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Assessing students' perceptions and awareness of climate change: A comparative study of three cities in Ghana

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Abstract

Africa faces considerable challenges due to climate change, especially Ghana, where dependence on rain-fed agriculture and limited capacity for adaptation increase vulnerability. This research examines students' awareness and perceptions of climate change, considering the impact of demographics, education, media, and personal experiences. Conducted in Accra, Kumasi, and Takoradi, the study uses a mixed-method approach, employing stratified random sampling and surveys to evaluate knowledge levels. Results show low awareness of climate issues, with social media significantly influencing perceptions. The study finds that although students are aware of climate-related effects like floods and droughts, misconceptions hinder proactive adaptation efforts. The findings emphasize the necessity of incorporating climate education into school curricula and promoting media-driven awareness campaigns. Improving climate literacy among students is crucial for preparing future generations to effectively tackle climate change challenges.

Keywords; Climate Change, Hedonic Factors, Social Media, Social Media Behavior, Student Perception, Utilitarian Factors.

INTRODUCTION

Africa ranks among the continent's most susceptible to the impacts of climate change (IPCC, 1996), with Nigeria being particularly at risk due to its southern coastal location and northern borders with the arid Sahel. The continent's poverty, dependency on rain-fed agriculture, and reaction and mitigation capacities are its most vulnerable points (Igwebuike et al., 2009). The detrimental effects of climate change on the socio-economic conditions of the population are worsened by a general lack of awareness about climate change, which is linked to the absence of adaptation strategies. Changes in the global climate that are caused by human activities altering atmospheric composition, whether these changes are more pronounced or less pronounced than natural climatic variability over the same time periods, are collectively referred to as climate change (United Nations Framework Convention on Climate Change, 1992). There are gaps that need to be filled due to the fragmented research in the topic and the lack of particular literature on public knowledge, views, and attitudes about climate change communication in the nation. It is imperative to integrate climate change topics into educational curricula from elementary to university levels.

In order to meet the worldwide difficulties posed by climate change, it is more important for young people in Ghana to educate themselves on the subject. Climate change educators and communicators face cognitive challenges such as a lack of understanding of the causes of climate change and the relationship between human behaviour and the phenomenon, as well as widespread low perceptions of people's ability to adapt to and mitigate the effects of this changing anthropogenic climate (Pruneau et al., 2010).

In Ghana, climate change is significantly impacting livelihoods by altering seasonal rainfall patterns. This has led to the drying up of streams and springs, causing substantial reductions in crop yields and food shortages. Despite these challenges, awareness of climate change impacts remains very low. Major contributors to this damage, such as corporations and the transport sector, have yet to take necessary actions to address these issues. The process of adapting to and mitigating the effects of climate change would greatly benefit from an understanding of public opinions, attitude, and beliefs (Shome and Marx, 2009). More frequent and intense weather and climate phenomena, such as storms, excessive heat, floods, droughts, and wildfires, are brought about by evolving climatic circumstances. As a result, these changes have direct and indirect effects on health, raising the stakes for mortality, illness transmission, recurrence, and the proliferation of health crises. The aim of this research is to;

1. To evaluate the level of awareness and perception on climate change among students.
2. To analyse how demographic, geographical, and educational factors influence students' understanding of climate change.
3. To assess the role of media, school curricula, and personal experiences in shaping students' climate awareness.

LITERATURE REVIEW

A lot of researchers have examined the need for student perceptions on climate change but few studies has been conducted on the role of the media, school curricula and personal experiences in shaping the students' perceptions on climate change. Understanding the impacts of climate change is essential for fostering a climate-friendly community. For instance;

In a pivotal study by Codjoe et al. (2014), it was discovered that residents of three communities in Accra were aware of climate change, which could potentially boost their involvement in adaptation planning within their areas. This finding is important, but it has not been investigated how well (1) scientific understanding and (2) the expertise of institutional workers involved in adaptation plans match with the perspectives of informal inhabitants. This brings up two important enquiries: (1) How does scientific understanding of climate change phenomena compare with the perspectives of people living in informal settlements on environmental changes caused by climate change? Second, how congruent are the views of relevant state authorities on climate change with those of people living in informal settlements? This study aims to answer these problems by examining four Accra informal settlements: Adedenpko, Ga-Nshonaa, Gbegbeyise, and Old Fadama. The results of this study may be very helpful in informing adaption strategies in Accra and other comparable locations.

(Esakkimuthu & Banupriya, 2023) investigated "climate change awareness among students." The study highlights the essential role of education and awareness in tackling climate change among students, advocating for enhanced educational strategies and community engagement to promote a sustainable future.

According to Lujala et al. (2015), 60% of those who lived close to dangerous places thought there were more hazards and took more aggressive steps to reduce them. Research has demonstrated the importance of risk perception in adaptation and mitigation efforts (Bord, Fisher, & O'Connor, 1999), underscoring the necessity of thorough assessments of risk perception. Undergraduate medical students' understanding and familiarity with climate change were investigated by Ramírez et al. (2024). According to the results, these kids don't know much about climate change.

Everyone must do their part to combat climate change, and health care providers must prioritise public education as an essential starting step. As a means of responding to climate change education, researchers analysed student and teacher perspectives and behaviours (Kwon et al., 2024) to identify actionable pedagogical approaches. Results show that "climate change adaptation" and "climate change sensibility" are under-emphasized in climate change curricula, whereas most programs emphasise gaining general knowledge about the topic.

Asuquo and John (2007) discovered that merely 40% of individuals in the Ediba Community had a correct grasp of climate change, highlighting the necessity for enhanced educational efforts.

In a similar vein, Lee et al. (2023) observed that although most university students in Klang Valley were exposed to information about climate change, a considerable number still lacked a profound comprehension of the subject.

METHODOLOGY

This research will employ a mixed-method approach (quantitative and qualitative) to ensure comprehensive analysis.

1. Study Area

The research conducted in Accra, Kumasi, and Takoradi seeks to evaluate students' exposure to climate-related incidents by examining the geographical variety and the urban-rural distribution of these cities. The study focuses on how these elements affect students' awareness, experiences, and susceptibility to climate change.

Accra, the capital, is marked by a high population density, swift urban growth, and extensive infrastructure development. This setting frequently encounters issues like flooding, air pollution, and the urban heat island effect, which can intensify the consequences of climate change. Students in Accra might experience more climate-related events due to the city's geographical position, its susceptibility to flooding, and its coastal location. However, the level of exposure can vary between students residing in wealthy urban areas with superior infrastructure and those in informal settlements with limited access to essential services.

Kumasi, Ghana's second-largest city, represents a blend of urban and rural experiences. While the city is rapidly urbanizing, it remains surrounded by rural areas heavily reliant on agriculture. This combination offers a distinctive study area for analyzing the varying levels of vulnerability among students in the urban center compared to those in nearby rural communities. Students in Kumasi might encounter climate risks such as deforestation, changes in agricultural productivity, and urban flooding, whereas those in rural areas might be more susceptible to alterations in crop patterns and water availability.

Takoradi, situated in the Western Region, features a coastal urban environment also impacted by climate change, particularly through rising sea levels, coastal erosion, and storms. The city is closely linked to the oil and gas industry, which has introduced both development and environmental challenges. Students in Takoradi may be especially exposed to coastal and marine-related climate events, while rural students in surrounding areas might face risks associated with agricultural productivity and natural resource management.

The population used in the study were the students of both genders based on High school and university students. Approximately 100 students across the three cities of Ghana (Accra, Kumasi and Takoradi). Stratified random sampling will be used to ensure representation based on gender, education level, and city.

2. Data collection methods

Primary data was gathered through a field survey utilizing a well-designed questionnaire was distributed to students to access their awareness, beliefs, and sources of information about climate change. A total of one hundred validated data instruments were distributed among pupils in the chosen schools across three cities of Ghana (Accra, Kumasi and Takoradi).

The questionnaire was randomly administered through google forms to ensure each student had an equal opportunity to answer the questions.

The dependent variable in this study was the perception of students regarding climate change, while the independent variable was social media usage behavior. The mediating factors were hedonic and utilitarian.

3. Conceptual Framework

This conceptual framework highlights the relationship between social media usage behaviour and the perception of students towards climate change. The mediating factors are hedonic and utilitarian factors. Furthermore, the level of social media usage mediates the relationship between social media usage behaviour, hedonic and utilitarian factors.

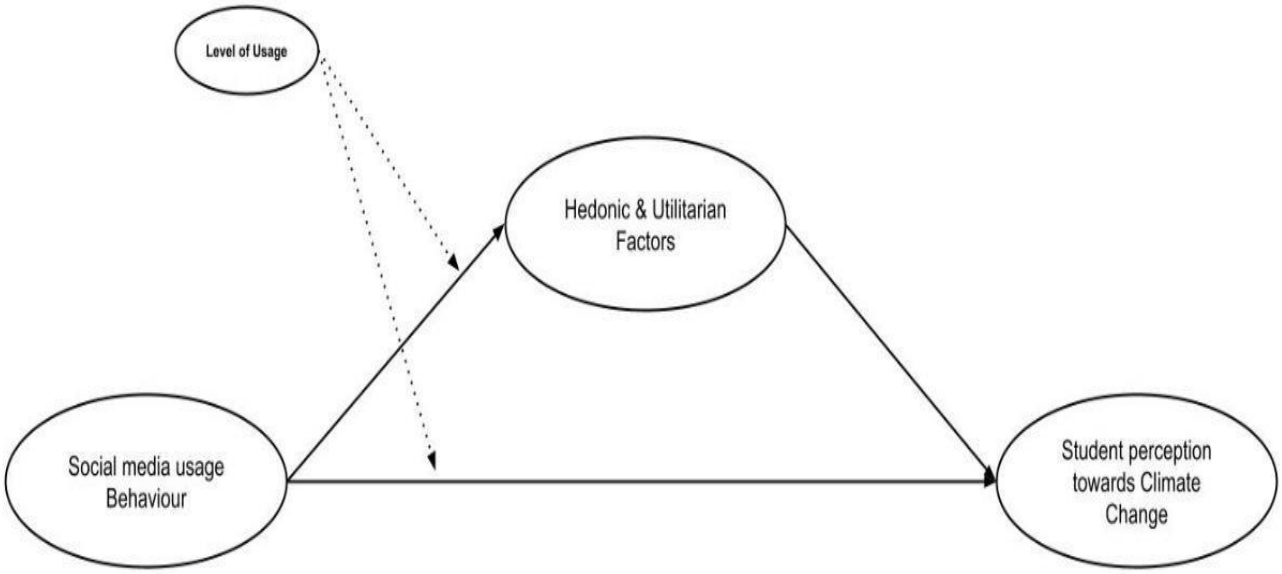
Social media usage behaviour is an independent variable that depicts how students engage with social media with the frequency, intent and type of content they see on social media. Secondly, the hedonic factors define the practical and informative use and gaining knowledge on climate change. These two factors have effects on how social media impacts the perception of students.

Student perception towards climate change is also the dependent variable. It illustrates how students are able to engage and understand climate change issues on social media platforms.

The moderating factor is the level or usage of social media. This variable edifies the relationship between social media usage and hedonic or utilitarian factors.

It depicts that higher usage of social media can amplify hedonic influences, whilst lower levels will strengthen utilitarian motivations. In conclusion, this framework helps to know the role or how social media contributes to climate and students' perceptions.

Figure 1



RESULTS AND DISCUSSIONS

1. Construct Reliability and Validity

Data in Table 1 measures the model assessment and confirms the reliability of most of the constructs. With the Social Media Behavior (SMB) variable all the items were found to be acceptable (0.679-0.842), which reveals a strong reliable composite of (CR= 0.848) and convergent validity of (AVE =0.584). The Hedonic/Utilitarian (HU)Item HU1-HU3, was also found to be highly loaded with (>0.77), HU4 had (0.659), and HU5 with (0.856) was lightly good but retained due to the relevance of theory, CR was (0.856) and AVE was (0.546).

The last variable is Student Perception (SP): SP1, SP2, SP3 and SP4 were well loaded with (>0.73) but SP2 had (-0706 which is problematic negative loading, making it less reliable (CR=0.633, RHO_ A = 0.206).

Table 1. Construct Reliability and Validity

Item	Outer loading	VIF	AVE	CR	Cronbach's alpha	rho_A
SMB1	0.679	1.354	0.584	0.848	0.777	0.761
SMB2	0.842	1.884				
SMB3	0.739	1.548				
SMB4	0.787	1.534				
HU1	0.773	1.888	0.546	0.856	0.803	0.789
HU2	0.813	2.12				
HU3	0.812	1.94				
HU4	0.659	1.471				
HU5	0.615	1.285				
SP1	0.833	1.725	0.596	0.633	0.788	0.206
SP2	-0.706	1.416				
SP3	0.811	1.682				
SP4	0.731	1.61				

2. Discriminant Validity: Formell-Larcker Criterion

The data in table 2 provides the Findings of the discriminant validity using Formell-Larcker Criterion. The Diagonal Values exceeded the off-diagonal correlation, making it a discriminant validity. The √AVE for HU (0.739) > Correlation SMB (0.737 and SP (0.68) and √AVE for SMB (0.764) > Correlation with SP (0.736). The findings reveal that there is marginal discriminant validity between the variables,

Table 2. Discriminant Validity

	HU	SMB	SP
HU	**0.739**		
SMB	0.737	**0.764**	
SP	0.68	0.736	**0.772**

3. Predictive Power

The data in Table 3 reveals the predictive power of the R2 Values. Hedonic and utilitarian factors

HU was found to be 0.543 (representing Moderate). SMB (Social Media Behaviour had a value of 54.3 % variance in motivations.

Students' perceptions (SP) had 0.584 showing a strong value, with a combined model of 58.4% of the perception variance. The Predictive Relevance was (Q2 >0): for both HU (0.523 and SP (0.527). The Error Metrics RMSE (~0.71) and MAE (~0.56 reveals a reasonably accurate prediction.

Table 3. Predictive Power

Endogenous latent constructs	R-Square	R-Square Adjusted	Q^2 _predict	RMSE	MAE
HU	0.543	0.538	0.523	0.716	0.557
SP	0.584	0.575	0.527	0.704	0.575

4. Correlation analysis of student perceptions of climate change

Table 4 shows the correlation analysis of students' perceptions of climate change. H1 shows that there is a high significant association between SMB and HU (human resources), as evidenced by the strong path coefficient of 0.742 and p-value of 0. H2, there is a moderate link between HU and SP (Satisfaction/Performance?) as indicated by a path coefficient of 0.305 and a p-value of 0.002.

H3, A considerable indirect effect is indicated by the combined effect from SMB to SP via HU, which has a strong path coefficient of 0.512 and a t-statistic of 5.52. H4, with a path coefficient of 0.227 and a p-value of 0.004, there is a strong correlation between the paths associated with SP (maybe the direct effect on satisfaction/performance).

All hypotheses are supported based on the p-values being less than the standard significance level of 0.05, confirming that all paths in the model are statistically significant. The results means that the relationships between the variables are statistically significant. People's behavior and reactions to climate change are greatly influenced by their knowledge (Taber & Taylor, 2009).

Table 4 Direct Effect

Hypothesis	Path	Path Coefficient	SE	t-statistics	p-values	Decision
H1	SMB -> HU	0.742	0.057	0.077	0	Supported
H2	HU -> SP	0.305	0.098	3.05	0.002	Supported
H3	SMB -> SP SMB -> HU ->	0.512	0.093	5.52	0	Supported
H4	SP	0.227	0.077	2.857	0.004	Supported

CONCLUSION

This research highlights the pressing need to increase climate change awareness among students in Ghana. The findings suggest that while students acknowledge the effects of climate change, their understanding is frequently hindered by misconceptions and inadequate education. Social media significantly shapes perceptions, but its influence varies with demographic and educational factors. The study highlights the importance of integrating climate change topics into educational curricula and encouraging media-driven awareness initiatives. Addressing these gaps is vital for empowering students with the knowledge required to engage in climate action and adaptation strategies.

LIMITATIONS

Despite providing valuable insights, this study has certain limitations. Firstly, the sample size of 100 students may not fully represent the broader student population in Ghana, affecting the generalizability of the findings. Secondly, data collection relied on self-reported surveys, which may be subject to response bias. Thirdly, the study mainly focused on urban and semi-urban areas (Accra, Kumasi, and Takoradi), potentially neglecting rural perspectives where climate change impacts might differ significantly. Additionally, while the study assessed the role of media in shaping climate perceptions, it did not explore other external influences such as cultural beliefs and government policies. Future research should expand the sample size, include more diverse geographic areas, and incorporate qualitative interviews for deeper insights into students' perceptions and behavioral responses to climate change.

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