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MOTIVATION AND COGNITIVE STYLE AS PREDICTORS OF STUDENTS' ATTITUDE TO ENVIRONMENTAL CONCEPTS IN BIOLOGY

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Abstract

Environmental concepts are one of the concepts embedded in the biology curriculum. It has an application in every walk of life and is of value. Over the years, however, it has been noticed that students' attitude towards the subject is not good. Therefore, this study examined motivation and cognitive style of learning as predictors of students' attitude to environmental concepts in biology among secondary school students in three local government areas in Ekiti State. The descriptive survey design was used. Four research questions guided the study. 1000 senior secondary school II students were selected for the study. Data were collected using the motivation Scale ($r=0.80$), cognitive style scale ($r=0.81$) and attitudinal scale ($r=0.88$) in Biology. Descriptive statistics and Multiple Regression Analysis were used for data analysis. The results showed that there is a significant relationship between motivation ($r=0.092$) and attitude, cognitive style and attitude. Also, motivation and cognitive style ($F_{2,51.3721}$) jointly contributed to students' attitude. Furthermore, cognitive style ($\beta = 0.366$; $t = 8.816$; $p > 0.05$) relatively contributed to the attitude of students toward environmental concepts in biology. Based on the findings, it was recommended that attention should be given to students' cognitive style and students should be motivated to enhance their attitude

Keywords: Cognitive styles, Motivation, Environmental concepts in Biology, Curriculum

Introduction

It has been acknowledged that education serves as the most potent instrument capable of facilitating transformative changes within the environment. This instrument can effectively foster awareness and enhance individuals' sensitivity towards their ecological surroundings, as environmental education aims to equip individuals with the requisite knowledge, skills, attitudes, motivations, and commitments to collaboratively or independently address environmental challenges, thereby guiding them to avert prospective environmental dilemmas. Consequently, to achieve this objective, the educational system must be actively engaged, as it represents the most comprehensive organizational framework through which environmental education and initiatives can be implemented. Furthermore, the educational system possesses resources and instructional aids that facilitate the teaching of environmental education and instill appropriate environmental values in students, as the stewardship of our environment constitutes a collective obligation (Ardoin & Heimlich, 2021). The integration of environmental concepts, specifically ecology, the conservation of natural resources, and pollution, into the biology curriculum is of paramount significance, as the overarching goal is to foster a positive disposition among students, enabling their active participation in the protection of their environment. Moreover, this foundational knowledge will empower them to educate their local communities, thereby achieving the ultimate objective, which is environmental sustainability. Undoubtedly, the safeguarding of the environment is critically important to human existence, as it pertains to the ecological contexts in which individuals reside.

The objective of incorporating environmental concepts into the biology curriculum is to eradicate the prevalent deficiencies in environmental ethics, the lack of knowledge, and the inadequate environmental responsiveness, comprehension, and skills among learners, a goal that can be effectively realized through education (Rivera & Lopez, 2023). By equipping students with appropriate knowledge, they are likely to cultivate a positive attitude and become motivated to devise solutions to environmental problems, ultimately transforming their perspectives, as learning becomes more impactful when they comprehend the significance of their environment to their lives.

Attitude is an acquired and internalized predisposition to respond positively or negatively to ideas, materials, events, objects, or individuals within one's environment. According to Jin & Oh (2022), attitudes encompass positive or negative feelings, beliefs, and actions that influence cognition, behavior, and decision-making. Although attitudes are not directly observable, they are inferred from consistent patterns of observable responses and behaviors that reflect underlying beliefs and emotions. Students' attitudes toward learning, particularly regarding environmental concepts significantly influence their academic achievement in these subjects.

Environmental attitude (cit2) is the result of individuals' learned responses, which may be positive or negative, toward their surrounding environment. Observational evidence indicates that public attitudes toward the environment are predominantly negative, and this negativity is reflected in various societal behaviors. Despite governmental efforts to promote environmental quality, evidence suggests that the broader community, including students, continues to contribute to environmental pollution.

The primary knowledge, attitudes, and practices exhibited by Nigerian students regarding the conservation of natural resources are deemed inadequate. It has been observed that these students exhibit a detrimental disposition towards the field of science, as evidenced by their consistently poor performance in science-related subjects. Such adverse attitudes have been ascribed to a deficiency in motivation and the cognitive learning styles employed by the students. Consequently, it is imperative to instill in the students a constructive attitude, as this is a significant predictor of educational outcomes (Amoah & Addoah, 2021).

The construct of motivation is inherently multidimensional, and one of the critical determinants influencing students' attitudes toward learning is their level of motivation. Yeşilyurt et al. (2023) in his research indicates a positive and statistically significant correlation between motivation and students' attitudes toward learning. Motivation fosters a positive attitude, thereby encouraging students to engage actively in the conservation of natural resources, safeguard endangered species, and mitigate environmental pollution

In instances where students exhibit a lack of motivation, the learning process becomes arduous, participation levels diminish, distractions proliferate, and the retention of desired information is compromised. The constructs of attitude and motivation represent critical components integral to the provision of quality education (Erinfolami, 2020). These elements serve as the fundamental impetus for the initiation of learning concerning environmental concepts within the domain of biology, and subsequently act as the driving force to sustain the often protracted and laborious learning journey. Should these factors be overlooked, the efficacy of the learning experience may be severely undermined. Students display a constructive attitude when they are inspired to engage in learning through active participation both within the classroom and in external environments, a process facilitated by the assignment of tasks, enthusiastic contributions during question-and-answer sessions, and visits to practical sites where ecological studies are conducted (Omoseebi, 2020).

Another significant variable is cognitive style, which also influences students' attitudes toward learning. Cognitive style pertains to the manner in which an individual thinks, feels, perceives, recalls, and addresses problems (Kozhevnikov et al., 2014). The cognitive styles refer to the methodologies employed in the acquisition of information and the subsequent development

thereof. Cognitive styles are linked to cognitive behaviors typically utilized by individuals in their efforts to resolve issues, acquire knowledge, categorize, and apply information. Learners exhibiting a field-independent cognitive style possess the capacity to isolate information from its contextual surroundings and are often proficient in problem-solving, as one of the objectives of integrating environmental concepts into the curriculum is to provide solutions to ecological dilemmas. Conversely, learners characterized by a field-dependent cognitive style tend to perceive problems in their entirety rather than in discrete components; they exhibit a greater reliance on environmental cues. These individuals demonstrate a preference for collaborative learning experiences. The cognitive style of learning has been found to influence attitudes, characteristics, and social collaboration significantly. Students exhibiting a positive disposition are more likely to demonstrate the capability to process information in a logical manner, whereas a student that exhibit negative attitude toward learning cannot gain anything during the process of teaching. This negative disposition is poised to affect the learning approach, given the absence of pertinent information for cognitive processing (Giancola et al., 2022). omoseebi (2020) observed that cognitive style exerts a significant impact on students' attitudes, which consequently influences individual knowledge and practices concerning the environment. This research thus sought to explore the extent to which motivation and cognitive learning style affect students' attitudes toward environmental concepts within the discipline of biology.

Statement of the Problem

Environmental concepts are one of the concepts embedded in the biology curriculum. It has an application in every walk of life and is of value. Over the years, however, it has been noticed that students' attitude towards the subject is not good. The body of literature in previous research has predominantly focused on pedagogical strategies for the instruction of ecological concepts, while insufficiently addressing variables such as motivation and cognitive style. Empirical evidence has indicated that these factors are significantly associated with students' academic performance in subjects such as Mathematics, Basic Science, and Literature-in-English; however, the extent to which these variables influence learners' attitudes toward environmental concepts in Biology, specifically within the context of Ekiti State, has not received commensurate scholarly attention. Consequently, the present study aimed to examine the potential relationship between motivation, cognitive style, and academic achievement in environmental concepts in Biology among students in Ekiti State, Nigeria.

Research Questions

What correlation exists between motivational factors and students' disposition (attitude) towards environmental concepts?

What correlation exists between cognitive learning styles and students' disposition (attitude) towards environmental concepts?

What is the combined contribution of motivational factors and cognitive learning styles to students' disposition (attitude) towards environmental concepts?

What is the comparative contribution of motivational factors and cognitive learning styles to students' disposition (attitude) towards environmental concepts?

Method and Material

The research methodology employed in the execution of this study is a descriptive survey research design of a correlational nature, which was utilized to investigate the relationship between the motivational dimension of students and the cognitive dimension concerning environmental concepts in Biology. The study population consisted of all Senior Secondary Two (SSS II) Biology students within Ekiti State. A multi-stage sampling technique was applied in this investigation. From the three Senatorial Districts three Local Government Areas were randomly selected. Five schools were selected from each Local Government, culminating in a total of 15 schools. The Senior Secondary School Two (SS II) classes were chosen from each of the selected schools.

Data analysis

Data analysis was conducted using PPMC and MRA. This was utilized to ascertain the degree to which the independent variables contributed to the dependent variables and to determine which of the variables served as predictors of students' attitudes toward the concept of the environment in Biology.

Results and Discussion

Research question 1: What correlation exists between motivational factors and students' disposition (attitude) towards environmental concepts?

Variables	Mean	Std. Deviation	R	P value	Remark
Motivation	134.64	22.700	.092	.000*	Significant
Attitude	63.71	9.666			

*Denotes significant at $p < 0.05$

Table 1 The findings clearly demonstrate a positive, albeit weak, and significant relationship between motivation ($r = 0.092$; $p < 0.05$) and students' attitudes toward environmental concepts in Biology. This confirms that motivation plays a crucial role in shaping learners' attitudes toward these important concepts in the subject

Research question 2: What correlation exists between cognitive learning styles and students' disposition (attitude) towards environmental concepts?

Variables	Mean	Std. Deviation	R	P value	Remark
Cognitive style	46.30	7.596	.089	.000*	Significant
Attitude	63.71	9.666			

*Denotes significant at $p < 0.05$

Table 2 presents Pearson Product-Moment correlation analysis between students' cognitive style and their attitude towards the concepts of environment in biology. The results revealed a mean score of 46.30 ($SD = 7.596$) for cognitive style and 63.71 ($SD = 9.666$) for attitude. The calculated correlation coefficient (r) was found to be .089 and the p-value .000. The p value is below the alpha level of 0.05 so the null is rejected. This shows a positive correlation between the two variables that is statistically significant, but very weak.

Research question 3: What is the combined contribution of motivational factors and cognitive learning styles to students' disposition (attitude) towards environmental concepts?

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	8719.257	2	4359.629	51.371	.000 ^b
Residual	84610.307	997	84.865		
Total	93329.564	999			
R = 0.306					
R Square = 0.093					
Adjusted R Square = 0.090					
Std. Error of the Estimate = 9.212					

Table 3 illustrates that the students' attitudes were significantly influenced by both motivation and cognitive learning, with p-values of 0.000 and 0.001, respectively. This phenomenon is evidenced by the F ratio (51.371) and the significance value ($p < 0.05$). This suggests that the perceptions and responses of students towards the concept of the environment in Biology are profoundly shaped by their cognitive abilities during the learning process and their motivation towards learning. This implies that when students exhibit high levels of motivation and cognitive engagement, their attitudes towards environmental issues correspondingly improve to a considerable extent.

Moreover, the correlation coefficient value ($r = 0.306$) signifies a positive moderation between independent variables and dependent variables, specifically cognitive learning, student attitudes, and student motivation. This indicates that an increase in a student's motivation to learn, alongside enhanced cognitive learning, is likely to result in a more favorable attitude towards environmental concepts. Nevertheless, the coefficient of determination ($R^2 = 0.093$) reveals that merely 9.3% of the variance in students' attitudes can be accounted for by the interplay of the variables: motivation and cognitive learning. Even with the sample size and the number of predictors, the adjusted R^2 value of 0.090 suggests that the model lacks substantial explanatory power. The variables examined were identified as significant predictors of students' attitudes, yet they only elucidated approximately 90.7% of the variation in students' attitudes, indicating that other unexamined variables may also exert an influence on students' attitudes.

Research question 4: What is the comparative contribution of motivational factors and cognitive learning styles to students' disposition (attitude) towards environmental concepts?

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for β	
	B	Std. Error	Beta			Lower Bound	Upper Bound
Constant)	44.378	2.131		20.825	.000	40.196	48.560
motivation	.018	.014	.042	1.286	.199	-.009	.045
Cognitive	.366	.041	.287	8.816	.000	.284	.447

a. Dependent Variable: attitude

In addition, it was determined that students' attitudes towards environmental concepts were predominantly influenced by the cognitive factor, which emerged as a significant contributor in the regression analysis, distinctly differing from motivation. Specifically, the cognitive factor was significant, possessing a standardized coefficient ($\beta = 0.287$), a t-value of 8.816, and a p-value < 0.05 , thereby indicating its significance as a predictor of student attitudes. This suggests that students who exhibit a superior ability to comprehend, reason, and process biological concepts are more likely to develop positive attitudes towards environmental concepts. Conversely, the standardized coefficient ($\beta = 0.042$) associated with motivation is relatively low, coupled with a t-value of 1.286 and a p-value > 0.05 , signifying that, in this study, motivation does not serve as a significant predictor of students' attitudes. Although motivation was found to be significant, its impact was weaker compared to other factors and was positively correlated. This outcome implies that both the motivational dispositions of students and their cognitive styles significantly influence their attitudes towards environmental concepts. This could be attributed to the notion that an increase in knowledge may enhance interest and appreciation for the content. The results indicate that cognitive factors play a more critical role in determining the outcome variable than motivation.

Discussion

Based on the findings of this research, it is inferred that motivation constitutes a pivotal variable in the educational landscape, exerting a direct influence on students' academic outcomes. In this investigation, learning outcomes are defined as students' attitudes towards environmental concepts in the domain of biology. Consequently, motivation in education can be perceived as a variable that serves as a predictor of students' attitudes towards environmental concepts in biology. The results obtained indicated a positive and statistically significant correlation between student motivation and attitudes towards the environment within the biological context, evidenced by a significance value of 0.45. This finding is corroborated by Chiu et al. (2020), who

assert that motivation functions as a driving force that propels individuals to engage in various tasks.

As articulated by Omoseebi (2020), the attitudes of students towards environmental issues should be regarded with utmost priority, given that they are the demographic most directly impacted by such challenges within their communities. Furthermore, these students are tasked with devising solutions for the complexities that emerge from contemporary actions. The upcoming scientists, legislators, and leaders, who will bear the responsibility of environmental stewardship, must be effectively educated and inspired to cultivate a constructive attitude that will enable them to support the implementation of related policies in the future. Providing effective environmental education for secondary school students is crucial, as attitudes are often shaped from a young age. By the time these students reach adolescence, they should have a solid understanding of essential ecological concepts such as pollution, conservation of natural resources, and technological impacts. This knowledge will empower them to develop their own perspectives about the environment and its implications. Education, combined with information and hands-on experiences, can facilitate changes in attitudes toward various subjects, as these attitudes are not inherent but rather learned. Such attitudes may be influenced or reinforced by examples and opinions from parents, educators, or peers, and they can manifest as either positive or negative towards specific subjects, often influenced by cultural and traditional contexts. Educational interventions in both formal and informal settings, spanning from infancy to adulthood, will serve as additional mechanisms to shape our attitudes and behaviors towards the environment.

Environmental Education is a fundamental component in addressing environmental challenges and constitutes a significant aspect of sustainable development research (Rivera & Lopez, 2023). This assertion is supported by a study conducted by Akomolafe (2021), which established that students' environmental knowledge serves as a predictor of their environmental attitudes. It is therefore imperative that educators and educational administrators assume a crucial role in fostering a positive attitude among learners towards the environment, as students are unlikely to develop a constructive attitude unless they are able to internalize the same perspective from their educators.

The significance of cognitive style cannot be underestimated, as it aids individuals in problem-solving endeavors. The findings revealed that students' cognitive style exhibited a slight yet positive correlation with their attitudes towards environmental concepts in biology. The instructional methods employed within the classroom and the manner in which information is assimilated significantly influence students' behaviors, either positively or negatively.

The pupils who receive all-inclusive facts regarding the 'Environmental Concept' are capable of transforming a negative disposition into a positive one. This assertion is corroborated by the research conducted by Febrina et al. (2022). Erinfolami (2022) found that students exhibiting field dependence demonstrate a preference for collaborative engagement with peers and seek motivation and reinforcement from their educators, whereas field independent students prefer solitary work, devoid of peer interference, and derive motivation from the tasks they undertake. A subset of students encounters difficulties and ultimately fails to process information effectively due to their attitudes, which consequently exerts a detrimental impact on the instructional outcomes (Watson & Gable, 2010). A positive disposition facilitates logical elaboration in students, while a negative attitude towards learning fails to confer any benefits during the instructional process. Such negative attitudes exert influence over cognitive styles due to the absence of information available for processing.

Summary

The findings from the study indicated that motivational factors exhibited a positive and significant correlation with learners' attitudes towards environmental concepts in Biology. The results further illuminated a significant relationship between cognitive style and students' attitudes towards environmental concepts in Biology. Additionally, the study findings revealed that the combined effect of motivation and cognitive learning style significantly impacted students' attitudes. The

investigation indicated that the cognitive style variables contribute relatively to students' attitudes, while the motivation variable does not significantly influence students' attitudes concerning environmental concepts in Biology.

Conclusion

The outcomes derived from this research demonstrated that students' motivation and cognitive style serve as predictors of their attitudes towards environmental concepts within the realm of Biology. The findings provided valuable insights into additional factors that may predict students' attitudes towards environmental concepts in Biology. Consequently, it is evident that when students are appropriately motivated and afforded the opportunity to process information, they possess a greater likelihood of achieving enhanced performance and adopting favorable attitudes and behaviors towards environmental issues and challenges encountered in their biology studies. Subsequently, accomplishing the sustainable development goals related to the environment by the year 2030 will become considerably attainable.

Recommendations

Motivation and cognitive style represent critical learning instruments that can yield desired educational outcomes. Therefore, it is imperative for school administrations and educators to foster students' motivation and cognitive development, ensuring that students are sufficiently motivated, while teachers should exemplify a positive attitude towards their students.

References

- 1) Akomolafe, C. O. (2021). Effect of environmental education on secondary school students' knowledge of and attitude towards the environment. *International Journal of Education and Practice*, 9(3), 581–593. <https://doi.org/10.18488/journal.61.2021.93.581.593>
- 2) Amoah, S. A., & Addoah, T. (2021). Does environmental knowledge drive pro-environmental behaviour in students? Evidence from higher institutions. *Humanities and Social Sciences Communications*, 8(1), 1–11. <https://doi.org/10.1057/s41599-021-00914-1>
- 3) Ardoin, N. M., & Heimlich, J. E. (2021). Environmental learning in everyday life: Foundations of meaning and a context for change. *The Journal of Environmental Education*, 52(5), 267–291. <https://doi.org/10.1080/00958964.2021.1979526>
- 4) Chiu, T. K. F., Fang, D.-C., Chen, J., Wang, Y., & Sheng, C. (2020). Motivation and learning engagement as mediating variables for the development of sustainable learning communities. *Frontiers in Education*, 5, Article 590869. <https://doi.org/10.3389/feduc.2020.590869>
- 5) Erinfolami, O. B., & Oke, O. B. (2022). Cognitive style and gender as predictors of students' achievement in environmental concepts in biology. *Multidisciplinary Journal of Women in Colleges of Education (MUJOWICE)*.
- 6) Febrina, R., Hidayat, R., & Sari, N. (2022). The effect of field-dependent and field-independent cognitive styles on academic achievement in biology among secondary school students. *Journal of Biological Education*. <https://doi.org/10.1080/00219266.2022.2071819>
- 7) Giancola, M., Palmiero, M., & Piccardi, L. (2022). Field dependence–independence cognitive style and creativity: The role of the preference for complexity and the need for cognition. *Behavioral Sciences*, 12(7), 212. <https://doi.org/10.3390/bs12070212>
- 8) Miller, L. B., Rice, R. E., Gustafson, A., & Goldberg, M. H. (2022). Relationships among environmental attitudes, environmental efficacy, and pro-environmental behaviours across and within 11 countries. *Environment and Behavior*, 54(9–10), 672–710. <https://doi.org/10.1177/00139165221131002>
- 9) Omoseebi, O. B. (2020). Curriculum content, pedagogical content knowledge, student-related factors and learning outcomes in environmental concepts in biology in Ekiti State, Nigeria

[Doctoral dissertation, University of Ibadan]. Faculty of Education, Department of Science and Technology Education.

- 10) Rivera, J. A., & Lopez, M. C. (2023). Integrated environmental education programs: Enhancing students' awareness and promoting positive environmental behaviours. *Journal of Environmental Education Research*, 29(1), 45–62. <https://doi.org/10.1007/s10460-023-00412-3>
- 11) Yeşilyurt, M., Yeşilyurt, F., & Kaya, V. H. (2023). Examining the relationship between students' motivation and their attitude towards science in secondary school. *Sustainability*, 15(15), 11612. <https://doi.org/10.3390/su151511612>