Educational Management Strategies to Mitigate Climate Change Issues

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ABSTRACT

Climate change presents a global challenge requiring innovative and collaborative approaches to mitigate its impact. This article explores the intersection of community engagement, infrastructure management, and student involvement in addressing climate change. Engaging communities in decision-making initiatives fosters a sense of shared responsibility and encourages the adoption of more sustainable practices. Infrastructure management is essential to this endeavor to achieve eco-friendly design, maximize energy efficiency, and guarantee resilience against climate-related disasters. In addition, including students in climate action produces a future generation of leaders who are aware of environmental issues and know how to promote sustainable solutions. A quantitative survey using a standardized questionnaire was conducted. The target participants were school administrators and teachers at the public senior secondary schools in Kwara State, Nigeria. The data was analyzed using SmartPLS 3.0. The findings from the relationships demonstrate the significance of educational strategy elements in mitigating climate change issues. These findings reveal a significant gap in how we turn student involvement into real climate action in schools. The study emphasizes the need to enhance collaboration between schools and their communities, along with planning for sustainable infrastructure, as essential strategies for effective management. The insights gained from this research are invaluable for policymakers, school leaders, and education stakeholders who are working to create educational policies that weave sustainability into the fabric of school management practices. This research will contribute to knowledge such that these three elements (community engagement, student involvement & infrastructure management) provide a comprehensive strategy for mitigating climate change that empowers students to take the lead in empowering community-driven activities backed by strong infrastructure. Also, this coordinated approach not only strengthens community resilience but also supports larger international initiatives to mitigate climate change.

Keywords: Community engagement, infrastructure management, student involvement, climate change

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INTRODUCTION

Climate change is one of the main problems the world is currently facing. This is based on the effects of the world's technological growth, which is becoming increasingly sophisticated with each passing age. Any sustained alteration to the typical weather patterns in a particular area or on the planet as a whole is referred to as climate change. It's commonly believed to be either human-induced or natural. Serious negative effects on the planet, including severe regional climatic changes, deadly floods, frequent droughts, extreme heatwaves, and windstorms, have been linked to this occurrence. Climate change poses a significant global challenge, demanding innovative and collaborative solutions. Education is pivotal in this fight, as it empowers individuals and communities to embrace sustainable practices. This article explores how community engagement, infrastructure management, and student involvement intersect to mitigate climate change locally. By fostering shared responsibility and equipping future leaders, educational strategies can enhance

resilience and promote sustainability.

According to UNESCO (2017), schools that adopt a whole-school approach to sustainability should start by fostering a culture that weaves environmental responsibility into every facet of school life. This method highlights the crucial role of school principals in crafting strategies that fit their unique situations. In Nigeria, this means that school leaders need to work hand-in-hand with community members, gathering insights from teachers, parents, guardians, and non-teaching staff, to create climate action strategies that are inclusive and relevant to their context. By collaborating in this way, schools can blend community engagement, student participation, and effective infrastructure management practices that promote environmental awareness and sustainable habits.

This is especially important considering that climate change, characterized as shifts in weather patterns mainly driven by rising atmospheric carbon pollution (Borde et al., 2022), poses increasing risks to educational infrastructure, learning environments, and community resilience throughout Nigeria. Increased temperatures, prolonged periods of drought and/or heavy rain, and other extreme weather conditions are examples of these changed weather patterns. Children are the group most at risk from climate change globally, accounting for 88% of the disease burden associated with it (Larry & Richard, 2017). The built environment of schools, which includes the grounds, buildings, neighbourhoods, and surrounding areas in addition to the lessons, interpersonal interactions, and other significant experiences that take place there, is extremely significant and has the potential to either positively or negatively impact children's health and well-being (Matthew et al., 2019).

The purpose of climate change education is to educate people on the causes, effects, challenges, and methods of adaptation to climate change. Teachers and school administrators need to understand the complex interactions that exist between people and the climate to do this (Henderson & Serafeim, 2020; Pinga & Jor, 2019). The impact that settings play in assisting students in meeting their learning objectives cannot be overstated. This is to fulfill the objectives of education, which include providing students with the abilities, information, attitudes, and potential to enable them to contribute to society as a whole and to themselves as individuals. Rubén & Peter (2020) assert that the educational system is related to and exists within its surroundings.

Statement of the Problem

Even though there's a growing global concern about climate change, the education sector in Nigeria hasn't quite embraced effective management strategies to tackle its effects. Schools have a vital role in raising awareness and promoting sustainable behaviors, yet there's still a big gap in understanding how educational management practices, like community engagement, infrastructure management, and student involvement, can be effectively aligned to confront climate-related challenges. Current efforts often feel disjointed, lacking a unified approach that links educational leadership with environmental sustainability. This study aims to explore how educational management strategies can be utilized to address climate change issues in public senior secondary schools in Kwara State, Nigeria, to provide evidence-based insights that can shape policy and encourage a comprehensive, education-focused response to climate change.

Numerous research studies have been conducted on education and climate change issues. Abdullahi (2020) focused on raising awareness through education in mitigating climate issues. The study examines managing education toward mitigating climate change in the North-central zone of Nigeria. A stratified random sampling technique was used to select 375 head teachers and 384 teachers in public primary schools in the North-central zone of Nigeria. The questionnaire titled “Managing Education Toward Mitigating Climate Change Issues Questionnaire (METACCIQ) was used to collect data for the study and analyzed using descriptive statistics and t-test analysis. The results show that there is no significant difference between raising awareness, resilience teaching and learning, and mitigating climate change issues in Nigeria. Helen et al. (2021) conducted climate-friendly strategies for mitigating the impact of climate change in secondary schools in Otuocha education zone, Anambra state, Nigeria. The descriptive survey research design was used for the study. The population of the study comprised 706 respondents, made up of 26 principals and 680 teachers in the 26 public secondary schools in Otuocha Education Zone of Anambra State. A sample for the study was 230 respondents was selected for the study through simple random sampling. The instrument for data collection was a 23-item validated questionnaire developed by the researchers. The test of reliability on

the instrument using Cronbach's Alpha yielded a reliability coefficient value of 0.85. Data for the study were analyzed with mean, standard deviation, and t-test. The findings of the study revealed that planting drought-resistant flowers, trees, and shrubs in and around the school (mean=3.93), establishing a school cafeteria composting programme (mean=3.72), and sharing tips for parents to introduce sustainability practices at home(mean=3.63) were some of the strategies for mitigating the impact of climate change in secondary schools.

Additionally, Matthew et al (2019) treatise on Climate Change in the American Mind: Data, Tools, and Trends, Environment: Science and Policy for Sustainable Development. However, it is worth noting that none of the authors cited in this study specifically addressed educational management strategies and the mitigation of climate change issues. Additionally, previous studies did not emphasize the importance of community engagement, student involvement, and infrastructure management as critical variables to measure educational management strategies. The great difference in the geographic locations and regions covered by the available studies is another important gap that prompted this investigation. Therefore, the purpose of this study is to close the gaps left by other researchers.

Literature Review

Educational Management Strategies

Management is all about using resources wisely to meet the goals of an organization in a way that's both efficient and effective (Abdullahi, 2017; 2020). In the realm of education, management means planning, coordinating, and overseeing both people and materials to create learning environments that truly respond to the needs of institutions and society. So, educational management strategies include the various procedures, methods, and approaches that administrators and educators use to ensure that educational activities align with developmental priorities (Tonwe, 2019). This study examines the three interconnected strategies (community engagement, infrastructure management, and student involvement) that schools can use to help combat climate change.

Community engagement generally is about getting community members actively involved in the planning, organizing, coordinating, and decision-making processes of schools (Abdullahi, 2020). In Nigeria, where many schools rely on local communities for their establishment and support, this connection creates an essential platform for shared responsibility in tackling sustainability challenges. When done effectively, community engagement allows schools to weave local knowledge and practices into their environmental management strategies, boosting their resilience against climate-related risks. Unfortunately, in many Nigerian schools, the level of engagement tends to be more consultative than collaborative, which limits the opportunity for communities to work together in crafting sustainable solutions. By nurturing authentic partnerships between schools and their local communities, educational management can make strides in climate change mitigation through localized efforts like tree planting, waste management, and environmental awareness initiatives.

Infrastructure Management and Sustainable School Systems

Infrastructure management in education is all about carefully planning, organizing, and maintaining physical resources to keep everything running smoothly and sustainably (Kingsley, 2019). With climate change becoming a pressing issue, this goes beyond just regular maintenance; it also involves creating and maintaining eco-friendly and resilient learning spaces. Preventive and routine maintenance practices (Manzaedo et al., 2020) are crucial for ensuring that our infrastructure can handle environmental challenges, lower carbon footprints, and boost energy efficiency. Unfortunately, many schools in Nigeria struggle with funding, which often results in crumbling facilities and a lack of proper maintenance culture (Ballew et al., 2019). To effectively link infrastructure management with climate mitigation, it requires a need to move from simply fixing things when they break to planning for sustainability, which means embracing renewable energy, reducing waste, and incorporating green architecture in our educational institutions.

Student involvement is a vital yet often overlooked aspect of educational management when it comes to tackling climate change. By engaging in participatory learning, students can gain the knowledge, skills, and

attitudes they need to address environmental issues effectively. However, recent evidence indicates that simply having students participate doesn't guarantee successful climate action unless there are supportive structural and administrative frameworks in place. This highlights the importance of school leadership in fostering environments where student-led initiatives, like environmental clubs or sustainability campaigns, are not only encouraged but also connected to wider school and community efforts.

While earlier research has looked at these components individually, there's been little focus on how they connect within a unified framework for tackling climate change in education. Community engagement lays the groundwork for collective action, infrastructure management ensures that schools are physically and operationally prepared, and student involvement fosters lasting behavioral and attitudinal shifts. When these elements are strategically aligned, they can form a comprehensive educational management approach that not only boosts climate resilience but also nurtures environmental citizenship among students and the broader community. This integrated model is especially significant in Nigeria, where schools act as both educational hubs and community pillars, capable of spearheading local responses to global environmental issues.

Climate Change Issues

Climate change and climate variability are principal issues confronting the global community. The intricate nature of the global climate as an interconnected system, comprising earth and socio-ecological systems, necessitates critical inquiries coupled with reflexive and transformative educational methods (Abdullahi, 2020). learning-centered transformation about sustainability concerns and the challenges posed to learning and pedagogy (Pietzsch et al, 2017). There is hence a need to shift from simple content-based, silo approaches of pedagogy to a more systemic and 'deeper' inquiry that draws together biophysical, socio-economic, and socio-psychological understandings (Elbanna et al, 2020). In this light, concepts such as educational management strategies as an integral component of quality education and a critical tool for sustainable development have gained global currency (Lausselet et al, 2017). Empower people to change their thinking and approaches towards the mitigation of climate change issues. This can be facilitated by enhancing opportunities for quality education on sustainable development. It will promote social transformation through the redesigning of educational pedagogies and empowering people to build knowledge, skills, values, and behaviors critical for averting climate change issues.

Climate change is characterized by long-term alterations in weather patterns mainly due to rising atmospheric carbon emissions (Borde et al., 2022), which have serious implications for educational infrastructure, health, and accessibility. As UNESCO (2017) emphasizes through its whole-school approach to sustainability, schools need to foster a culture of environmental responsibility by weaving sustainability into every aspect of management and teaching. For schools in Nigeria, this means empowering principals, teachers, and students to implement strategic, community-focused, and infrastructure-backed initiatives that not only reduce environmental risks but also exemplify sustainable practices. As a result, educational management can become a powerful catalyst for achieving climate resilience and supporting both national and global sustainability objectives.

Theoretical Background

The theoretical background of this study is based on the theory of planned behaviour proposed by Ajzen (1991). The theory of planned behaviour posits that a person's behaviour is determined by their intention to perform the behaviour, which is influenced by three factors: (i) Attitude: How comfortable or uncomfortable a person is with the behaviour. (ii) Subjective Norms: the seeming pressure from society to engage in the behaviour or not. (iii) Perceived behavioural control: The degree to which an action is perceived as simple or complex can also have a direct impact on behaviour. The theory of planned behaviour has been widely used to predict climate change issues and environmental behaviours, such as recycling, conservation efforts, and the adoption of sustainable practices.

It is predicated on the idea that people are driven to seek out rewards and shun penalties. In line with this concept, rational assessment of the consequences of behaviour serves as a guide for decision-making. The overall perception of a behavioural option is determined by the total of the perceived positive and

negative effects. Behaviour is only indirectly determined by attitude through behavioural intention. The TPB emphasizes the significance of situational limitations as well. People consider their perceived behavioural control (PBC) over the behaviour, or their ability to carry out the behaviour, in addition to their attitudes towards the behaviour, when establishing their behavioural intention. A third component thought to affect decision-making is social norms. According to the TPB framework, the expectations of important reference persons to engage in an activity or not are what constitute perceived social pressure, or social norms. People's tendency to follow social standards is thought to be primarily motivated by a fear of social isolation. The social norm is believed to influence behaviour indirectly through its effect on intention, just like attitude and PBC do. Furthermore, the TPB assumes that when PBC accurately predicts objective behavioural control, it also accurately predicts behaviour.

This approach is applied to this study because it offers more insights into the relationship between knowledge, attitude, behavioural intention, and actual behaviour as it relates to climate change issues. Since beliefs in this instance relate to information about a particular behaviour, knowledge is not a distinct component of the model; rather, attitudes are a function of beliefs. As a result, Azjen's concept permits the portrayal of cognitive elements via emotive factors by virtue of their impact on beliefs. For example, an individual's behavioural intentions reflect their awareness that they have control over a particular situation, just as much as their ideas about how a particular behaviour would turn out. The planned behavior theory can be applied in an educational setting such that it focusing on how educational managers should implement programs that encourage sustainable practices within the school environment.

By integrating these concepts into the Theory of Planned Behavior (TPB) framework, this study places educational management strategies within a behavioral model that highlights both personal factors (like attitudes and intentions) and external influences (such as social norms and control). This viewpoint emphasizes that effectively tackling climate change in schools relies not just on awareness and policies, but also on aligning both individual and collective motivations towards sustainable practices. Therefore, the TPB offers a solid theoretical foundation for examining how educational management strategies can be crafted to shape behavioral intentions and actions that foster environmental sustainability in Nigerian secondary schools. The following hypotheses were created and put to the test:

- There is no significant relationship between community engagement and mitigation of climate change issues
- There is no significant relationship between student involvement and mitigation of climate change issues
- There is no significant relationship between infrastructure management and mitigation of climate change issues.
- There is no significant relationship between educational management strategies and mitigation of climate change issues

RESEARCH METHOD

Research Model

This research employs a quantitative research design. Quantitative data analyses are those that make use of numerical data and are employed to forecast future events or to characterize the current condition of affairs. This type of analytical process can be used to establish facts about a topic that applies to a wider audience. The ability to analyze quantitative data through statistical analysis is one advantage of using it. Scientists view the quantitative approach as logical and objective, as statistics is a mathematical science (Sekaran & Bougie, 2016; Neuman, 2013).

Population and Sampling Procedure

A total number of 440 principals and teachers from Kwara State public senior secondary schools were purposively sampled, and 430 participants responded to the survey. Some questions were eliminated during data cleaning because they were deemed inappropriate for use. Eventually, 425 questionnaires were used

for this study. The questionnaire for this study consisted of 25 questions. Based on this, the study progressed with 425 correctly answered questionnaires, yielding a response rate of 99% for the final assessment of the study hypotheses.

Measures

A structured questionnaire was employed for the target participants to complete over the Internet by filling out a Google Forms survey. There were four variables, namely community engagement, infrastructure management, waste management, and climate change issues, with 25 items adapted as an instrument. The research instruments went through a comprehensive validation process to make sure it was relevant, clear, and suitable for measuring the concepts being studied. To establish content validity, an expert review was conducted, aligning each item with the theoretical constructs of the study and existing literature. Two experts were involved in this validation, one from the Department of Educational Management and the other from the Department of Test and Measurement, both of whom have significant expertise in educational research, psychometrics, and sustainability studies. During the evaluation, the experts examined each item based on several important criteria, such as its relevance to the construct being measured, the clarity and simplicity of the wording, how well the items covered all aspects of the construct, and their cultural and contextual appropriateness for use in Nigerian secondary schools. Following their feedback, minor adjustments were made to improve the phrasing of some items and enhance their contextual accuracy. This thorough process resulted in a high level of content validity, as both experts agreed that all items were either relevant or highly relevant to their respective constructs. The instruments used for each variable were adapted from prior studies in which all variables amounted to 25 items. Specifically, community engagement was measured with six items adapted from Abdullahi (2020); Unruan et al (2022). Infrastructure management was assessed with six items adapted from (De Wit-de Vries et al, 2019; De Moortel & Crispeels, 2018). Student involvement with six items (Pietzsch et al, 2017), climate change issues with seven items (Leal Filho et al, 2023); Helen (2021). All items used a five-point Likert scale ranging from 1 for strongly disagree to 5 for strongly agree based on the findings of (Mugenda & Mugenda, 2013; Choy, 2014; Miller et al, 2013), and Diamantopoulos et al. (2012), suggesting that this scale offers a quicker and simpler response format compared to scales with 7 points.

Google Forms was used to develop online surveys that were distributed to participants via WhatsApp to collect data for this study. All participants were informed of the study's purpose and methods in the introduction. The survey questionnaire includes the ethical consent that the participants have to agree to before proceeding to answer the questionnaire. In this study, participation was completely optional, and participants were allowed to withdraw at any time without giving a reason. The participants' identities remained anonymous because their data was kept secret and confidential. This approach was adopted following the principles outlined by Mayer (2013); Dillman et al (2014).

Data Analysis

SMART PLS 4.0 was employed to analyze the data collected for this study. It was selected because SMART PLS comes with a wide range of tools and subroutines for formative and reflective assessments as well as structural models, like goodness of fit, bootstrap-based significance testing, PLS prediction, and the heterotrait-monotrait (HTMT) criterion. It makes it possible to perform extra statistical studies, including tetrad analysis confirmation. Among the methods are latent class segmentation, importance-performance map analysis, and higher-order models. using SMARTPLS, the measurement model had to be done first by testing for discriminant validity, convergent validity, construct validity, and reliability. Secondly, a structural model is created to test the hypotheses (Hair et al., 2019). The second step involves evaluating the structural model, which includes calculating effect sizes, determining if the model is predictive relevant, and determining how well endogenous constructs explain variance.

To make sure the findings are solid, multicollinearity among the constructs was assessed by checking the Variance Inflation Factor (VIF) values. Thankfully, all the indicators were well below the recommended limit of 5.0, which means we didn't have to worry about any major collinearity issues. Also, the study tackled the potential problem of common method bias (CMB), a common concern in self-reported surveys, by using both procedural and statistical strategies. Anonymity and confidentiality were assured to help reduce social

desirability bias, and we carefully crafted the survey items to avoid any confusion. For the statistical side, the study used Harman's single-factor test along with a full collinearity assessment. The results were reassuring: no single factor dominated the variance, and all VIF values from the full collinearity test were under 3.3, confirming that common method bias wasn't a significant issue in this study.

FINDINGS

Measurement Model Assessment

The measurement model is examined in the first step of SMARTPLS analysis to establish a relationship between the components and the theoretically stated constructs. four latent constructs are included in the estimation of the measurement model in this study. The reflective measurement model, which suggests that a construct influences how its indicators (manifest variables) vary, was used in this work (Hair et al, 2014). The model shows an arrow connecting a construct to its indicators. Tests of indicator reliability, internal consistency reliability, convergent validity, and discriminant validity are among the validity and reliability assessments that are required for a reflective measurement model (Hair et al., 2021). A measurement model is deemed to have sufficient internal consistency reliability if the composite reliability (CR) of every construct is more than the established threshold point of 0.7 (Kilic, 2016; Hair et al., 2021). Table 1 shows that the results demonstrated that the items' internal consistency reliability for the constructs is adequate. The convergent validity of the measurement model was evaluated in this study by analyzing the average variance extracted (AVE) value. As suggested by earlier studies, convergent validity is deemed sufficient when constructs exhibit AVE values of approximately 0.5 or above (Hair et al., 2019). All of the constructions show AVE values above 0.5, according to the output shown in Table 1. This finding implies that there is a strong degree of convergent validity in the measurement model.

Table 1: *Summary of Measurement Model (Construct Reliability and Validity) (p<0.01)*

Constructs	Items	Factor loading	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Community engagement (CE)	CE1	0.896	0.844	0.886	0.567
	CE2	0.725			
	CE3	0.677			
	CE4	0.782			
	CE5	0.777			
	CE6	0.632			
Student involvement (SI)	SI1	0.655	0.770	0.839	0.502
	SI3	0.656			
	SI3	0.874			
	SI4	0.562			
	SI5	0.640			
	SI6	0.685			
Infrastructure management (IFM)	IFM1	0.785	0.877	0.902	0.619
	IFM2	0.777			
	IFM3	0.738			
	IFM4	0.822			
	IFM5	0.880			
	IFM6	0.707			
Climate change issues (CCI)	CCI1	0.859	0.893	0.914	0.573
	CCI2	0.828			
	CCI3	0.807			
	CCI4	0.678			
	CCI5	0.805			
	CCI6	0.722			
	CCI7	0.702			

Note: CE: Community Engagement, SI: Student Involvement, IFM: Infrastructure Management; CCI: Climate Change Issues.

Factor loadings are essential for evaluating the measurement model to show reliability. Essentially, higher average loading levels will lead to increased reliability (Sarstedt et al, 2021). When each item's loading estimate is more than 0.6 of the factors' loading, a measurement model shows adequate indicator reliability. However, depending on the underlying reasoning, this threshold may vary, such that when the AVE of the constructs is more than 0.50 for the entire sample, there is no need to delete factor loading (Afthanorhan, 2020). Table 1 above displays the factor loadings for each of the four constructs. Most Factor loadings of the 26 items (observed variables) varied with positive values, indicating greater than 0.6 and significant at the 1% level. As a result, every item used in this investigation has an acceptable degree of indication dependability.

In a structural equation model, discriminant validity ensures that a measurement for a concept is unique and precisely captures the elements of interest that were not previously covered by other measurements (Hair et al., 2021). Put differently, discriminant validity is mostly utilized to assess and confirm whether or not there is a substantial multicollinearity problem with the variables. Henseler et al. (2015) observed the broad use of the Heterotrait-Monotrait Ratio (HTMT) for the same goal, while Hair et al. (2021) suggested the Fornell-Larcker criterion as the conventional approach frequently employed for assessing discriminant validity.

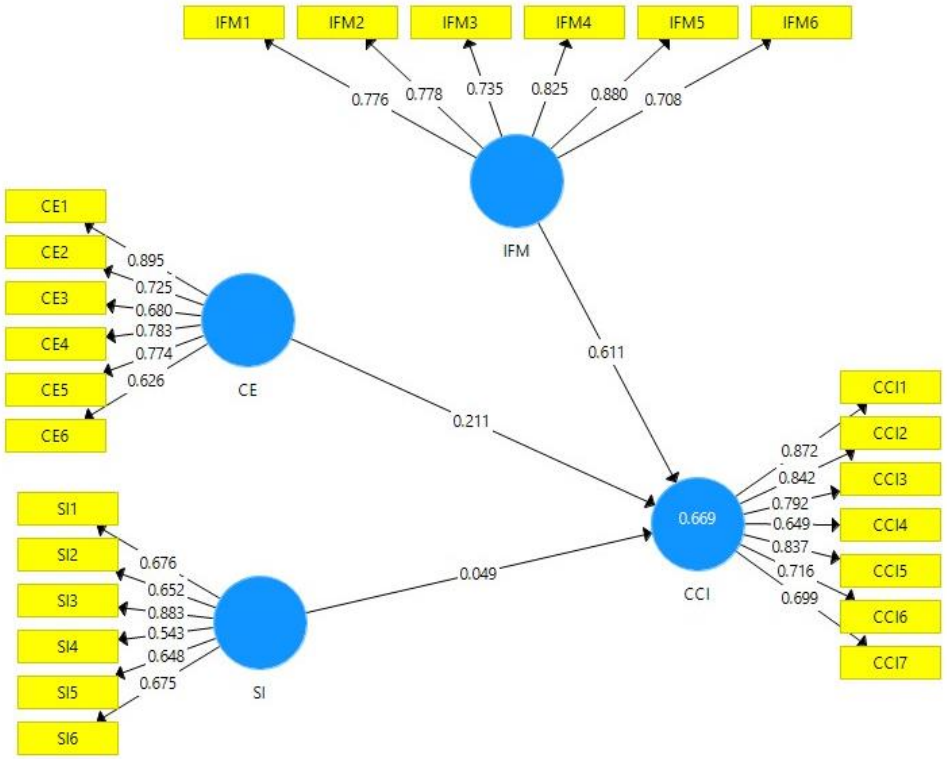

Figure 1: *Construct Measurement Model*

Henseler et al. (2015) introduced the HTMT, which is thought to be a more rigorous approach than the traditional method. HTMT is the most recent set of criteria for evaluating discriminant validity. As suggested by previous studies, HTMT is appropriate when is less than 0,85. The HTMT 0.85 results met the established threshold of less than 0.85 recommended by Ab Hamid et al (2017), and Kline (2015), as Table 2 illustrates. The results demonstrate a satisfactory level of validity. Additionally, since the HTMT is less than 0.85, it can be said that the data has been obtained correctly and does not have any problems with discriminant or convergent validity, based on both internal and external correlation.

Table 2: *HTMT Values of the Construct*

	CE	SI	IFM	CCI
CE				
SI	0.840			
IFM	0.808	0.821		
CCI	0.846	0.792	0.706	

According to Fornell and Larcker (1981), discriminant validity is demonstrated when a latent variable explains a larger percentage of the variance in the indicator variables it is associated with than it does with other constructs in the same model. This needs to be satisfied by comparing the squared correlations between the average variance extracted (AVE) for each construct and the other constructs in the model (Henseler et al., 2015). Using the square root of the constructs, the Fornell-Larcker criterion results in Table 3 showing that the construct's capacity for self-distinction from others is consistent with the criteria for discriminant validity suggested by Henseler et al. (2015). Overall, the measurement model's analysis confirms that the survey instrument's items are trustworthy and dependable.

Table 3: *Fornell and Lacker Criterion*

	CE	SI	IFM	CCI
CE	**0.787**			
SI	0.744	**0.753**		
IFM	0.683	0.724	**0.709**	
CCI	0.739	0.705	0.615	**0.757**

Note(s): The diagonal is the square root of AVE, while the off-diagonal numbers are the correlations between latent variables.

Assessment of the Structural Model

The structural model is examined using PLS-SEM analysis once the measurement model as a whole has been evaluated. The structural model method is usually evaluated in this context to take important analytical elements into account while testing the suggested research hypotheses. Additionally, this phase analysis is necessary to acquire significant data and assess the quality of the model (Hair et al, 2017). In this study stage, the main goal is to identify important variables to test the suggested research hypotheses. This analytical process is essential for drawing significant conclusions and evaluating the model's suitability. The coefficient of determination (R2), effect size (f2), model fit, path coefficients, predictive relevance or cross-validated redundancy (Q2) for endogenous constructs, and the significance levels of t-values and p-values are among the important metrics taken into consideration in this context.

Quality of Fits

As per the researchers' recommendations, a goodness of fit test for the proposed model should be conducted as the following step in the structural model study. It shows the fitness of the model and aids in the discovery and elimination of redundant information and abnormalities. SMART-PLS evaluates the goodness of fit using RMS-theta and Standardized Mean Square Residual (SRMR). Research indicates that if the SRMR cut-off value is less than or equal to 0.80 (Tuksino, 2016), which represents its absolute state, then it is good. Similarly, it will be deemed well-fit if its values are less than or equal to 0.80. Furthermore, for good fitness, the RMS-theta value should be less than or equal to 0.70 (Steiger, 2007). Also, A value of CFI should be greater than or equal to 0.90 (Hair, et. Al, 2014), and a value of TLI should be greater than or equal to 0.90 (Awang, (2015). The fit statistics indicate adequate fit between the hypothesized model and the data ($\chi 2/df$ = 3. 12, d_G= .80, d_ULS = .04, CFI= .96, TLI= 0.94, and RMSEA= .04, SRMR= .05). The current study's model fits values fall within the acceptable range, demonstrating the model's good fit for the investigation and potential prediction of the components and their interactions. Table 4 illustrates the values for the goodness of fits.

***Table 4**: Quality of Fits*

Goodness of fit	Value	Rule of thumbs	Justification	Interpretation
SRMR	.05	<.08	Tuksino (2016)	Fulfilled
RMS-theta	.04	<.07	Steiger (2007)	Fulfilled
CFI	.96	>.90	Hair, et. al (2013)	Fulfilled
TLI	.94	>.90	Awang (2015	Fulfilled
d_ULS	.04	<.08	Hair, et. al (2013)	Fulfilled
d_G	.08	<.10	Hair, et. al (2013)	Fulfilled
Chisq/df	3.12	<.5.0	Awang (2015)	Fulfilled

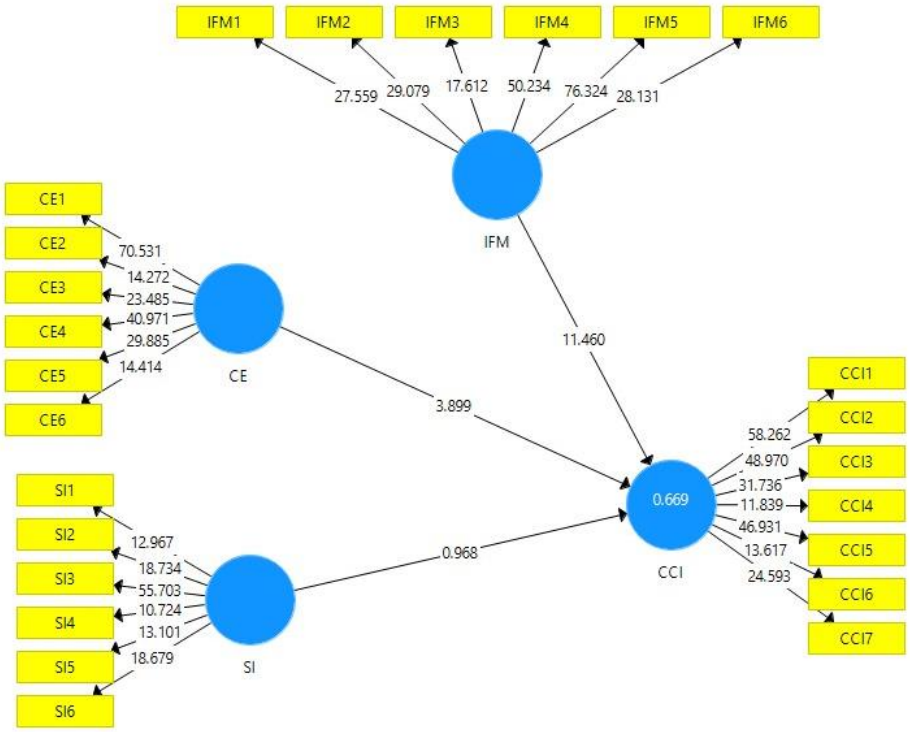

Figure 2: *Structural Model of the Study (Bootstrapping @5000)*

After assessing the goodness of the structural model, the bootstrapping procedure was employed to evaluate the hypothesized relationships between the effects of latent constructs to determine the statistical significance of the parameters within the structural model. The Smart PLS 4.0 tool was used to conduct the bootstrapping procedure, which allowed for the generation of t-statistics for significance testing. Then, perform bootstrapping @ 5,000 as suggested by Ramayah et al. (2018). Figure 2 and Table 5 summarize the hypothesized relationship from the bootstrapping procedure.

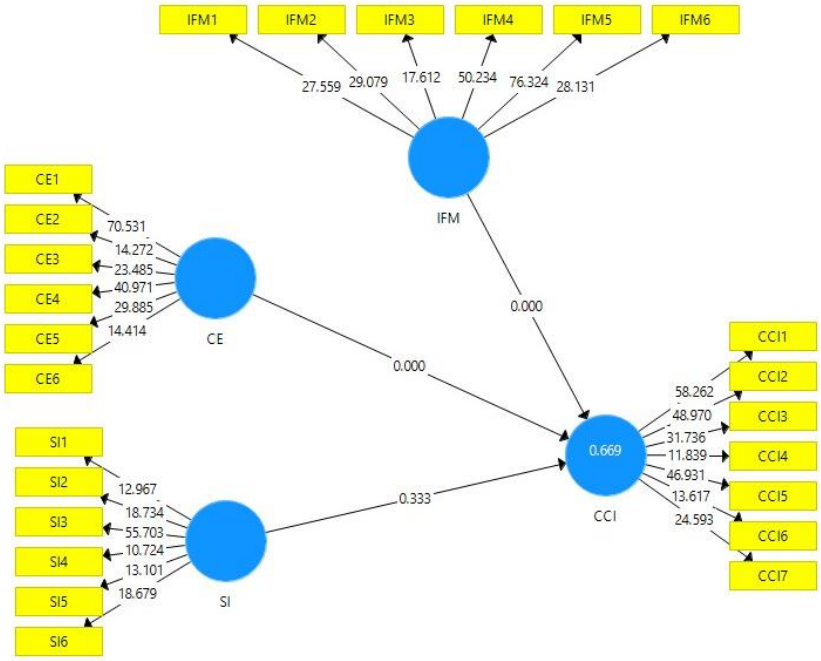

Figure 3: *Structural Model of the Study*

Table 5: *Result of Structural Model (Path Coefficient)*

Hypotheses	Original sample (Beta)	Standard Deviation	t-Value	P Value	Decision
CE -> CCI	0.275	0.065	4.220	0.000	Supported
SI -> CCI	-0.047	0.057	0.825	0.410	Not Supported
IFM -> CCI	0.628	0.057	10.982	0.000	Supported

Note: *t-value > ∝=0.05, **t-value > ∝=0.01 with two tailed test

Table 5 and Figure 4 above illustrate the findings of the structural model evaluation. Hypotheses 1 and 3 were shown to have a significant effect on climate change issues (β= 0.275, p 0.00) and (β= 0.628, p> 0.0). However, student involvement (β= -0.047, p> 0.410) had no significant impact on climate change issues.

DISCUSSION AND CONCLUSION

Climate change is a complex issue that calls for tailored and collaborative strategies, especially in the education sector. This study looked into how community involvement, infrastructure management, and student participation serve as effective educational management strategies to tackle climate change challenges in Kwara State, Nigeria. The results offer valuable insights into how these factors work together to promote sustainable practices in schools. The findings showed that community engagement plays a crucial and positive role in addressing climate change issues. This suggests that when schools actively involve parents, local leaders, and other community members in decision-making and environmental initiatives, they cultivate a sense of shared responsibility and collective action. This aligns with the work of Ballew et al. (2019), who point out that community engagement boosts environmental awareness and strengthens local responses to climate challenges. Likewise, Manzaedo et al. (2020) emphasize that collaboration between schools and communities opens doors for developing climate adaptation practices that are relevant to the local context. Beyond confirming previous research, this study enhances our understanding by demonstrating that, in Nigeria, community engagement not only raises awareness but also aids in implementing practical sustainability initiatives, like waste reduction and tree planting, within school settings.

Interestingly, infrastructure management has shown a strong positive link to climate change mitigation. This aligns with Abdullahi (2023), who pointed out that when schools effectively manage their physical facilities and prioritize preventive maintenance, they can weave sustainability principles into their everyday operations. Analyzing this further, it suggests that the climate resilience of educational institutions

is, in part, dependent on how well-prepared their infrastructure is. Schools that boast functional energy systems, green spaces, and well-kept facilities are in a better position to exemplify environmental responsibility. Therefore, managing infrastructure isn't just a practical necessity; it's also a strategic approach to embedding sustainability into the core of educational practices.

On the other hand, student involvement didn't show a significant connection to tackling climate change issues. This finding contrasts with research like that of Helen et al. (2021), which highlights the importance of students in fostering eco-friendly school cultures. One possible reason for this discrepancy could be the lack of institutional support for student-led sustainability initiatives in Nigerian secondary schools. As De Wit-de Vries (2019) pointed out, when structures or policies don't actively encourage students to engage in environmental governance, their potential contributions often go untapped. This highlights the urgent need for educational policymakers to make student participation in sustainability programs a priority, integrating it into the curriculum, establishing environmental clubs, and incorporating it into school governance frameworks.

The findings really highlight how the Theory of Planned Behaviour (Ajzen, 1991) plays a crucial role in understanding how attitudes, social norms, and perceived behavioral control influence environmental actions in educational settings. Community engagement showcases the power of social norms and shared expectations, while effective infrastructure management ties into perceived behavioral control through the management of resources and facilities. On the other hand, student involvement connects to attitudes and intentions regarding sustainability. The fact that student involvement didn't show a significant impact points to a disconnect between positive attitudes and actual behaviour, a gap that can be closed by fostering environments that help turn student intentions into real actions.

From a theoretical standpoint, this study adds to the existing literature by providing empirical evidence that educational management strategies, especially community engagement and infrastructure management, can be powerful tools for addressing climate change in educational contexts that are still developing. It also enhances the application of the Theory of Planned Behaviour by illustrating how organizational and contextual factors can influence the shift from intention to sustainable action. On a practical level, the study offers important insights for school administrators, policymakers, and educational planners in Nigeria. By strengthening ties with communities and implementing proactive infrastructure policies, we can significantly boost the education sector's ability to contribute to climate resilience.

Implications and Limitations of the Study

The implications for the present study necessitate that educational management strategies can positively influence the mitigation of climate change issues. Implementing strategies that foster effective community engagement, student involvement, and infrastructure management can create an environment that stimulates positive mitigation of climate change issues. This study shows that educational management strategies facilitate community engagement between school and community by providing advanced collaborations on sustainable practices and creative solutions to climate change issues. Furthermore, this study highlights the benefits of using educational management strategies to accelerate student involvement for effective mitigation of climate change issues. The research also indicates that infrastructure management plays a crucial role in encouraging effective mitigation of climate change issues.

This study sheds light on how educational management strategies can help tackle climate change challenges in Nigerian secondary schools, but it's important to recognize a few limitations. First off, the research was limited to public senior secondary schools in Kwara State, which might restrict how applicable the findings are to other areas with different environmental conditions, administrative capabilities, and socio-economic contexts. To get a broader perspective, future research should consider including a wider variety of states or even conduct analyses at the national level to capture regional differences and improve representativeness. Additionally, the study relied entirely on self-reported data from school administrators and teachers, which could be swayed by social desirability bias or personal views. To enhance the validity of future research, a mixed-methods approach could be beneficial, combining quantitative surveys with qualitative methods like interviews, focus groups, and classroom observations. This would yield richer, more detailed insights into how educational management practices impact sustainability outcomes.

Moreover, the study only looked at three indicators of educational management strategies: community engagement, infrastructure management, and student involvement. It didn't touch on other important aspects, such as policy implementation, teacher professional development, leadership styles, and financial resource allocation. Future studies should incorporate these additional elements to create a more holistic model for climate change mitigation in education. Finally, this research focused solely on secondary education. Expanding the investigation to include basic and tertiary education, along with conducting longitudinal studies to monitor behavioral and institutional changes over time, would provide a deeper understanding of how educational systems can promote long-term environmental sustainability and resilience.

CONCLUSION AND RECOMMENDATIONS

This study examined how educational management strategies, like community engagement, infrastructure management, and student involvement, can help tackle climate change issues in secondary schools in Kwara State, Nigeria. The results show that community engagement and infrastructure management play a significant role in climate change mitigation, while student involvement, although important in theory, didn't have a notable statistical impact. These findings underscore how vital institutional structures and collaboration among stakeholders are in fostering sustainable practices in education. To effectively confront the challenges of climate change, secondary schools need to embrace inclusive and collaborative strategies that go beyond the classroom walls. School leaders should work on building strong partnerships with parents, local leaders, and the surrounding communities to foster a sense of shared responsibility for sustainability initiatives. Creating community-based environmental committees or "green teams" can boost local participation and ensure that sustainability goals are relevant and rooted in the community's culture. Moreover, policymakers and education authorities should weave sustainability-focused infrastructure planning into school development policies. This means adopting energy-efficient technologies, maintaining eco-friendly facilities, and incorporating environmental management principles into everyday school operations. It's equally crucial to integrate environmental education throughout the curriculum to raise awareness and encourage lasting behavioral changes among students. Even though student involvement didn't show significant statistical results, schools can still empower students through hands-on learning projects, environmental clubs, and peer-led advocacy that connect classroom lessons to real-world environmental actions.

This study highlights that effective educational management strategies, anchored in community involvement and sustainable infrastructure practices, are crucial for advancing climate change mitigation in Nigerian schools. The takeaway is straightforward: achieving climate resilience in education demands both structural and cultural changes within the school system. By embedding sustainability principles throughout all levels of school administration, Nigeria's education sector can significantly contribute to nurturing environmentally conscious citizens and promoting long-term ecological stability.

Based on the insights and conclusions drawn from this study, a number of recommendations are put forward to enhance the effectiveness of educational management strategies in addressing climate change in Nigerian secondary schools. To start, there's a pressing need for better policy integration and institutional backing. The Ministry of Education, in partnership with environmental agencies, should craft and roll out a national policy focused on climate education and sustainable school management. This policy should ensure that sustainability principles are woven into every facet of school administration, from curriculum development to infrastructure projects and community involvement.

Moreover, school leaders should embrace more organized methods of engaging with the community. By forming formal partnerships between schools and their local communities, we can cultivate a shared sense of responsibility for environmental initiatives. These collaborations might take shape as school-community environmental committees or development boards that jointly oversee sustainability projects like tree planting, waste recycling, and renewable energy efforts. This inclusive strategy will help foster a sense of ownership among community members and enhance the long-term viability of school-based environmental programs.

Additionally, prioritizing sustainable infrastructure development is crucial. Governments and school

boards should channel investments into eco-friendly facilities and establish routine maintenance practices that minimize waste, boost efficiency, and reduce long-term operational costs. It's also vital to focus on building the capacity of school leaders and teachers. Ongoing professional development programs should emphasize environmental leadership, climate change education, and sustainable resource management, equipping administrators with the necessary skills to create and execute impactful environmental initiatives.

While the study found that student involvement didn't have a statistically significant impact, it's still a crucial pathway for encouraging lasting behavioral change. Schools should weave environmental education more thoroughly into their curricula by incorporating hands-on learning experiences, student-led clubs, and advocacy initiatives. By empowering students to take active roles in sustainability efforts, we can nurture eco-conscious habits that last a lifetime.

Additionally, it's vital to set up monitoring and evaluation systems to keep track of progress and ensure accountability. Education authorities ought to create measurable indicators to evaluate the success of climate mitigation strategies, such as energy conservation, waste reduction, and community engagement. Strengthening collaboration between the education sector, private companies, and non-profits will also be key to mobilizing funding, sharing expertise, and replicating successful, sustainable school management models throughout the country.

Conflict of interest

There is no conflict of interest to state, according to the author

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