prepare the unprepared ones, remedial education programs were established in the universities with the intent of nurturing their mastery of basic skills in English, Mathematics, and Sciences [3, 4]. In essence, the remedial program is referred to as a customized education support service designed with the purpose of rectifying the academic deficiencies of identified weak students who would have otherwise been relegated to low wages and other socioeconomic marginalization [5]. An ample number of students entering 2-year and 4-year university undergraduate programs in the Western context have participated in the program [6]. For example, Chen [2] indicated that more than 68% of American undergraduates in 2-year programs have taken remedial education trajectories, while over 39.6% were entering 4-year undergraduate programs. Similarly, in a non-Western context like Nigeria, there has been an upsurge in students' enrollment in the program lately [3]. Therefore, it is imperative that remedial programs should be deemed a collegiate responsibility by various education stakeholders in higher institutions.

Students' academic success in the remedial program is hardly an outcome of a single factor or one mechanism. For instance, some researchers have indicated that racial disparities, sociodemographic profiles, prior academic background, and household economic status are potential predictors of students' academic success in remedial programs [2, 6]. Nevertheless, the inconsistencies in students' learning outcomes cannot be fully explained by the

distinctions in students' sociodemographic profiles and variability in cognitive competencies [7]. Therefore, for process-driven remediation, other researchers have followed contemporary approaches, underscoring the significance of psychoemotional factors in fostering and enhancing the academic success of underprepared students in preuniversity science programs [3]. Specifically, exploring students' active engagement and their positive relationship with social contexts is among the emerging trends used in promoting various learning outcomes [8]. Many educationists and interventionists have concentrated on student engagement probably because it is among the malleable predictors of academic success in higher institutions [9, 10]. Indeed, engaged students are proactive and translational, as well as make significant contributions in the learning process [11]. Studies have also revealed that student engagement in school work is vital to positive behaviours, including lifelong learning, aspirations, school satisfaction, and intention for skill upgrading [12, 13]. Inferably, the extent to which remedial students actively engage and devote their useful time and energy to educationally purposeful activities can contribute to their academic success.

Nonetheless, recent research studies have indicated that student engagement in school work was negatively affected during the early 2020 COVID-19 pandemic period [14, 15] probably because some restrictions imposed during the COVID-19 pandemic practically hindered face-to-face content delivery in schools [16] and students' physical access to educational facilities [17], such as laboratories. The pandemic also affected students' learning, aspirations, psychological well-being, and study habits all over the world [18]. To buffer against the negative impact of the pandemic on teaching and learning and reduce the spread of the COVID-19 virus in humans, higher educational institutions responded to the pandemic in three ways: continuing face-to-face instruction while maintaining social distancing; starting a hybrid learning model or/and total migration to online and remote learning [19]. In Nigeria, for example, the teaching and learning modality was shifted to online instruction for all programs in the universities, including remedial programs. University instructors immediately made unprepared adjustments to continue postsecondary education [20]. The consequence of this unprepared paradigm shift to technology-enhanced learning environments is that student engagement and academic success may likely dwindle.

Of note, interventionist and developmental researchers have earlier suggested that students' seamless adjustment and active engagement in a new learning environment can be facilitated with support from teaching staff and other personnel [21]. For instance, studies have revealed the benefits of social support from teachers, families, and friends in fostering student academic engagement in the learning context [22, 23], as well as promoting school-based outcomes, including academic achievement [23, 24]. In addition, a supportive learning environment has been identified as critical in mitigating early students' withdrawal and maladjustment in the school setting [25]. Based on the aforementioned benefits, one might also assume that support from teachers, peers, and parents can assist in cultivating remedial student academic engagement and science success in online learning during the COVID-19 pandemic period.

Literature is replete with studies showing how diverse learning supports (i.e., teacher, peer, and parent support) are related to student engagement and academic success. However, most studies on the relationship between learning support, student engagement, and academic success have focused on students in elementary and secondary schools, and little is known about these relations in the remedial education context. However, remedial education is a crucial stage in motivating students' engagement since it is an emotion-laden period and students may battle with a series of social, emotional, and academic-related challenges [3]. Besides, the influence of learning supports and student engagement on academic success may be particularly strong in remedial education because remedial students' academic success mainly relies on external influences [1]. Hence, specifically exploring remedial students' responses to their academic and social demands, as it relates to the learning support they received in remedial education during the COVID-19 pandemic, is critical in nurturing their academic engagement and improving their science success. The present study addresses the paucity of studies that examine the relationships between perceived learning support, student engagement, and science success of remedial students in the university placement examinations during the COVID-19 pandemic.

2. Literature Review

2.1. Academic Performance. Academic performance has been considered as an important educational goal for knowledge growth and societal transformation in the present-day rapid pace of global advancement in the area of science and technology [26]. Indeed, academic performance is increasingly seen as a relevant topic in schools, perhaps due to its unquestionable association with early school dropouts [27]. Generally, academic performance is the extent to which students accomplish their set learning goals in either short- or long-term perspectives [28]. In the scientific literature, academic performance serves as a yardstick for evaluating the gamut of students' cognitive and noncognitive characteristics in sciences and the context in which learning occurs [29].

Different terms such as academic success, learning outcomes, academic achievement, and academic grade have been applied in the literature to explain student academic performance in school [8]. For instance, some authors identified academic grade and achievement scores as appropriate quantitative summaries of students' academic performance in school [3, 30]. In contrast, positive psychologists considered students' psychological characteristics like social learning outcomes and school satisfaction as part of students' academic success [10, 31, 32], probably because they establish the core of early school adjustment and educational attainment [33]. However, achievement scores were mainly adopted by universities in the Western and

non-Western contexts for evaluating the gamut of students' academic performance in remedial courses [3, 6].

Existing literature on remedial education and the developmental program has indicated that a large proportion of remedial course-takers rarely succeed at the end of remediation [2, 3]. For instance, Chen [2] noted that approximately 51% of students applying for 2-year undergraduate programs and 40% of those seeking university entrance into 4-year degree programs were unable to pass the remedial courses they took. This high rate of failure has brought the remedial program's effectiveness to a series of controversies by the public, perhaps due to the huge sums of money appropriated by universities for the remedial program that does not add up to students' final grade point average in the university [34]. However, total elimination of the remedial program will be very difficult since the program has been made optional for students by university regulations [35]. Thus, we consider it crucial to explore the impact of personality (student engagement) and contextual factors (teacher, peer, and parent support) on remedial students' science success during the COVID-19 pandemic period.

2.2. Student Engagement. Student engagement has been deemed a crucial construct in educational psychology because of its theoretical relevance and practical implications [36]. Traditionally, student engagement is a purposeful effort and nonmandatory dedication by an individual committed towards academic task completion and achieving an intended learning outcome [13]. The exact dimensions of student engagement have not been agreed upon to date. However, the present study conceptualized student engagement as a multidimensional construct with interrelated dimensions, measurable through various indicators of emotional, behavioural, cognitive, and agentic components [11, 37]. This is because these dimensions typify students' active participation in a given context.

Emotional engagement refers to positive (e.g., fun and interest) affections experienced by an individual, and those affections have the potential capability of improving students' academic success [37]. Cognitive engagement is broadly categorised as students' cognitive competencies and strategies (e.g., metacognition and deep learning), an individual invested in learning to understand and master a given content [38]. Behavioural engagement simplifies the quality of time and effort dedicated to task completion and learners' willingness to endure and seek help when faced with learning challenges [38]. Lastly, agentic engagement refers to students' expression of preferences to their teacher on the learning contents and their active contributions to the flow of instruction [11].

Although vast empirical evidence on student engagement exists, little is known about the nature of student engagement in remedial education contexts [39]. Besides, the non-Western context, like sub-Sahara African countries, does not have the best way to track their students' engagement in schools [22], unlike the Western context (e.g., United States of America, United Kingdom, and Australia) with good tracking records of undergraduate student engagement since the inception of National Survey on Student Engagement (NSSE) in the mid-1990s [40]. This was also echoed by Salmela-Aro et al. [41] in their recent scoping review on student engagement. They indicated that in spite of the clear conceptualization, dimensionality, and psychometric properties of the student engagement constructs, there is an excessively Western prejudice on how engagement is conceptualized and measured. They suggested that more student engagement research studies should be conducted using non-Western samples. Therefore, this study aimed to address these research gaps by testing and revalidating the factorial structure of the student engagement construct using the data gotten from Nigerian samples.

2.3. Learning Support. Learning support is generally referred to as social resources recognized to be accessible and used by students in their learning environment [22]. Learning supports are also associated with a person's perception of being loved, cared for, and valued in an ecological learning context [23]. Such perceptions and thoughts appeared to buffer against negative learning outcomes, including alienation from academic activities [42]. Generally, learning support for academic activities is comprised of the embodiment of support sources and support dynamics [43]. Based on prior empirical evidence, three extant embodiments of support, such as instrumental, informational, and emotional support, emerged [44]. Instrumental support is characterized by offering both behavioural and material assistance in problem-solving and practical tasks. In contrast, informational support refers to providing useful information in the form of suggestions, appraisal, feedback, and advice by agencies in the learning environments. Lastly, emotional support is characterized by companionships in the form of caring, kindness, encouragement, empathy, warmth, trust, and esteem. The current study covers informational and emotional support because they are related to educational support services rendered in the remedial programs.

Notwithstanding the diverse forms of learning support, each support form can be official or unofficial, depending on the interactions between the learner and support sources [45]. Supports from diverse sources are likely to be more beneficial when compared to one or two sources [22, 23]. The principal sources of support for academic activities are provided by the teachers and classmates in school [24]. Support from classmates has been shown to impact early school adjustment and mitigate academic burnout [46]. Peer influence is also associated with adolescents' antisocial behaviours like juvenile delinquency [47]. For instance, constant interactions with best friends with questionable characters may be of negative influence on peers [47]. However, mutual peer associations are very beneficial for group work engagement in social and academic activities [23]. Peer support is likely to be more of informational and emotional support in the form of warmth, encouragement, advice, and kindness, which can be motivating factors for learning and learning enjoyment.

Support from teachers in school and parents at home is likely to have a direct impact on students' learning outcomes and indirectly when mediated by other learning predictors, including the learning atmosphere [48]. Specifically, research studies have revealed that support from teachers has a significant impact on academic performance and students' royalty [23, 36]. Teacher support can also establish the basis for other supportive tendencies (e.g., cooperative learning) among the peer group through modeling mutual and affective relationships like empathy, common understanding, and appreciation in the classroom [49]. Just like teacher support, parent support has been identified as a critical predictor of student academic and social outcomes, including high academic grades and positive interest in school work [50]. Parent support is also considered as a safe haven and secure base for the child's emotional development in school [22]. The extent of parents' support for their children's academic success depends on the level of support offered in the school context [51]. Therefore, the need to explore both social support from school and home arises in the present study. Although the impact of learning support on students' academic success has been extensively researched in the past, a gap still exists in the literature on the detailed anatomy and dynamics of learning support from diverse sources as perceived by students. Moreover, little is known about the economic precursors of learning support in the technology-enhanced learning environment, especially in the remedial program, since available research studies were conducted in traditional classroom settings with children in elementary and secondary school age [22, 23]. Therefore, the present study explores the perceived learning support experiences of remedial students in online learning during COVID-19 school closure.

2.4. Theoretical Background of the Study. Student engagement is regarded as a crucial part of education since it is a needed requirement for successful learning outcomes [36]. The conception of student engagement, encompassing emotional, cognitive, behavioural, and agentic dimensions, can be described from a motivational theoretical perspective [11]. Motivation is the thrust that strengthens students to engage in a given task and succeed academically [48]. Self-determination theory (SDT) is a well-known theory that supports individual motivational traits, and it argues that students are motivated to learn and achieve academic success if their basic needs for autonomy, relatedness, and competence are fulfilled [52]. Autonomy is characterized by students' quest for academic freedom, and it provides the motivational starting point for student behavioural engagement in class [53]. Autonomy is also connected to emotional engagement because students with a greater sense of freedom usually enjoy their class. However, the association of autonomy with cognitive and agentic engagement has not been extensively validated in the past. It is plausible to assume that autonomy can lead to greater student's contributions to the flow of lessons in online learning and the deployment of better cognitive strategies for successful learning outcomes. Competence is associated with students' mastery of a given instruction, and it is a crucial motivating antecedent for cognitive and agentic engagement [54]. Finally, relatedness typifies a sense of association with other people, and it has been shown that students' connectedness with others contributes to their emotional, behavioural, cognitive, and agentic engagement [54]. In this sense, supportive social contexts that fulfil these three psychological needs appeared to have the capability of advancing students' motivational inclination from amotivation to extrinsic motivation and, finally, to intrinsic motivation [54]. For instance, it has been indicated that the social context (parent, peer, and parent support) plays a central role in students' motivational predisposition to engage in learning and inspires them to succeed academically [48]. This implies that learning support that satisfies the three psychological needs is associated with the four dimensions of student engagement and academic success.

Previously, SDT was highly adopted in the fact-to-face context to enhance students' academic achievement [53], but not in research conducted in online and remote settings [55]. This was also voiced by [52], the initiators of SDT, in their current study. They also suggested that future research studies that will adopt SDT should explore how the three fundamental needs of a child can be fulfilled in an online and remote setting with considerable student engagement and greater academic success. Yet, a practical direction for fulfilling the three psychological needs in the technology-enhanced learning environment is lacking. Therefore, it is relevant to advance knowledge in understanding how learning support (from teachers, peers, and parents) can motivate student engagement and advance academic success in online learning during COVID-19 pandemic school closure from a SDT perspective.

Based on the aforementioned literature, it is conceivable to postulate that learning support and student engagement would be motivating factors of remedial students' academic success in online learning during the COVID-19 period. Therefore, we specifically explored the distinct contributions of the three aspects of learning supports and four student engagement dimensions to remedial students' academic success in the university placement examination during the COVID-19 era. Aspects of learning support and student engagement dimensions were entered in a hierarchical manner into the regression model because the social context (e.g., teacher, peer, and parent support) has been theoretically identified as a precursor of student engagement in school [22]. Perceived learning support from teachers, peers, and parents was entered as an initial predictor in the first step, followed by emotional, cognitive, behavioural, and agentic engagement. The essence of conducting hierarchal regression analysis was to examine the variation in the endogenous variable with each successive addition of an exogenous variable. We hypothesized the following:

(1) Teacher, peer, and parent support will significantly predict the science success of remedial students in UTME during the COVID-19 era.

(2) Emotional, cognitive, behavioural, and agentic engagement will significantly predict the science

success of remedial students in UTME during the COVID-19 era after controlling for teacher, peer, and parent support.

3. Methods

3.1. Research Design. The research study design utilizes a quantitative method, employing a survey approach to collect data directly from the students enrolled in the remedial program. The quantitative data collected were analyzed using correlation and hierarchal regression analysis. Correlation analysis was used to measure and gauge the levels of relationship among learning support, student engagement, and academic success. At the same time, regression analysis was used to establish the predictive dimensions of learning support and student engagement on students' academic success. The dimensions of student engagement considered in the regression analyses include behavioural, emotional, cognitive, and agentic, whereas the subconstructs of learning support considered include teacher support, peer support, and parent support. Hierarchal regression analyses are used to determine the specific contributions of the exogenous variables to the endogenous variable and the incremental validity of the various dimensions of the predictive variables under investigation [3, 56, 57].

3.2. Participants and Procedures. The study population was remedial students in a southeastern public university in Nigeria who recently took a university placement examination in the year 2021. The population was considered because the students were currently enrolled in a learning support program. In the year 2021, the Nigerian remedial education program was conducted by employing a technology-enhanced environment. For instance, Google Interactive Classroom was used for general classroom teachings, while WhatsApp groups were created for afterschool peer-to-peer interaction. However, remedial students were physically assessed in the university placement examination, and at the same time, COVID-19 standard operation procedures like social distancing and the use of a face mask were strictly adhered to. The distribution of the questionnaires was done the using online Google Forms in students' WhatsApp online groups. To collect data from the said population, we conformed to some regulations for conducting research studies in social sciences. For instance, the research proposal was initially presented and successfully approved by the relevant Institutional Research Board (UM.P/PTD (IT) 6441/1). Furthermore, we obtained permission from relevant school authorities before proceeding with the data collection exercises. Above all, the participants voluntarily consented to participate in the study by accepting the invitation letter to answer the survey questions, having been assured of the confidentiality of their responses. Moreover, they were informed that filling in the Google Forms is optional and they can opt out if they wish. Finally, the participants were informed that any information relating to their personal identities would not be made known to the public. Finally, a total of 216 remedial students filled and submitted the Google Forms questionnaires. The description of the participants' demographic information is presented in Table 1.

3.3. Measures

3.3.1. Academic Achievement. To measure the academic achievement, we used the actual school record of each remedial student's overall science score in the university placement examination, which scored a maximum of 400 marks. The scores were obtained from the school's official record for the purpose of data analysis. The scores obtained range from 165 to 333: 165 was the lowest score and 333 was the highest score. We use remedial students' registration numbers to tally the achievement scores with their individual responses to the questionnaire.

3.3.2. Learning Support Questionnaire (LSQ). A learning support questionnaire (LSQ) designed by Kember and Leung [49] was utilized for the study. LSQ is a 17-item self-report measure scored on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The scale is divided into three: teacher support, peer support, and parental support. Teacher support has seven items; for example, "when I had difficulty with assignments, I found the feedback provided by the teacher useful." Peer support has four items; for example, "discussing course material with my classmates outside classes has enhanced my understanding of the material." Finally, parent support has six items; for example, "my parents discuss school work with me on a daily basis." Jelas et al. [23] established a reliability value of 0.74 for the entire instrument using the Malaysian sample. In our study, LSQ was subjected to face and content validity in order to establish its adequacy in Nigerian settings by submitting to specialists in educational psychology and measurement and evaluation. Calculating the alpha value of the subconstructs using Cronbach alpha, teacher support was 0.868, peer support was 0.770, and parent support was 877. When the composite reliability (CR) was computed, the CR values ranged from 0.771 to 0.877, surpassing the 0.60 required acceptable cutoff point [58]. In addition, LSQ has a good convergent validity since the values of average variance extracted (AVE) ranged from 0.470 to 0.545 [59]. The internal consistencies and AVE values of student engagement subconstructs are presented in Table 2.

3.3.3. Student Engagement Questionnaire (SEQ). A student engagement questionnaire (SEQ) designed by Reeve and Tseng [11] was used for the study. SEQ is a 22-item self-report instrument using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The scale is divided into four: emotional, behavioural, agentic, and cognitive engagement. The emotional engagement has four items, for example, "I enjoy learning new things." The behavioural engagement has five items;for example, "I listen carefully in

Table 1: Descriptive statistics of the participants' demographic information.

	Mean	SD	Frequency	Percentage
Age	19.1	1.58	—	—
Gender	—	—		
Male	—	—	73	33.8
Female	—	—	143	66.2
Total	—	—	216	100
Proposed faculty				
Education	—	—	16	7.4
Physical science	—	—	21	9.7
Biological science	—	—	95	44.0
Health science	—	—	78	36.1
Engineering	—	—	2	0.9
Pharmacy	—	—	4	1.9
Total			216	100
Geopolitical zone				
South East	—	—	56	25.9
South South	—	—	86	39.8
South West	—	—	30	13.9
North Central	—	—	20	9.3
North West	—	—	14	6.5
North East	—	—	10	4.6
Total			216	100

class." The agentic engagement has five items; for example, "during class, I ask questions." Lastly, cognitive engagement has eight items; for example, "when I study, I try to connect what I am learning with my own experiences." Reeve and Tseng [11] subjected the scale to the Cronbach alpha measure in Taipei, Taiwan, with the following results: emotional engagement, 0.78; agentic engagement, 0.82; behavioural engagement, 0.94; and cognitive engagement, 0.88. To ascertain the suitability of the SEQ in the Nigerian settings, we subjected the instrument to face and content validity by submitting it to experts in educational psychology and specialists in measurement and evaluation. Computing the reliability coefficient of the subscales using Cronbach alpha resulted in the following values: emotional engagement was 0.811, behavioural was 0.832, agentic was 0.864, and cognitive was 0.893. When the composite reliability was calculated, the CR values ranged from 0.812 to 0.893, exceeding the 0.60 accepted standard [58]. In addition, the value of AVE of SEQ subconstructs ranged from 0.505 to 0.566, thus, indicating a good convergent validity [59]. The internal consistencies and AVE values of student engagement subconstructs are presented in Table 2.

3.3.4. Tools for the Procedure, Measurements, and Analysis of Data. In the present study, analyses of data were done using IBM SPSS v. 26 and IBM Amos v. 24.0. IBM SPSS was utilized to perform descriptive statistical analyses and hierarchal regression analyses, while IBM Amos statistical software was employed to establish the measurement models of the constructs. Prior to the data analysis, we screened several data-related problems such as issues of missing values, normality check, identification of outliers, and multicollinearity problems [60]. A box plot was used to examine the outliers in each subconstruct [61]. For the

Table 2: Validity and reliability of the constructs.

S/N	Subconstructs	CA	CR	AVE
1	Teacher support	0.868	0.870	0.491
2	Peer support	0.770	0.771	0.470
3	Parent support	0.877	0.877	0.545
4	Agentic engagement	0.864	0.866	0.566
5	Behavioural engagement	0.832	0.834	0.505
6	Emotional engagement	0.811	0.812	0.520
7	Cognitive engagement	0.893	0.893	0.513

Note: CA = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

normality check, we tested the skewness and kurtosis critical ratios for individual items at a 95% confidence level by considering acceptable intervals of −1.96 and +1.96 [60]. Then, we verified multivariate normality by examining the values of multivariate kurtosis coefficients and the critical ratio of each construct [62]. In addition, considering that only a self-report questionnaire was utilized in assessing the latent variables, we checked for common-method bias by conducting Harman's single-factor test in the current study. Finally, we examined multicollinearity issues with tolerance T and variance inflation factor (VIF; [63]).

We determined the measurement model by conducting confirmatory factor analysis (CFA) to validate the factorial structure of the instruments with Nigerian samples. We initially calculated the CFA for learning support with three components, namely, teacher, peer, and parent support. Afterwards, CFA for student engagement consisting of four dimensions, emotional, behavioural, cognitive, and agentic, was computed. The examination of model fit was verified in accordance with the score of chi-square (χ^2), root mean square error of approximation (RMSEA), goodness of fit index (GFI), Tucker–Lewis index (TLI), and comparative fit index (CFI; [58, 64]). In line with the previous literature, we performed these measurement models to cover the three recommended categories of model fit tests, namely, parsimonious fit (e.g., chi-square/degree of freedom), incremental fit index (e.g., TLI and CFI), and absolute fit index (RMSEA, GFI, and chi-square test; Copriady et al. [65]). Acceptable cutoff statistics, as recommended, include the following: the probability value should be less than 0.05 for chi-square; TLI, GFI, and CFI values should be greater than 0.90; and RMSEA should be less than 0.08 [58, 64].

Furthermore, we determined the internal consistency of the instruments by computing Cronbach's alpha coefficients and composite reliability (CR). At the same time, the convergent validity was also determined by calculating the average variance extracted (AVE). In addition, we compared the square root of the AVE of each latent variable to its correlations with the other subconstructs to determine the discriminant validity. Hair et al. [60] indicated that an alpha value of 0.70 and above is adequate when performing CFA, whereas the minimum CR value of 0.60 [66] and AVE value of 0.40 are deemed satisfactory provided that CR values are up to 0.60 [59]. Concerning the acceptable discriminant validity, Fornell and Larcker [59] indicated that the square root of the AVE must be greater than the correlation between the latent constructs, while Kline [67] noted that the

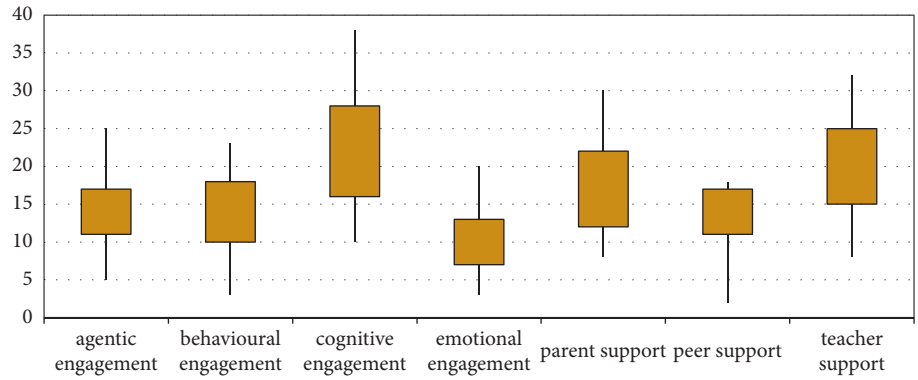

Figure 1: Box plot for the latent constructs.

correlation matrix must be less than 0.90. Finally, the unique explanation of each latent variable on student academic success in UTME was examined using hierarchal regression analysis [56].

3.4. Data Analysis and Interpretation

3.4.1. Initial Analysis: Assumption Check. The initial data check indicated that there was no missing value in the present data. Careful examination of the box plot in each subconstruct revealed that the data are without outliers (see Figure 1). Moreover, the data obtained from Nigerian samples were normally distributed since the skewness and kurtosis critical ratios for individual items in the constructs ranged from 0.063 to −1.820 at a 95% confidence interval (see Table 2), which fall within the acceptable intervals of −1.96 and +1.96 [60]. In addition, our verification of multivariate normality revealed that the multivariate kurtosis coefficients for both constructs were −8.941 and −10.485, with critical ratios of −2.597 and −2.382, respectively. This also implied that the data were normally distributed in the constructs because the values of the critical ratios were less than the 5 cutoff benchmarks [62]. Furthermore, the present study is without the issue of common-method bias since Harman's single-factor test results revealed that the factor accounted for 13.002% of the variance. Lastly, there is no multicollinearity problem since preliminary results indicated that VIF ranged from 1.006 to 1.053, which is less than 5.0 acceptable cutoff, and T ranged from 0.950 to 0.989, which is greater than 0.20 [63]. Thus, all regression assumptions were met in the present study.

3.4.2. Descriptive Statistics. With the descriptive statistics, we described the skewness, kurtosis, means, and standard deviation of the latent constructs. Pearson correlation among the latent variables was also estimated. These are presented in Table 3.

Overall, the outputs from Pearson correlation analysis revealed low and moderate significant levels of relationships among the dimensions of learning support and student engagement. Moreover, significant and moderate and high levels of relationships were associated with the subconstructs and student academic achievement in the university placement examination. For instance, peer support has a low correlation with agentic engagement ($r = 0.178$, $p < 0.01$) and is moderately related to cognitive engagement ($r = 0.209$, $p < 0.001$) but highly correlated with student academic achievement ($r = 0.407$, $p < 0.001$). Moreover, the correlation matrix was below the value of 0.90, and the values of the square root of AVE were greater than the correlation coefficients between the latent variables, thus justifying an acceptable discriminant validity. In addition, there is a variation in the mean scores and standard deviation among the subconstructs and achievement scores.

3.5. Measurement Models. The CFA outputs revealed that the measurement model for the perceived learning support with three subdimensions was provided as an acceptable model fit, with fit indices of $\chi^2 = 203.164$ at p value of 0.000, $\chi^2/\text{df} = 1.751$, CFI = 0.934, GFI = 0.899, TLI = 0.922, and RMSEA = 0.059. Furthermore, the measurement model of student engagement with four subdimensions also presented an adequate model fit, with fit statistics of $\chi^2 = 313.953$ at p value of 0.000), $\chi^2/\text{df} = 1.547$, CFI = 0.945, GFI = 0.885, TLI = 0.937, and RMSEA = 0.050. In addition, the assessment of the measurement model also indicated that all items corresponding to the dimensions of learning support and student engagement were loaded on the intended latent constructs. The standard factor loadings (i.e., estimated interrelations in the reflective measurement model represented by arrows pointing from the latent variables to its observable indicators) surpassed the benchmark of 0.50 [58]. For instance, Figure 2 indicates that the standard factor loadings of all observable indicators of the learning support construct range from 0.51 to 0.77, surpassing the acceptable threshold value of 0.50 [58]. Similarly, Figure 3 revealed that the standard factor loadings of all items of the student engagement construct ranged from 0.56 to 0.84, exceeding the 0.50 required cutoff value [58]. The outputs from the confirmatory factor analysis are represented in Table 4.

3.6. Hierarchical Regression Analysis. Hierarchical regression analysis was conducted to explore the predictive impact of the dimensions of learning support and student engagement of remedial students' science success in the

Table 3: Means, standard deviation, skewness, kurtosis, and bivariate correlation among the variables.

S/N	Variables	1	2	3	4	5	6	7	8
1	Teaching support	**0.701*****							
2	Peer support	0.084	**0.676*****						
3	Parent support	0.012	0.081	**0.738*****					
4	Agentic engagement	0.014	0.178**	0.150*	**0.752*****				
5	Behavioural engagement	−0.026	0.066	0.007	0.206**	**0.710*****			
6	Emotional engagement	−0.046	0.088	−0.002	0.071	0.049	**0.721*****		
7	Cognitive engagement	0.091	0.209**	−0.007	0.204**	0.166*	0.073	**0.716*****	
8	Achievement score	0.325***	0.407***	0.322***	0.422***	0.256***	0.159**	0.364***	1
	Mean M	2.97	3.03	3.02	3.03	2.99	3.05	3.02	265.4
	Standard deviation, SD	0.863	0.900	0.919	0.942	0.950	0.924	0.876	33.5
	Skewness	−0.148	−0.165	−0.229	−0.138	−0.344	0.044	−0.161	−1.32
	Kurtosis	−1.26	−1.26	−1.15	−0.962	−1.122	−1.004	−1.33	−1.18

Note: $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. The bold values provided in Table 3 are square root of AVE.

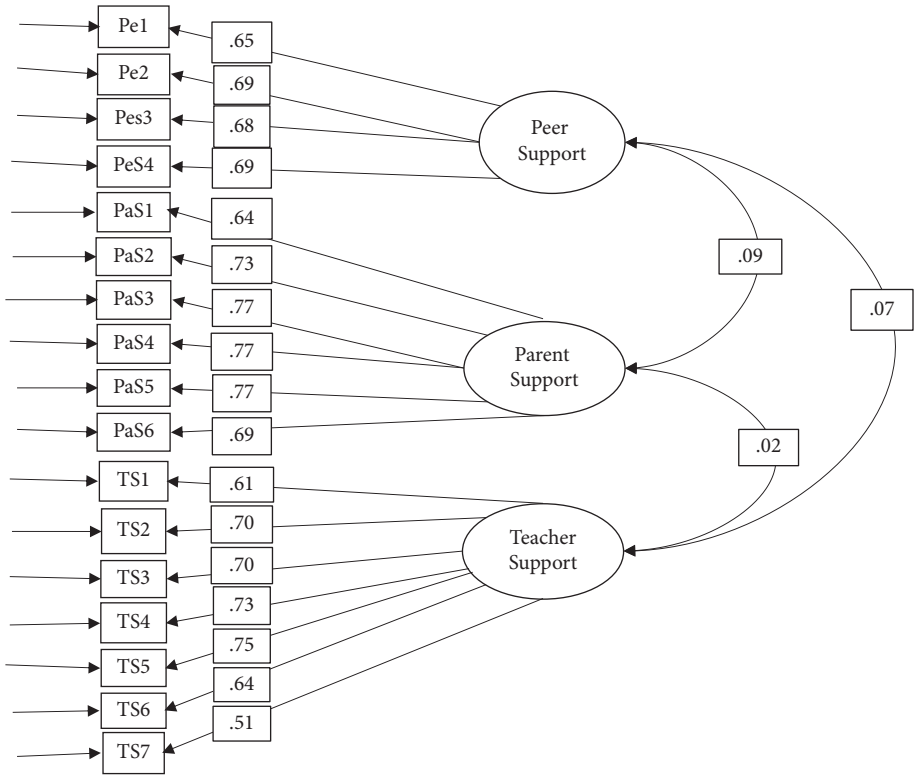

Figure 2: CFA of learning support. Note: PE = peer support; PaS = parent support; TS = teacher support.

university placement examination. The regression analysis was done by entering the predictor variables in a stepwise manner. For instance, we first examined the predictive effects of teacher, peer, and parent support on student science success in the university placement examination. Afterwards, we examined the impacts of emotional, behavioural, cognitive, and agentic engagement in predicting student science success after controlling for aspects of learning support.

As indicated in Table 5, comparative analysis of the relative predictive impacts of different predictor variables on remedial students' science success in the university placement examination was explored. Dimensions of learning support were entered in the first step. The output from the regression analysis revealed significant and positive predictive effects of teacher support ($\beta = 0.253$, $p < 0.001$), peer support ($\beta = 0.280$, $p < 0.001$) and parent support ($\beta = 0.275$, $p < 0.001$). Moreover, dimensions of learning support were able to explain 24.3% of the variance in remedial students' science success. In the second step, the dimensions of student engagement were included in the regression model. Overall, all dimensions of student engagement were able to account for an additional 28.7% of the variance in remedial students' science success after controlling for the three aspects of learning support. Furthermore, the results from the regression analysis also indicated that agentic engagement ($\beta = 0.278$, $p < 0.001$), behavioural engagement ($\beta = 0.227$, $p < 0.001$), emotional engagement ($\beta = 0.127$, $p < 0.01$), and

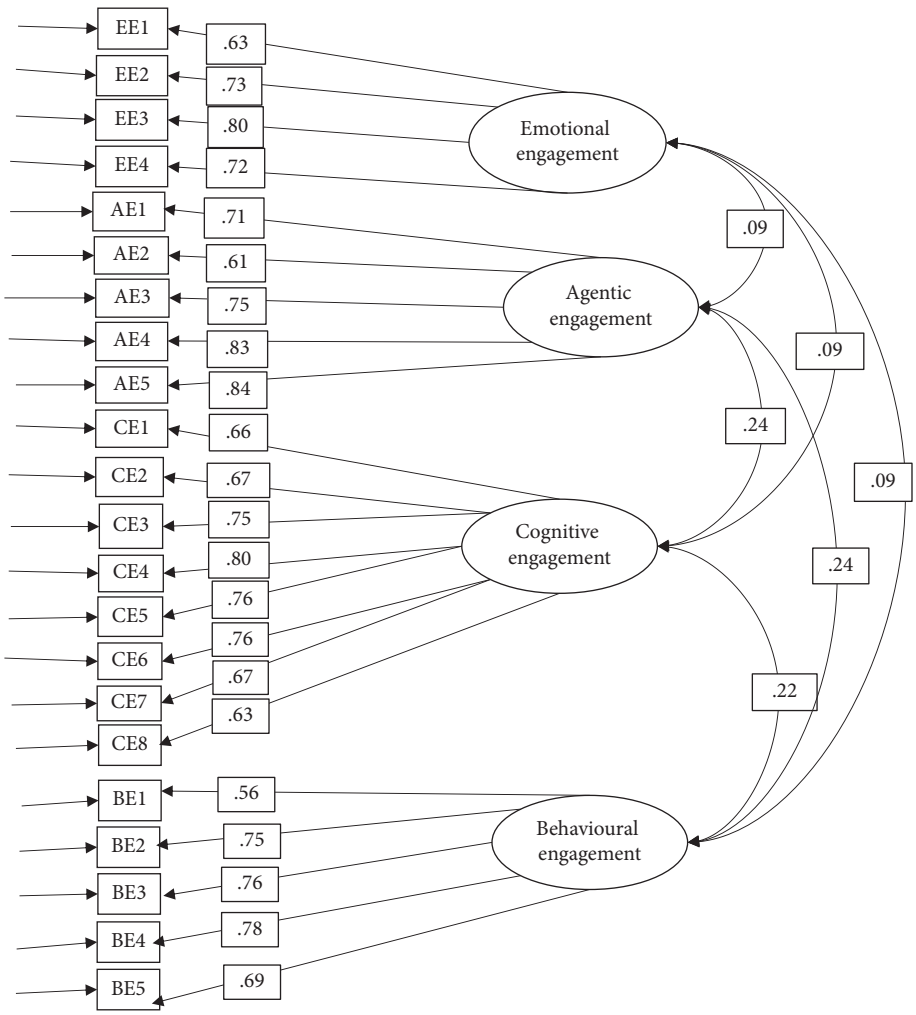

Figure 3: CFA of student engagement. Note: AE = agentic engagement; BE = behavioural engagement; EE = emotional engagement; CE = cognitive engagement.

Table 4: Assessment of the measurement model.

Constructs	χ^2	χ^2/df	CFI	GFI	TLI	RMSEA
Learning support	203.164	1.751	0.934	0.899	0.922	0.059
Student engagement	313.953	1.547	0.945	0.885	0.937	0.050
Acceptable cutoff	p = 0.000	<5.0	>0.90	>0.85	>0.90	<0.08

Note: χ^2 = chi-square goodness of fit; df = degree of freedom; CFI = comparative fit index; GFI = goodness of fit; TLI = Tucker–Lewis index; RMSEA = rood mean square error of approximation.

Table 5: Hierarchical regression analysis predicting remedial students' science success in UTME.

Steps	Predictor variables	Unstandardized coefficients		Standardized coefficients
		B	Std. error	Beta (β)
1	(Constant) $R^2 = 0.243^{**}$	187.507	10.320	
	Teacher support	1.287	0.305	0.253^{***}
	Peer support	2.386	0.513	0.280^{***}
	Parent support	1.544	0.337	0.275^{***}
2	(Constant) $R^2 = 0.287^{**}$	112.897	10.987	
	Teacher support	1.270	0.244	0.249^{***}
	Peer support	1.300	0.421	0.152^{***}
	Parent support	1.374	0.270	0.244^{***}
	Agentic engagement	1.823	0.330	0.278^{***}
	Behavioural engagement	1.545	0.335	0.227^{***}
	Emotional engagement	1.051	0.397	0.127^{**}
	Cognitive engagement	1.151	0.220	0.262^{***}

Note: $^{**}p < 0.01$; $^{***}p < 0.001$.

cognitive engagement ($\beta = 0.262$, $p < 0.001$) were significant and positive predictors of students' science success. In addition, the final regression model was able to account for 53% of the variance in remedial students' science success.

4. Discussion

This study explored the impacts of perceived learning support and student engagement on remedial students' science success in online learning during the COVID-19 pandemic. Our findings from the regression analysis revealed that the dimensions of learning support, including teacher, peer, and parent supports, positively and significantly predicted remedial students' science success in the university placement examination during the COVID-19 emergency paradigm shift to online learning. These results are in line with the findings of Novianti et al. [68], in which they found a significant association between learning supports with the academic success of students. In addition, some authors also found a significant and direct impact of learning supports on students' academic achievement in the Malaysian context [23]. This positive impact of learning support forms on student's success implies that the more parents, peers, and teachers provide learning support to students, the more students' academic performance is enhanced. The present results were also related to the findings of Permatasari et al. [69], in which they found a significant relationship between social context (teachers, peers, and parents support) and academic resilience during COVID-19 school closure. Aduba and Mayowa-Adebara [20] concluded in their study that adequate learning support was provided to Nigerian university students during the pandemic period. This, to a large extent, contributed to students' adaptability and academic success in the COVID-19 online learning environment [70]. Our findings are also in line with pre-COVID-19 studies that have revealed significant effects of learning supports on students' academic success [22, 71], thus emphasizing the critical importance of social interactions on students' academic success.

Besides perceived aspects of learning support, the present study examined the dimensions of student engagement as important exogenous variables that are capable of predicting remedial students' science success in the university placement examination during the pandemic period. Outputs from the regression analysis indicated that the dimensions of student engagement, including emotional, behavioural, cognitive, and agentic, were significant and positive predictors of student academic success during the pandemic period. The results confirmed the qualitative findings of Chiu [72], in which it was revealed that academic success during COVID-19 online learning is highly associated with the level of student engagement. In addition, the authors of a recent systematic review study also found that academic success is highly predicted by the level of student academic engagement in a technology-enhanced learning environment [73]. This positive relationship between student engagement and academic success implies that as the level of student engagement in academic activities increases, one's academic performance also improves. Furthermore, our results enabled us to untangle the unique roles played by each subdimension of student engagement in explaining the variances in student academic successes. The agentic engagement and cognitive engagement have the highest predictive powers on students' academic success, followed by the behavioural and emotional dimensions, respectively. Though all the dimensions contributed positively to the academic success of these students during the pandemic period, the fact that agentic and cognitive dimensions were the highest predictors highlights the importance of active cognitive investment and contribution to the flow of instruction have on student academic achievement [11, 38]. Further breakdown of the individual predictive powers of the dimensions shows that the behavioural dimension had a higher index than the emotional component. This further shows the essence of the practical investment of time and efforts of students in their studies. Our findings corroborate the findings of similar studies that examined the relationship between the dimensions of student engagement and their academic success [74, 75]. Overall, our findings, in tandem with previous studies, have revealed the relevance of student engagement to academic success.

The results of the analyses also indicated that all three aspects of learning support were positive and significant predictors of students' academic success in the second model. This aligned with the emerging theoretical understanding that student engagement and academic success during COVID-19 online learning can be promoted through a supportive learning environment [76]. It has been suggested that most disengaged and unsuccessful students in technological-enhanced classrooms resulted from less autonomy-supportive learning environments [73]. The results of the present study were in line with the findings of previous studies [23, 44], possibly because a supportive learning environment is a valuable pathway for motivating students' engagement and academic success in a technology-enhanced learning setting [73]. Therefore, for a student to thrive in online learning, the supportive learning environment created by the teachers, peers, and parents is very crucial for their academic engagement.

5. Conclusions, Implications, Limitations, and Suggestions for Further Research

Our findings highlighted that support from teachers, peers, and parents and emotional, behavioural, cognitive, and agentic engagement had significant impacts on remedial students' science success in the university placement examinations. The findings revealed the importance of both learning support and student engagement to students' academic success during the pandemic period, given the fact that the higher the learning supports and student engagement scores, the higher the students' academic scores. It was concluded that for the academic successes of students to be enhanced during emergency situations such as the COVID-19 pandemic period, supportive structures that transcend systems should be in place and efforts should be made to facilitate their engagement in online learning platforms.

Our study has two major implications, namely, theoretical and practical implications. Theoretically, our study contributed to the extant literature on learning students' motivation and academic success via student engagement and learning support, especially in higher education, where remedial students tend to experience academic difficulties in the field of sciences. In addition, our study has added to the self-determination theory (SDT), yet in technology-enhanced settings since our study indicated that student engagement is a function of SDT in online learning [72]. The current study also extended the role of social contexts in facilitating online learning in higher education.

Furthermore, our study has provided empirical evidence that has practical implications, particularly for teaching and teacher education. Since student engagement has a positive influence on students' academic success in online learning [72], teachers and other stakeholders in the education sector should endeavour to create a learning environment that is learner-centred and, at the same time, make efforts to encourage remedial students to actively participate in online learning activities. At the same time, our study has empirically shown that perceived social context (teacher, peer, and parent support) plays a crucial role in motivating student engagement in online learning. This has brought to the attention of school administrators, policymakers, instructors, and adult learners that learning support influences students' early adjustment and engagement in online learning. Therefore, higher education institutions should consider incorporating educational support from different personnel to encourage student engagement in learning, especially for remedial students who, to some extent, exhibit academic maladjustment emerging from dissatisfaction with schools. This is because support from different sources, including teachers, peers, and parents, has been identified as an extrinsic motivator that mediates between students' amotivation and intrinsic motivation [48].

The current study has some limitations. First, our findings might be reflective of a particular group of remedial students whose parents provided good computer gadgets and reliable Internet connectivity for online learning in Nigeria. This is noticeable in the small number of remedial students who responded to the online Google Form. Hence, it is difficult to fully generalize the findings to all remedial students, especially those with limited access to computer and Internet facilities during the pandemic emergency period. Therefore, further studies should be conducted with more representative samples by applying the use of a self-administered questionnaire while observing COVID-19 protocols. Secondly, although the study adopted a quantitative research paradigm and examined the impacts of perceived learning support and student engagement on science success during online learning, only a correlational research design was employed, making it difficult to explain explicitly. Future researchers should adopt a mixed-methods approach by triangulating the findings. In addition, we relied on self-report data in this study, and this might introduce a response bias. This is because students may have filled the online Google Form questionnaire in a socially desirable manner, perceiving high learning support and engagement in science. It has been suggested that assessing the level of student engagement in science learning is difficult [77]. Therefore, we suggest that future researchers should use multiple approaches, such as observational methods, self-paced reading, and eye-tracking, for assessing student engagement in science.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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