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Indirect Influence of Self-Regulation and Motivation on the Relationship between the Learning Engagement and Academic Performance among Colleges of Education Biology Students in Niger State, Nigeria

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ABSTRACT: The study investigated the indirect influence of self-regulation and motivation on the relationship between learning engagement and performance among biology pre-service teachers in Niger State. Six objectives with corresponding six research questions were raised to guide the study. Similarly, four research hypotheses were achieved at 0.05 level of significance. The study adopted a correlational design. The study focused on 4,020 NCE II students from the School of Sciences within a larger population of 97,479 College of Education students during the 2022–2023 academic session. Using a multi-stage sampling approach, 351 biology students were ultimately selected. A self-designed instrument called the Self-Regulation and Motivation Inventory Questionnaire (SMIQ) was used to collect data, with a reliability score of 0.7 (Cronbach's alpha). Descriptive statistics such as mean and standard deviation, alongside scatter plots, were employed to answer the research questions, while regression analysis tested the hypotheses. The study found a high level of self-regulation among biology students at the College of Education in Niger State, with mean scores ranging from 4.19 to 4.52. The results indicated that biology students at the College of Education in Niger State are motivated both intrinsically and extrinsically, with mean scores ranging from 3.26 to 4.59. The analysis revealed a slight positive association between learning engagement and academic performance among biology students. Similarly, a positive relationship was found between motivation and academic performance among Colleges of Education students. The study did not find significant evidence at $p > 0.05$ to support the mediating influence of self-regulation on the relationship between learning engagement and academic performance among College of Education students. This suggests that self-regulation may not play a substantial mediating role in translating engagement into academic success in this context. And the analysis did not reveal a significant mediating effect at $p > 0.05$ of motivation on the relationship between learning engagement and academic performance.

KEYWORDS: Influence, self-regulation, cognitive processes, learner engagement, academic performance, pre-service biology teachers, Nigeria

I. INTRODUCTION

The rapid advancements in science and technology have significantly increased the need for continuous knowledge updates. Education remains the cornerstone of both individual and national development, universally recognized as a fundamental human right that transcends gender boundaries [1]. As [2] emphasizes, education forms the bedrock of economic and social progress, serving as the key to success and a pathway to sustainable development. High-quality education is essential in nurturing responsible citizens capable of driving economic growth and competing in today's knowledge-driven world. In Nigeria, education equips individuals with the knowledge and skills necessary for intellectual advancement and social empowerment [1]. Biology, as a fundamental branch of science, delves into the study of living organisms, encompassing both plants and animals. It explores their structures, functions, growth, origins, evolution, distribution, and interactions

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within ecosystems [3]. Biology plays a crucial role in science education, offering students a deeper understanding of genetics, evolution, ecology, and cellular and molecular biology. Through this subject, students develop an appreciation for the complex relationships among organisms and their environments, as well as humanity's role in the natural world. Furthermore, biology provides the foundation for comprehending scientific research, technological advancements, and pressing environmental issues [2]. Given its importance in sustaining economies and fostering scientific literacy, biology education has remained a priority [4]. By cultivating critical thinking and problem-solving skills, biology empowers students to address real-world challenges and contribute meaningfully to national development.

Despite the significance of biology education in Nigerian schools, students' poor performance in biology examination remains a major concern [5, 6, 7]. This issue is largely attributed to teacher-centered instruction, which limits student engagement and active participation in the learning process. Enhancing student involvement and adopting effective teaching strategies could lead to meaningful learning experiences and improved academic performance. In education, performance refers to the extent to which students acquire the knowledge, skills, and competencies intended by their instructors [8]. It serves as a key indicator of a student's success in achieving learning objectives. Since students are central to the learning process, their personal engagement and motivation significantly influence their academic performance. The shift towards student-centered learning in the 21st century underscores the importance of an interactive and dynamic educational environment. This approach focuses on learning objectives, the exchange of information between teachers and students, and the development of critical thinking skills [2]. Creating an engaging learning environment that supports student-centered approaches is crucial for fostering academic achievement and enhancing student involvement. [9] highlighted that students' choice of deep (meaningful) or surface (rote) learning largely depends on their interactions with the learning environment, which also serves as a key predictor of academic performance. Effective learning engagement is shaped by the interactions between students and instructors, playing a vital role in their overall academic success. Given the evolving educational landscape, students must take ownership of their learning journey. Strengthening their ability to engage in self-regulated learning is a fundamental requirement for success in today's dynamic academic environment. In self-regulated learning, students take charge of their education by assessing tasks, evaluating available strategies, and applying themselves to successfully complete those tasks. [10] define self-regulated learning as an active process where students set objectives for their learning, monitoring, regulating, and controlling their thoughts, motivation, and behavior to achieve them. Similarly, [11] describes self-regulated learning as an intentional process in which learners exercise control over their cognitive and motivational strategies to accomplish educational goals.

Motivation plays a crucial role in shaping students' cognitive processes and behavior. It serves as a driving force behind learning and can be influenced by personal and environmental factors, such as the attachment to learning activities and the administration of rewards and punishments [12]. [13] emphasizes that while motivation is a critical element in the learning process, it alone may not be sufficient to ensure academic success. Academic motivation encompasses a student's effort, persistence, and dedication to completing tasks and mastering chosen subjects. It positively impacts learning by encouraging engagement, sustaining effort, and providing direction in learning activities [14]. A student's level of motivation directly influences their self-regulation in learning and, consequently, their academic performance. [10] assert that students learn more effectively when they are actively engaged in the learning process rather than passively absorbing information. For this reason, fostering motivation is essential in ensuring meaningful student engagement.

[15] note that self-regulation has a significant impact on academic outcomes, including grades. Similarly, [16] found that motivation is a key predictor of academic success, persistence, and determination. While prior studies have explored the influence of self-regulation and motivation on student performance, the indirect relationship between these factors and academic achievement remains under-researched. Therefore, this study aims to examine the indirect effects of self-regulation and motivation on the relationship between learning engagement and academic performance among biology students in colleges of education in Niger State.

Statement of the Problem

The importance of Biology in science and technology-related courses cannot be over-emphasized. It is a pre-requisite for entering into Tertiary Institutions to study Biological and Physical sciences; technology and engineering, pharmacy, medicine, and health-related courses. This made the Federal Government of Nigeria to include it in the school curriculum and make it compulsory for Colleges of Education students who want to study sciences, technology, and health-related

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disciplines. Despite the importance of Biology to National Development, Colleges of Education Biology students' poor performance in examinations has been a significant concern [6]. Students encounter problems in understanding some of the concepts in Biology such as genetics, cell division and taxonomy, which students find difficult to learn, thereby, leading to poor performance. [10] noted that lack of self-regulation processes is the primary factor leading to tertiary students' failure. Hence, to curb this problem of poor performance, Colleges of Education students should put in extra effort in their learning by engaging in self-regulated learning. Recent studies show that only 45% of students in the Colleges of Education achieve a GPA of 3.0 or higher, indicating a significant challenge in academic performance. Additionally, a survey conducted in the study area revealed that 60% of students reported difficulties in managing their study time and maintaining motivation. However, for students to engage in self-regulated learning, it is paramount to have an exciting learning environment that would give them better learning engagements, arouse and sustain their interest. The bid to provide better learning engagements has led the government to provide an enabling environment upon recommendations such as building infrastructural facilities for students (e-library) and provision of internet in the school among others [17]. This poor performance of pre-service teachers can be attributed to a lack of motivation and self-regulation among others. This encourages the researchers to embark on this study indirect influence of self-regulation and motivation on the relationship between learning engagement and academic performance among Colleges of Education students in Niger state.

Purpose of the Study

This study investigated indirect influence of self-regulation and motivation on relationship between learning engagement and performance among biology pre-service teachers in Niger State.

The objectives of the study are to:

1. Determine the level of College of Education biology students' self-regulation in Niger State
2. Determine the level of College of Education biology students' motivation in Niger State
3. Assess the relationship between learning engagement and academic performance among College of Education biology students in Niger state.
4. Assess the relationship between motivation and academic performance among College of Education biology students in Niger state.
5. Determine the mediating influence of self-regulation on the relationship between Learning engagement and academic performance among College of Education biology students in Niger state.
6. Examine the mediating influence of motivation on the relationship between learning engagement and academic performance among College of Education biology students in Niger state.

Research Questions

The following research questions guided the study.

1. What is the level of Biology students' self-regulation in the Colleges of Education in Niger State?
2. What is the level of Biology students' motivation in the Colleges of Education in Niger state?
3. What is the relationship between learning engagement and academic performance among College of Education students in Niger state?
4. What is the relationship between motivation and academic performance among College of Education students in Niger state?
5. What is the mediating influence of self-regulation on the relationship between Learning engagement and academic performance among College of Education students in Niger state?
6. What is the mediating influence of motivation on the relationship between learning engagement and academic performance among College of Education students in Niger state?

Hypotheses

To carry out the research effectively, the under listed null hypotheses were formulated and were tested at 0.05 level of significance:

H_{O1} There is no significant relationship between the learning engagement and performance among biology students in the College of Education in Niger State.

H_{O2} There is no significant relationship between the motivation and academic performance among College of Education biology students in Niger state.

H_{O3} There is no significant relationship between the mediating influence of self-regulation on the relationship between the Learning engagement and academic performance among College of Education biology students in Niger state.

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H_{O4} There is no significant relationship between the mediating influence of motivation on the relationship between the learning engagement and academic performance among College of Education biology students in Niger state.

II. METHODOLOGY

This study adopted a correlational research design to examine the relationships among self-regulation, motivation, learning engagement, and academic performance of College of Education students in Niger State. Correlational research is particularly useful in assessing how variables interact within a single group [18]. The study targeted NCE II students from the School of Sciences, comprising 4,020 students across seven departments: Physics, Mathematics, Chemistry, Biology, Physical and Health Education (PHE), Integrated Science, and Computer Science. From this population, a sample of 351 students was selected using a multi-stage sampling technique. Purposive sampling was used to select the School of Sciences and the NCE II level, as these students are academically stable and well-acquainted with the school environment. Additionally, simple random sampling was used to select students from the biology department. The Self-Regulation and Motivation Inventory Questionnaire (SMIQ) was used for data collection, alongside academic performance records obtained from the college examiners. The SMIQ was structured into four sections. Section A, B, C & D. Sections A solicit information on demographic data such as department and gender. Section B of (SMIQ) consist of 20 items used to collect data on self-regulation and Section C consist of 20 items that was used to collect data on students' Motivation. Section D consisted of 20 items that was used to collect data on students' learning engagements. Responses were measured using a five-point Likert scale (Strongly Agree to Strongly Disagree), with a decision mean of 3.0 used for interpretation.

To ensure validity, the instrument underwent construct and criterion validation by three experts from Federal University of Technology, Minna, and College of Education, Minna. Face and content validity were further reviewed by an education psychology expert from Ibrahim Badamasi Babangida University, Lapai, who assessed clarity, coverage, and language appropriateness. The reliability of the instrument was tested through a pilot study at Federal College of Education, Kontagora, using Cronbach's alpha, which yielded values above 0.7, confirming strong internal consistency [19]. Before data collection, permission was obtained from relevant school authorities. The researchers trained two research assistants to guide students in completing the questionnaire accurately. To ensure full participation and retrieval, the researchers and assistants remained present during the administration process. Data were analyzed using inferential statistics. Linear regression analysis was used to test the null hypotheses, with statistical significance set at 0.05 alpha level. All analyses were conducted using SPSS version 23.0 and AMOS software.

III. RESULTS AND DISCUSSION

This study analyzed data to address the research questions and test the formulated hypotheses. The findings are presented below, organized by research question.

Research Question One: What is the level of biology students' self-regulation in the College of Education in Niger State? To answer this research question, mean and standard deviation were calculated and the result presented in Table1:

Table 1: Level of Biology Students' Self-Regulation in the College of Education in Niger State.

S/N	Statement	N	$\bar{x}$	SD	Decision
1	When learning new science concepts, I attempt to understand them.	351	4.50	.650	High
2	When learning new science concepts, I connect them to my previous experiences.	351	4.40	.676	High
3	When I do not understand a science concept, I find relevant resources that will help me.	351	4.32	.798	High

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4	When I do not understand a science concept, I would discuss with the teacher or other students to clarify my understanding.	351	4.25	.811	High
5	During the learning processes, I attempt to make connections between the concepts that I learn.	351	4.35	.745	High
6	When I make a mistake, I try to find out why.	351	4.19	.877	High
7	When I meet science concepts that I do not understand, I still try to learn them.	351	4.36	.823	High
8	When new science concepts that I have learned conflict with my previous understanding, I try to understand why.	351	4.35	.852	High
9	I think that learning science is important because I can use it in my daily life.	351	4.44	.882	High
10	I think that learning science is important because it stimulates my thinking.	351	4.20	.814	High
11	In science, I think that it is important to learn to solve problems.	351	4.34	.788	High
12	In science, I think it is important to participate in inquiry activities.	351	4.52	.688	High
	Grand Mean		4.35	0.78	High

Decision Mean = 3.00.

Table 1: reveals the level of self-regulation among biology students at the College of Education in Niger State. The mean scores for each item ranged from 4.19 to 4.52, indicating a generally high level of agreement among the students regarding their self-regulatory behaviours in learning science concepts. For instance, students reported actively attempting to understand new science concepts (X = 4.50, SD = 0.650) and connecting these concepts to their previous experiences (X = 4.40, SD = 0.676). They also demonstrated a proactive approach to seeking help when encountering difficulties, either by finding relevant resources (X = 4.32, SD = 0.798) or discussing with teachers or peers (X = 4.25, SD = 0.811). Moreover, students displayed persistence in their learning endeavors, as evidenced by their efforts to make connections between learned concepts (X = 4.35, SD = 0.745) and understanding the reasons behind their mistakes (X = 4.19, SD = 0.877). Even when faced with challenging concepts, students exhibited a willingness to learn and engage (X = 4.36, SD = 0.823). Furthermore, the results indicate that students recognize the importance of learning science for its practical application in daily life (X = 4.44, SD = 0.882) and its role in stimulating critical thinking (X = 4.20, SD = 0.814). They also value problem-solving skills (X = 4.34, SD = 0.788) and participation in inquiry activities (X = 4.52, SD = 0.688) within the context of science education. Overall, the grand mean score of 4.35 (SD = 0.78) suggests a strong consensus among biology students at the College of Education in Niger State regarding their self-regulatory behaviours in learning science concepts. These findings underscore the importance of fostering self-regulated learning strategies among students, which can positively influence their academic success and future professional development.

Research Question Two: What is the level of biology students' motivation in the College of Education in Niger State? To answer this research question, Mean and standard deviation were used and the result presented in Table 2

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Table 2: Level of Biology Students' Motivation in the College of Education in Niger State

S/N	Statement	N	$\bar{X}$	SD	Decision
1	It is important to have the opportunity to satisfy my own curiosity when learning science.	351	4.46	.770	High
2	I participate in science courses to get a good grade.	351	4.23	.808	High
3	I participate in science courses to perform better than other students.	351	4.26	.955	High
4	I participate in science courses so that other students think that I'm smart.	351	4.32	.951	High
5	I participate in science courses so that the teacher pays attention to me.	351	4.19	.933	High
6	During a science course, I feel most fulfilled when I attain a good score in a test	351	4.30	.918	High
7	I feel most fulfilled when I feel confident about the content in a science course.	351	4.27	.959	High
8	During a science course, I feel most fulfilled when I am able to solve a difficult problem.	351	3.88	1.099	High
9	During a science course, I feel most fulfilled when the teacher accepts my ideas.	351	4.59	.809	High
10	During a science course, I feel most fulfilled when other students accept my ideas.	351	4.44	.768	High
11	I am willing to participate in this science course because the content is exciting and changeable.	351	4.32	.969	High
12	I am willing to participate in this science course because the teacher uses a variety of teaching methods.	351	4.19	.969	High
13	I am willing to participate in this science course because the teacher does not put a lot of pressure on me.	351	4.15	.962	High
14	I am willing to participate in this science course because the teacher pays attention to me.	351	4.24	1.131	High
15	I am willing to participate in this science course because it is challenging.	351	4.04	1.126	High
16	I am willing to participate in this science course because the students are involved in discussions.	351	3.62	1.150	High
17	I usually keep track of my progress towards my goals.	351	3.26	1.403	High
18	I am able to accomplish goals I set for myself.	351	4.23	1.090	High
19	If I wanted to change, I am confident that I could do it.	351	4.26	.990	High
20	I can stick to a plan that's working well.	351	4.37	.973	High
21	I usually only have to make a mistake one time in order to learn from it.	351	4.04	1.048	High
22	I have personal standards, and try to live up to them.	351	3.99	1.106	High

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23	As soon as I see a problem or challenge, I start looking for all possible solutions.	351	4.26	.936	High
24	When I'm trying to change something, I pay a lot of attention to how I'm doing.	351	4.15	1.026	High
25	I set goals for myself and keep track of my progress.	351	3.72	1.175	High
26	I can usually find several different possibilities when I want to change something.	351	3.47	1.335	High
27	If I make a resolution to change something, I pay a lot of attention to how I'm doing.	351	4.09	1.119	High
28	I usually think before I act.	351	4.06	1.022	High
	Grand Mean		4.12	1.02	High

Decision Mean = 3.00.

Table 2 reveals various aspects of their motivational factors. Mean and standard deviation were utilized to analyze responses to a series of statements regarding students' motivations in science courses. The findings indicate a generally high level of agreement among the students regarding their motivations. Mean scores for each item ranged from 3.26 to 4.59, suggesting a diverse range of motivational factors at play. Students expressed intrinsic motivations, such as the importance of satisfying their own curiosity (X = 4.46, SD = 0.770) and feeling fulfilled when confident about the course content (X = 4.27, SD = 0.959). Additionally, they demonstrated extrinsic motivations, including striving for good grades (X = 4.23, SD = 0.808) and seeking recognition from peers and teachers (performing better than others, X = 4.26, SD = 0.955; gaining attention from the teacher, X = 4.19, SD = 0.933). Furthermore, students indicated a willingness to engage in science courses due to various factors, such as finding the content exciting and changeable (X = 4.32, SD = 0.969), appreciating diverse teaching methods (X = 4.19, SD = 0.969), and perceiving manageable pressure from teachers (X = 4.15, SD = 0.962). Moreover, students exhibited strong self-regulatory behaviours, such as setting goals (X = 4.23, SD = 1.090), tracking progress towards these goals (X = 3.72, SD = 1.175), and persisting in finding solutions to challenges (X = 4.26, SD = 0.936). The grand mean score of 4.12 (SD = 1.02) suggests an overall agreement among biology students regarding their motivations in science courses. These findings underscore the importance of considering both intrinsic and extrinsic motivational factors in understanding students' engagement and performance in science education.

Research Question Three: What is the relationship between learning engagement and academic performance among College of Education students in Niger state? To answer this research question scatterplot was used and the analysis presented in Figure 1.

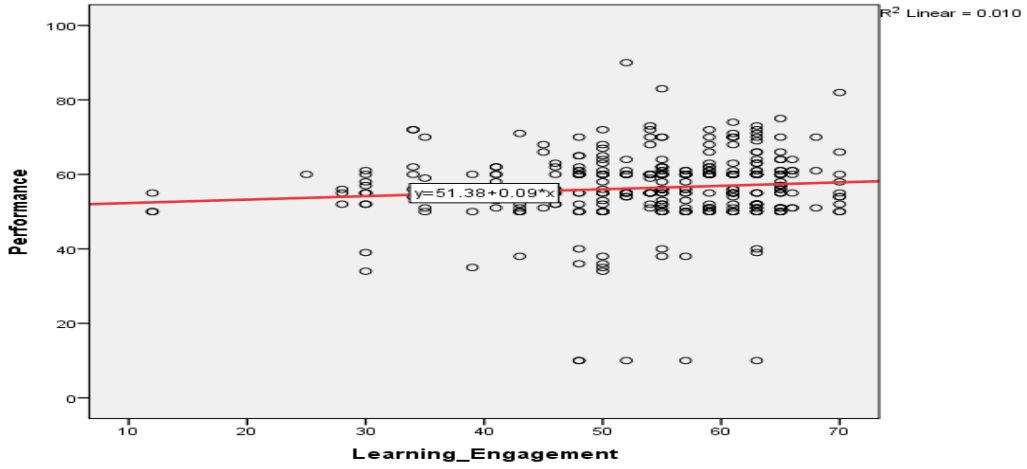

Figure 1: Relationships between learning engagement and academic performance

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Figure 1 illustrates the positive relationship between learning engagement and academic performance among College of Education students. The scatterplot reveals a significant correlation, as evidenced by the upward trend of the regression line. This suggests that increased learning engagement is associated with improved academic performance, indicating a positive and meaningful relationship between the two variables.

Research Question Four: What is the between motivation and academic performance among College of Education students in Niger State? To answer this research question scatterplot was used and the analysis presented in Figure 2.

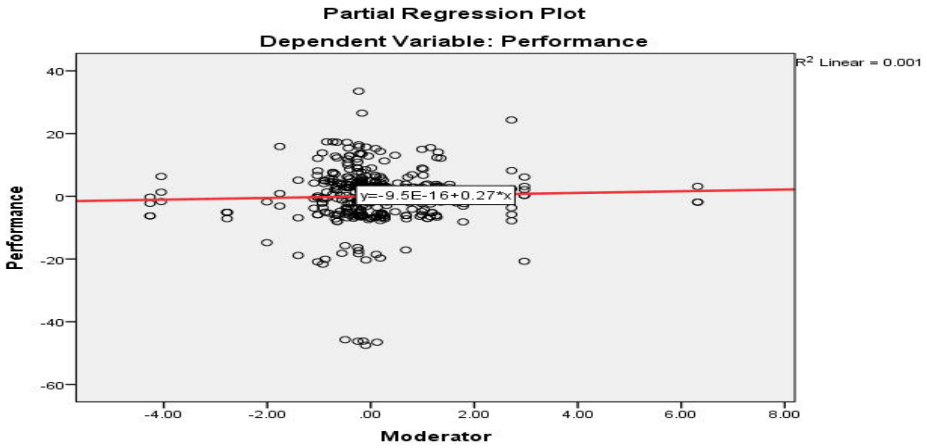

Figure 2: Relationships between Motivation and Academic Performance among College of Education Students

Figure 2 depicts the positive correlation between motivation and academic performance among College of Education students. The scatterplot reveals a significant relationship, as shown by the upward trend of the regression line. This suggests that higher motivation levels are associated with better academic performance, indicating a positive and meaningful relationship between motivation and academic success.

Research Question Five: What is the mediating influence of self-regulation on the relationship between Learning engagement and academic performance among College of Education students in Niger state? To answer this research question scatterplot was used and the analysis presented in Figure 3.

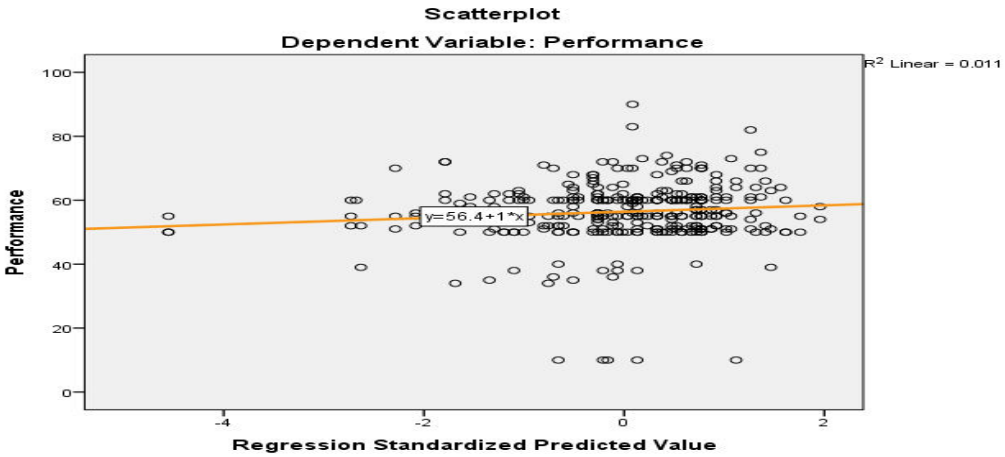

Figure 3 Mediating Effect of Self-regulation on the Relationships between Learning Engagement and Academic Performance among College of Education students.

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Figure 3 illustrates the mediating role of self-regulation in the relationship between learning engagement and academic performance among College of Education students. The scatterplot reveals a positive indirect effect, as evidenced by the regression line, suggesting that self-regulation plays a facilitating role in enhancing academic performance. Specifically, the results indicate that self-regulation mediates the positive relationship between learning engagement and academic performance, highlighting its importance as a critical factor in achieving academic success.

Research Question Six: What is the mediating influence of motivation on the relationship between learning engagement and academic performance among College of Education students in Niger state? To answer this research question scatterplot was used and the analysis presented in Figure 4.

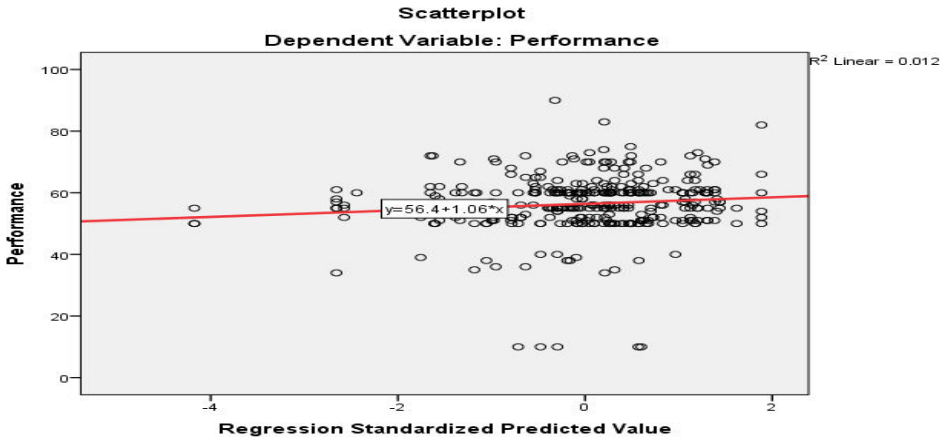

Figure 4 Mediating Influence of Motivation Relationships between Self-regulation and Academic Performance among College of Education Students

Figure 4 depicts the mediating effect of motivation on the relationship between self-regulation and academic performance among College of Education students. The scatterplot reveals a positive indirect relationship, as shown by the regression line, indicating that motivation plays a significant role in enhancing academic performance. Specifically, the results suggest that motivation mediates the positive relationship between self-regulation and academic performance, highlighting its importance as a key factor in achieving academic success.

Testing of Null Hypotheses

To investigate the research hypotheses, data were analyzed, and the findings are presented below. The null hypotheses were tested at a 0.05 significance level, indicating that any observed effects or relationships were considered statistically significant if the p-value was less than 0.05.

HO_1: There is no significant relationship between the learning engagement and performance among biology students in the College of Education in Niger State. To test this hypothesis, linear regression was used and the results are presented in Table 1a.

Table 1.1a Model Summary of the Relationship between Learning Engagement and Students' Performance in Biology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.102[a]	.010	.008	9.433

a. Predictors: (Constant), Learning Engagement

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Table 1.1a presents a summary of the regression model, examining the relationship between learning engagement (predictor) and biology students' performance (criterion). The results reveal a correlation coefficient (r) of 0.102 and a coefficient of determination (r2) of 0.010, indicating that 1.0% of the variance in biology students' performance can be attributed to learning engagement. Further details on the regression coefficients are provided in Table 1.1b.

Table 1.1b Linear Regression Coefficient between Learning Engagement and Students' Performance in Biology

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	51.383	2.678		19.186	.000
	Learning Engagement	.093	.048	.102	1.909	.057

a. Dependent Variable: Performance

Table 1.1b presents the regression coefficients for the relationship between learning engagement and biology students' performance. The results show a standardized Beta coefficient (B) of 0.102, t-value of 1.91, and a p-value greater than 0.05. Although the coefficient is positive, indicating a positive relationship between learning engagement and biology students' performance, it is not statistically significant at the 0.05 level. Consequently, the null hypothesis is retained. The regression coefficient suggests that for every one-unit increase in learning engagement, biology students' performance is expected to increase by 0.093 units, assuming all other factors remain constant.

HO_2: There is no significant relationship between motivation and biology academic performance among College of Education students in Niger state. To test this hypothesis, linear regression was used and the results presented in Table 2.2a

Table 2.2a Model Summary of the Relationship between Motivation and Students' Performance in Biology

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.068[a]	.005	.002	9.460

a. Predictors: (Constant), Motivation

Table 2.2a presents a summary of the regression model, examining the relationship between motivation (predictor) and biology students' performance (criterion). The results reveal a correlation coefficient (r) of 0.068 and a coefficient of determination (r2) of 0.005, indicating that only 005% of the variance in biology students' performance can be attributed to motivation. The regression coefficients for this relationship are presented in Table 2.2b.

Table 2.2b Linear Regression Coefficient between Motivation and Students' Performance in Biology

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	52.911	2.806		18.856	.000
	Motivation	.056	.044	.068	1.265	.207

a. Dependent Variable: Performance

Table 2.2b presents the regression coefficients for the relationship between motivation and biology students' performance. The results show a standardized Beta coefficient (B) of 0.068, t-value of 1.27, and a p-value of 0.21, which is greater than 0.05. Although the coefficient is positive, indicating a positive relationship between motivation and biology students'

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performance, it is not statistically significant. Consequently, the null hypothesis is retained. The regression coefficient suggests that for every one-unit increase in motivation, biology students' performance is expected to increase by 0.056 units, assuming all other factors remain constant.

HO3: There is no significant mediating influence of self-regulation on the relationship between the Learning engagement and academic performance among College of Education biology students in Niger state. To test this hypothesis, linear regression was used and the results presented in Table 3.3a

Table 3.3a Model Summary of the mediating influence of self-regulation on the Relationship between Self-Regulation and Students' Performance in Biology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.102[a]	.010	.008	9.433
2	.105[b]	.011	.005	9.443

a. Predictors: (Constant), Learning Engagement
b. Predictors: (Constant), Learning Engagement, Self-Regulation
c. Dependent Variable: Performance

Table 3.3a presents a mediation analysis examining the mediating effect of self-regulation on the relationship between learning engagement and academic performance. The direct effect of learning engagement on academic performance is shown in Row 1, with a correlation coefficient (r) of 0.102 and a coefficient of determination (r2) of 0.010, indicating that 1.0% of the variance in biology students' performance is attributed to learning engagement. However, when self-regulation is introduced as a mediator (Row 2), the indirect effect on the relationship between learning engagement and academic performance becomes apparent. The correlation coefficient (r) increases to 0.105, and the coefficient of determination (r2) increases to 0.011, indicating that 1.1% of the variance in biology students' performance is attributed to the indirect effect of self-regulation. Notably, self-regulation mediates an additional 0.1% of the variance in academic performance, highlighting its significant role in the relationship between learning engagement and academic performance.

Table 3.3b Model Summary of the Mediating Influence of Self-regulation on the Relationship between Learning Engagement and Students' Performance in Biology

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	51.383	2.678		19.186	.000
	Learning Engagement	.093	.048	.102	1.909	.057
2	(Constant)	53.062	4.235		12.529	.000
	Learning Engagement	.098	.050	.108	1.974	.049
	Self-Regulation	-.030	.058	-.028	-.512	.609

a. Dependent Variable: Performance

Table 3.3b presents the regression coefficients for the indirect effect of self-regulation on the relationship between learning engagement and academic performance. The results show a standardized Beta coefficient (B) of 0.047, t-value of 0.86, and a p-value of 0.609, which is greater than 0.05. Although the coefficient is positive, the effect is negative, indicating a negative indirect effect of self-regulation on the relationship between learning engagement and biology students' performance. However, this effect is not statistically significant, leading to the retention of the null hypothesis. The regression coefficient suggests that for every one-unit increase in self-regulation, biology students' performance is expected to decrease by 0.039 units, assuming all other factors remain constant, implying a negative mediating effect of self-regulation.

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HO4: There is no significant mediating influence of motivation on the relationship between learning engagement and academic performance among College of Education biology students in Niger State.

Table 4.4a Model Summary of the Relationship between Motivation and Students' Performance in Biology

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.102[a]	.010	.008	9.433
2	.112[b]	.012	.007	9.436

a. Predictors: (Constant), Learning Engagement

b. Predictors: (Constant), Learning Engagement, Motivation

c. Dependent Variable: Performance

Table 4.4a presents a mediation analysis examining the mediating effect of motivation on the relationship between learning engagement and academic performance. The direct effect of learning engagement on academic performance is shown in Row 1, with a correlation coefficient (r) of 0.102 and a coefficient of determination (r2) of 0.010, indicating that 1.0% of the variance in biology students' performance is attributed to learning engagement. The introduction of motivation as a mediator (Row 2) reveals an indirect effect on the relationship, with a correlation coefficient (r) of 0.112 and a coefficient of determination (r2) of 0.012. This indicates that 1.2% of the variance in biology students' performance is attributed to the indirect effect of motivation. Notably, motivation mediates an additional 0.2% of the variance in academic performance, highlighting its significant role in the relationship between learning engagement and academic performance.

Table 4.4b Model Summary of the Mediating influence of Motivation on the Relationship between Learning engagement and Students' Performance in Biology

		Unstandardized Coefficients		**Standardized Coefficients**		
Model		B	Std. Error	Beta	**T**	**Sig.**
1	(Constant)	51.383	2.678		19.186	.000
	Learning Engagement	.093	.048	.102	1.909	.057
2	(Constant)	49.455	3.482		14.202	.000
	Learning Engagement	.083	.050	.091	1.668	.096
	Motivation	**.039**	**.045**	**.047**	**.866**	**.387**

a. Dependent Variable: Performance

Table 4.4b presents the regression coefficients for the indirect effect of motivation on the relationship between learning engagement and academic performance. The results show a standardized Beta coefficient (B) of 0.047, t-value of 0.86, and a p-value of 0.387, which is greater than 0.05. Although the coefficient is positive, indicating a positive indirect effect of motivation on the relationship between learning engagement and biology students' performance, it is not statistically significant. Consequently, the null hypothesis is retained. The regression coefficient suggests that for every one-unit increase in motivation, biology students' performance is expected to increase by 0.039 units, assuming all other factors remain constant.

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IV. SUMMARY OF FINDINGS

1. The study found a high level of self-regulation among biology students at the Colleges of Education, with mean scores ranging from 4.19 to 4.52. This suggests that students actively engage in self-regulatory behaviours such as seeking understanding, connecting concepts, and persisting in learning even when faced with challenges.
2. The results indicate that biology students at the Colleges of Education in Niger State are motivated both intrinsically and extrinsically, with mean scores ranging from 3.26 to 4.59. Students exhibit motivation driven by curiosity, academic achievement, recognition, and fulfilment in learning environments. This multifaceted motivation highlights the complexity of factors influencing student engagement.
3. The analysis revealed a statistically non-significant positive relationship ($\beta = 0.102$, $p > 0.05$) between learning engagement and academic performance among biology students. Although there is a slight positive association, it suggests that other factors beyond engagement may influence academic outcomes, indicating the need for further investigation.
4. Similarly, a non-significant positive relationship ($\beta = 0.068$, $p > 0.05$) was found between motivation and academic performance among College of Education students. While motivation plays a role, its impact on academic performance appears limited, emphasizing the importance of considering additional factors.
5. The study's findings did not provide significant evidence to support the hypothesis that self-regulation mediates the relationship between learning engagement and academic performance among College of Education students. This suggests that self-regulation may not be a critical factor in converting engagement into academic achievement in this specific context.
6. The results of the analysis did not reveal a statistically significant mediating effect of motivation on the relationship between learning engagement and academic performance. Although motivation is widely recognized as an important factor in academic success, the findings indicate that it does not play a substantial mediating role in the relationship between engagement and academic outcomes among College of Education students.

Discussion of Findings

The present study delved into several key aspects of self-regulation, motivation, engagement, and academic performance among biology students at the Colleges of Education in Niger State. The study found a high level of self-regulation among biology students, indicating active engagement in self-regulatory behaviours. This aligns with existing research such as [16], which also observed positive predictors of academic progress associated with self-regulation strategies like self-evaluation and effort regulation. [20] and [15] similarly identified positive associations between self-regulation strategies and academic performance in varying educational contexts.[20], conducted among students in Iran, emphasized the significant role of self-regulation in enhancing academic achievement. Similarly, [15] research in Ethiopian public universities highlighted the relevance of self-regulated learning strategies in fostering perceived learning gains among undergraduate students.

The findings of the study also revealed that biology students exhibited both intrinsic and extrinsic motivation, driven by factors like curiosity, academic achievement, recognition, and fulfilment. This finding resonates with [21], which highlighted the predictive value of individual characteristics like self-efficacy and adaptability on learning engagement, mediated by self-regulated learning strategies. This finding is also consistent with prior research, such as [22], which also emphasized the complex interplay between motivational variables and engagement in learning activities. The author, conducted the study among preservice elementary teachers, highlighted the significant role of motivation in predicting engagement and emotional responses to learning tasks. Although this study focuses on biology students in a different educational context, the alignment with [22], findings reinforce the universal relevance of motivational factors in shaping student behaviours and academic experiences.

The analysis revealed a slight positive association between learning engagement and academic performance among biology students, although statistically non-significant. This finding corresponds with [20], which emphasized the indirect relationship between soft skills, motivation, and academic achievement, mediated by self-regulated learning. The findings also resonate with existing literature such as [23], which explored the motivating factors for learning among undergraduates. Despite the non-significant relationship, the present study aligns with the authors' assertion in emphasizing the multifaceted nature of motivation in influencing student engagement and academic outcomes. While the present study

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focuses specifically on the biology domain, the consistency with [23] underscores the broader applicability of motivational theories in understanding student behaviour and performance.

The findings revealed the positive mediating influence of self-regulation on learning engagement and academic performance. The study did not find significant evidence supporting the mediating influence of self-regulation on the relationship between learning engagement and academic performance. This aligns with [16], which emphasized the positive predictors of academic progress associated with self-regulation strategies. And the findings of the revealed the positive mediating influence of motivation on learning engagement and academic performance, the analysis did not also reveal a significant mediating effect of motivation on the relationship between learning engagement and academic performance. This finding corresponds with [20], which highlighted the indirect relationship between motivation and academic achievement, mediated by self-regulated learning.

V. CONCLUSION

This study investigated the relationships between self-regulation, motivation, learning engagement, and academic performance among biology students at Colleges of Education in Niger State. The findings reveal that students exhibit a high level of self-regulation, engaging actively in self-regulatory behaviours, and are motivated by both intrinsic and extrinsic factors. However, the relationships between learning engagement, motivation, and academic performance are complex and not entirely straightforward. Although positive associations were found, they were not statistically significant, suggesting that other factors beyond engagement and motivation may influence academic outcomes. Notably, the study found no significant evidence to support the mediating roles of self-regulation and motivation in the relationship between learning engagement and academic performance. This highlights the need for educators and policymakers to consider multiple factors when designing interventions to support student success.

Ultimately, this study underscores the complexity of factors influencing academic performance and emphasizes the need for further research to elucidate the intricate relationships between self-regulation, motivation, learning engagement, and academic performance in diverse educational settings. By adopting a comprehensive approach to student support and development, educators and policymakers can better foster academic success among students.

VI. RECOMMENDATIONS

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

1. Organize workshops specifically focusing on enhancing self-regulation skills among biology students. These workshops should offer practical strategies for goal-setting, metacognition, and environmental structuring to empower students in managing their learning effectively.
2. Implement motivational support programs tailored to address the diverse motivational factors identified among students. These should incorporate elements such as recognition of achievements, opportunities for pursuing personal interests, and setting meaningful goals to foster intrinsic motivation.
3. Launch research initiatives to explore additional factors influencing academic performance beyond learning engagement. Investigate variables such as socio-economic background, external environmental factors, and individual learning styles to gain a comprehensive understanding of student success factors.
4. Provide professional development opportunities for educators focused on implementing holistic approaches to support student learning. Training should include strategies for integrating self-regulation, motivation, and engagement into instructional practices to enhance academic outcomes.
5. Develop tailored student support services that cater to the diverse needs of the student population. Offer additional resources and assistance to students from disadvantaged backgrounds or those with specific learning needs to ensure equitable access to educational opportunities.
6. Establish mechanisms for evaluating the effectiveness of intervention programs targeting self-regulation and motivation. Regularly assess student outcomes and gather feedback to determine the impact of interventions and inform future program improvements.

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REFERENCES

[1] Abubakar, Z., Katcha M.A & Dajal R.G, Awareness and utilization of virtual learning resources among science lecturers in colleges of education in North Central Nigeria. *International Journal of Research Publication and Reviews*, 2025, 6, 1742-1751. https://doi.org/10.55248/gengpi.6.0125.0404

[2] Abubakar, Z., Impact of group investigation strategy on retention in biology concepts among secondary school students in Kwali Area Council, Abuja. *Zamfara International Journal of Education (ZIJE)* The Official Journal of the Faculty of Education Federal University Gusau, Zamfara State, Nigeria, 2024, 4, 2814 – 1369. https://www.doi.org/10.5281/zenodo.13354963\

[3] Ebele, F.U & Abubakar Z., Effects of group investigation strategy on secondary school student's academic achievement in Biology in Kwali educational zone of FCT-Abuja. *International Journal of Innovative Research & Development (IJIRD),* 2019*,* 8*,* 113-119. https://doi.org/10.24940/ijird/2019/v8/i12/DEC19060

[4] Akindipe, O. O., Mathematics achievement motivation: the relationship between parental involvement and Mathematics self-efficacy among Nigerian elementary school students. *A Thesis Submitted to the Graduate Faculty of the University of Georgia in Partial Fulfilment of the Requirements for the Degree Master of Arts*, Athens, Georgia, 2015.

[5] Awobodu, V.Y., Problem-based learning and programme instruction as strategies for enhancing learning outcomes in biology. *Unpublished Ph.D. Thesis, Department of Science & Technology Education, Olabisi Onabanjo University, Ago Iwoye, Ogun State, 2016.*

[6] Etobro, A. B., & Fabinu, O. E., Students' perceptions of difficult concepts in Biology in senior secondary schools in Lagos State. *Global Journal of Educational Research,* 2017*,* 16, 139-147. http://dx.doi.org/10.4314/gjedr.v16i2.8

[7] Adebanjo, A.A., Effects of dick and carey instructional model on students' learning outcomes in secondary school biology. unpublished Ph.D. thesis, department of science & technology education, olabisi onabanjo university, ago iwoye, Ogun State, 2019.

[8] Lamas, H., School performance. *Propositos y representaciones*, 2015, 3, 313–386. https://doi.org/10.20511/pyr2015.v3n1.74

[9] Sari, D. P., Student learning experience and their academic performance in flipped classroom: the mediating role of self-regulated learning and computer simulation. *Eurasian Journal of Educational research (EJER)*, 2022, 101

[10] Abu-Bakar, N., Muhammad, A. S., & Abu-Bakar, R., Correlation of self-regulated learning and academic achievement among Universiti Sultan Zainal Abidin (UnisZA) undergraduate students. *International Journal of Academic Research in Business and Social Sciences*, 2017, 7, 254-257. http://dx.doi.org/10.6007/IJARBSS/v7-i4/2804

[11] Stan, M. M., Topala, I. R., Necs, D. V., & Cazan, A. M., Predictors of learning engagement in the context of online learning during the COVID-19 Pandemic. *Frontier in Psychology,* 2022, 13, 867122, 1-13. https://doi.org/10.3389/fpsyg.2022.867122

[12] Motevalli, S., Perveen, A., & Michael, M. T. A. (2020). Motivating students to learn: An overview of literature in educational psychology. *International Journal of Academic Research in Progressive Education and Development*, 9, 2020, 63-74. http://dx.doi.org/10.6007/IJARPED/v9-i3/7779

[13] Arkhipova, M. V., Belova, E. E., Gavrikova, Y. A., Pleskanyuk, T. N., & Arkhipov, A. N., Reaching generation Z. attitude toward technology among the newest generation of school students. Advances *in Intelligent Systems and Computing,* Springer, Cham. 2019, 726, 1026-1032. https://doi.org/10.1007/978-3-319-90835-9_114

[14] Carsrud, A., Brännback, M., Elfving, J., Brandt, K., Motivations: The Entrepreneurial Mind and Behavior. In: Brännback, M., Carsrud, A. (eds) Revisiting the Entrepreneurial Mind. International Studies in Entrepreneurship, Springer, Cham 2017, 35. https://doi.org/10.1007/978-3-319-45544-0_13

[15] Tadesse, T., Asmamaw, A., Getachew, K., Ferede, B., Melese,W., Siebeck, M., & Fischer, M. R., Self-regulated learning strategies as predictors of perceived learning gains among undergraduate students in Ethiopian Universities. *Education Science*, 2022, 12, 468-482. https://doi.org/10.3390/educsci12070468

[16] Xu, L., Duan, P., LijunMa, A., & Dou, S., Professional identity and self-regulated learning: the mediating role of intrinsic motivation and the moderating role of sense of school belonging. *SAGE Open*, 2023, 1–11 https://doi.org/10.1177/21582440231177034

[17] Oshinaike, A. B., Electronic Resources Accessibility, ICT Skills and Environmental factors as Correlates of Undergraduates' Electronic Information Resources Utilization in Federal Universities in North-Central Nigeria. An Unpublished Ph.D thesis in the Department of School Library and Media Technology, University of Ibadan, 2021.

DOI:10.15680/IJARETY.2025.1205002

[18] Fidiani, A., Defri, M., Aang, Ro., & Dicky T. J (2021). The Relationship Between Interest and Emotional Intelligence to Learning Outcomes in Fitness Activities in Physical Education. *Journal of Physical Education for Secondary Schools (JPESS), 2021, 1, 41 – 45*. DOI: https://doi.org/10.17509/jpess.v2i2.60950

[19] Liew L. C. & Noraini I., Validity and Reliability of The Instrument Using Exploratory Factor Analysis and Cronbach's alpha, International Journal of Academic Research in Business and Social Sciences, Human Resource Management Academic Research Society, International Journal of Academic Research in Business and Social Sciences 2017, 7, 400-410, http://dx.doi.org/10.6007/IJARBSS/v7-i10/3387

[20] Feraco, T., Casali, N., Ganzit, E., & Meneghetti, C., Adaptability and emotional, behavioural and cognitive aspects of self-regulated learning: Direct and indirect relations with academic achievement and life satisfaction. *British Journal of Educational Psychology*, 2023, *93*, 353-367. https://doi.org/10.1111/bjep.12560

[21] Daniela, V. N., Maria, M.S., Ioana R.T., Daniela V. N.,& Ana-M.C. (2022) Predictors of Learning Engagement in the Context of Online Learning during the COVID-19 Pandemic. Journal of Educational Psychology 2022, 13, 122 https://doi:10.3389/fpsyg.

[22] Pedro, M., Manuel, V., Sandra F., María, L., Isabel, G.-R., Virginia, A., Anxela, B., Antonio, G., Motivation for science learning as an antecedent of emotions and engagement in preservice elementary teachers. *Journal of Science Education 2022, 106, 119-141.* https://doi.org/10.1002/sce.21686

[23] Anuar, N. A. K., Zakaria, N., Ibrahim, N., Mokhtar, M. I., Jasman, N. H., Yunos, D.M., & Rahmat, N. H. (2023). The influence of learners' motivation and self-regulated learning behaviour. *International Journal of Academic Research in Business and Social Sciences,* 2023, 13, 520 – 536. http://dx.doi.org/10.6007/IJARBSS/v13-i6/17114

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