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The Role of Educational Technology in Climate Change Related Mitigation

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Abstract

At present, the entire world is challenged by climate change with recessive economic consequences like extreme temperatures, flooding, food insecurity etc. Application of educational technology can be leveraged on to mitigate such effects with evident case scenarios from students' experiences in a university system. A descriptive survey design study with 240 students of Lagos State University was adopted from six departments to determine influence of educational technology in mitigating challenges of climate change and global economic recession among students. A 25-item questionnaire was used for data collection. The reliability of this instrument was tested using the Cronbach Alpha reliability and its coefficient stood at 0.91. The instrument was administered on individual basis. Data obtained from the instrument was analyzed using percentages, t-test as well as ANOVA to test the stated hypotheses at 0.05 level of significance. Results showed that there exists a strong correlation between educational technology, climate change and recessive economic factors among students irrespective of gender or age. Hence, determining educational technology applications in mitigating climate change and recessive economic challenges could be achieved by adopting hybrid learning, less use of paper, big data utilization and enhancement of online information dissemination among students. Students in universities could also be encouraged to embrace collaboration, communication and creativity which are part of the 21st century digital skills needed for navigating these eras.

Keywords: *Challenges, Climate Change, Economic Recession, Educational Technology*

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Background to the Study

Given the challenging times in our society today, it is imperative to contextually examine the role of educational technology in climate change and recessive economic mitigation. Failure to interrogate consequences of these multiple pandemics through education and educational technology might impose a collective doom on the planet (Ladson-Billings, 2021). Yu, *et al. (*2020) stated that mitigating these challenges requires an educated and motivated citizenry through green education, provision of knowledge related to climate change and promoting pro-environmental behaviours. In addition, Chowdhury, *et al.* (2021) notes that education mitigates effects of climate change in an increasingly global world.

Climate change is defined as the long-term condition caused by a series of unpredictable, and detrimental weather patterns resulting from human interferences (Hill-Jackson, Ladson-Billings and Craig, 2022). It connotes worsening extreme weather events, causing loss of biodiversity, and threatening human health (IPCC, 2022). Steg (2023) stated that human behaviour plays a critical role in global climate change response with high sensitivity that must be addressed worldwide (Chowdhury, *et al.* 2021). Climate change is predominantly caused by emissions of $CO_2$and methane due to combustion of fossil fuels such as coal, oil, gas as well as deforestation. Its effects are demonstrated in extreme weather events such as heat waves, heavy downpours, flooding, and droughts that threaten human health, security, well-being, livelihood, food/water supply, infrastructure, and economic growth (IPCC, 2022) as well as and reduced labour productivity (Trisos, et al., 2022).

Several studies attested to the severity of challenges and consequences of climate change. Opoku, Leal, Hubert & Adejumo (2021) discovered that in the west and central Africa, severe flooding resulted in mortality and forced migration from loss of shelter, increase in diseases such as malaria, lassa fever, and other infections (Stawicki, et al, 2021) and that rising sea levels reduce water quality, leading to water-borne diseases, including diarrhea diseases, a leading cause of mortality in Africa (Evans & Munslow, 2021). In addition, Atwoli, Muhia & Merali (2022) found out that extreme weather damages water supply, increase food insecurity and malnutrition, which causes 1.7 million deaths annually. Global economic recession is another pandemic ravaging the whole world now and it connotes a general down turn in any economy. Basically, a recession is associated with high unemployment, under-employment, high inflation, collapse of industries and huge debt burden (Ofoegbu, Amalu & Uchegbu, 2020). The global recessions were highly synchronized internationally, with severe economic and financial disruptions in many countries around the world.

In a study conducted by Ofoegbu, Amalu & Uchegbu (2020), they found out that there is a significant relationship between economic recession and psychological adjustment of undergraduate students of the University of Calabar, Cross River State and that students have adopted several untoward way in tackling the excruciating pains posed by the economic down turn in the country. It was also asserted that there is a relationship between food insecurity and mental health and stimulating suicidal ideation (Ciciurkaite & Brown, 2021). This untoward situation pushes a lot of students to engage in one anti-social behaviour or the other in order to move ahead in life or to survive the hardship. Taken together, there is a clarion call on the need

to adopt proven interventions that could mitigates these challenges from educational perspectives and one of such is adoption of educational technology.

Educational technology refers to the use of tools, technologies, processes and strategies to improve learning experiences in a variety of settings, and in recent years, its approaches include the use of mobile technologies, virtual realities, immersive environments, collaborative learning, social networking and cloud computing (Huang, Spector &Yang, 2019). In addition, Vaden (2020), stated that education technology involves the ability to identify, evaluate, and use information to solve both environmental and economic challenges. These definitions underscore the understanding that educational technology has evolved from just a mere educational approach to a model used in solving various human challenges including climate change impact factors through technology. According to a survey by Grand View Research, education technology integration worldwide will be worth more than $285 billion by 2027, expanding at a compound annual growth rate of 18.1%.

Findings from a study conducted by Newsome & Miller (2023) shows that educational technology is a catalyst for the innovations that will used to combat climate change. Motta (**2018**) in an analysis of the longitudinal study of American youth has revealed an association between interest in science at young age and increased trust in climate scientists 20 years later. Essentially, educational technology can serve as an essential source of information to ultimately contribute to the mitigation of climate change (Chowdhury, *et al.* 2021). In fact, young people/students believed technology can enable humans provide solutions to challenges of global warming, pandemic, climate change and economic crisis (Akhtar et al. 2019). Supporting this view, Kumar (2022) opined that hybrid learning accounts for digital learning landscape, access to information via the internet and relying on virtual classrooms for content delivery. Hybrid learning also help in reducing heavy reliance on paper work. With this, woods and other fibers used in paper production would be preserved, and this will ultimately help in conserving natural vegetation, because the main source of raw material for paper production is fiber from wood, cotton, wheat straw, sugar cane waste, flax and bamboo (Environmental Protection Agency, 2019). This will help in mitigating the risk of learning loss when teachers lose access to their students (Johnson et al., 2021). This will assist in preventing students from falling too far behind when times are bad, and it calls for the ability to teach more in less classroom time which is needed to overcome unscheduled school closures due to climate change and other crises (Newsome, Newsome & Miller, 2023). Thirdly, adopting educational technology would enhance regular, up-to-date engagement and conversation with students and this will promote climate actions awareness (Wolske et al. 2020). Fourthly, it would assist in mitigating these challenges through big data utilisation because battle against the challenges of climate change and global economic recession requires active collection of quantitative and qualitative data on energy usage, biodiversity counts, transportation surveys, community attitude surveys, attendance records, electrical bills (Newsome, Newsome & Miller (2023), Fifthly, with exposure to educational technology, the problem of unemployment and poverty would be solved because it would promote and enhance collaboration and creativity which are 21st century skills needed for multiple perspectives in learning (Stone, 2020). In all, challenges of climate change and global

economic recession is a problem to African students irrespective of their socio-economic status, religion, gender and age.

Statement of the Problem

Studies have shown that there is no country on the planet where its citizens at any level are insulated from the challenges of climate change and economic recession. IPCC (2022), discovered that increase in rainfall, flooding, wildfires, droughts, disease, cyclonic storms, food scarcity, sea level rise, and snowstorms have been attributed to human-induced climate change. Newsome, Newsome & Miller (2023) observed that due to challenges of climate change and global economic recession, humanity may likely face the risks of learning loss, economic loss, and scarcity of vital resources. Therefore, this study was carried to find out influence of educational technology in mitigating challenges of climate change and global economic recession among students in the Lagos State University. To aid the study, two research questions and three hypotheses were raised and answered at 0.05 level of significance.

Methodology

This study adopted the descriptive design to obtain relevant data on the effect of educational technology on climate change and global economic recession among students in a Nigerian University. The sample for the study consisted of 240 undergraduate students drawn from six departments from the Lagos State University, Lagos- Nigeria. A 25- item questionnaire designed by the researcher titled "Educational Technology, Climate Change & Economic Recession Challenges Scale"- (ETCCERCS) which consisted of three sections: A, B & C was used for data collection. Section A of the instrument sought information on students' demographic data such as gender, age, department and level. Section B sought for students' response on challenges of climate change & economic recession while section C sought information on students' inclination to educational technology. The instrument was validated by experts in the field of psychometrics. The reliability of this instrument was tested using the Cronbach Alpha reliability and its coefficient stood at 0.91. The instrument was administered on individual basis. Data obtained from the instrument was analyzed using percentages, t-test as well as ANOVA to test the stated hypotheses at 0.05 level of significance.

Results

Research question 1: What are the severity levels of challenges of climate change and global economic recession among students in a Nigerian University?

Table 1: Severity levels of challenges of climate change and global economic recession among students in a Nigerian University

		Frequency	Percent	Cumulative Percent
Valid	Intense	65	27.1	27.1
	Mild	67	27.9	55.0
	Insignificant	108	45.0	100.0
	Total	240	100.0	

Table 1 shows that the level of severity of challenges of climate change and global economic recession of 27.1% of respondents (65 students) is intense, that of 27.9 % of respondents (67 students) is mild, while the level of severity of 45.0% of respondents (108 students) is insignificant. This finding shows that challenges of climate change and global economic recession is so severe among more than half of the students.

Research Question 2: What are the students' inclination levels toward educational technology in a Nigerian university?

Table 2: Students' inclination levels toward educational technology

		Frequency	Percent	Cumulative Percent
Valid	High	148	61.7	61.7
	Average	68	28.3	90.0
	Low	24	10.0	100.0
	Total	240	100.0	

From Table 2, 61.7% of respondents (148 students) are highly inclined to educational technology, 28.3% of respondents (68 students) are averagely inclined, while the inclination of a mere 10.0% of respondents (24 students) to educational technology is very low. This finding shows that almost two-third of students in a Nigerian University are favourably inclined and disposed to adoption of educational technology in mitigating challenges of climate change and global economic recession.

Hypothesis 1. There is no significant effect of educational technology on challenges of climate change and global economic recession among students in a Nigerian University.

Table 3: Descriptive Statistics of mean and Standard deviation of effect of educational technology on challenges of climate change and global economic recession among students

	Inclination	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Challenges	High	148	24.65	9.465	.778	23.11	26.19
	Average	68	42.24	3.139	.381	41.48	43.00
	Low	24	51.83	6.445	1.316	49.11	54.55
	Total	240	32.35	12.826	.828	30.72	33.98

Table 3 shows that the mean and standard deviation of effect of educational technology on challenges of climate change and global economic recession among students in a Nigerian University are: highly inclined = 24.85 & 9,465, averagely inclined = 42.24 & 3.139 and low inclined = 51.83 & 6.445. This finding shows there is difference in their means. To know if the difference in their means was significant or not, ANOVA was performed as displayed on table 4.

Table 4: ANOVA of effect of Educational Technology on challenges of climate change and global economic recession among students

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24533.302	2	12266.651	196.627	.000
Within Groups	14785.298	237	62.385		
Total	39318.600	239			

Table 4 shows that $F_{(2,237)} = 196.627$ and that $p = 0.000$, and since the p-value which is 0.000 is less than 0.05, then there is statistically significant difference between the variables. Hence, the null hypothesis was rejected. In other words, there is a significant effect of educational technology on challenges of climate change and global economic recession among students in a Nigerian University. Figure 1 shows where the effect lies.

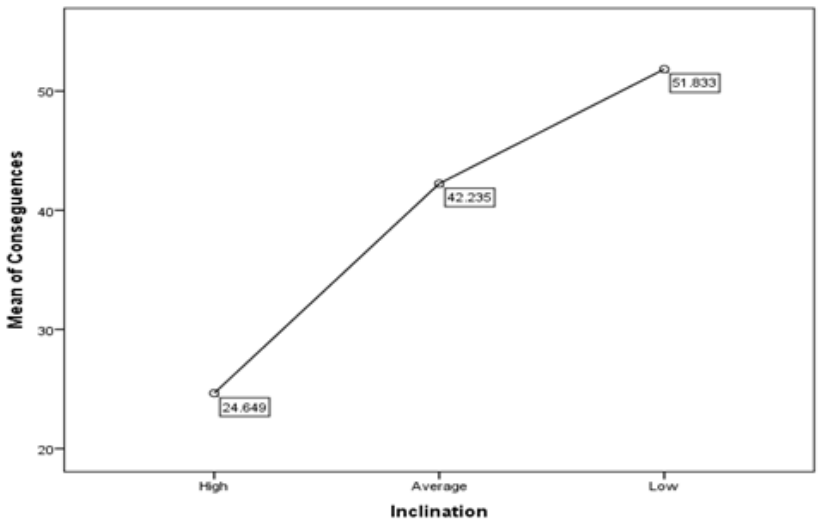

Figure 1: Effect of educational technology on challenges of climate change and economic

Figure 1 shows that on the measure of challenges of climate change and global economic recession, students who are highly inclined to educational technology had the least mean score, followed by those with average inclination, while those with low inclination had the highest mean score. That is, challenges of climate change and global economic recession on students who are highly inclined to educational technology were insignificant and vice versa. Hence, educational technology has significant effect on challenges of climate change and global economic recession.

Hypothesis 2. Gender will not significantly affect challenges of climate change and global economic recession among students in a Nigerian University

Table 5: Descriptive Statistics of mean and Standard deviation of effect of gender on challenges of climate change and global economic recession among students

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Challenges	Male	107	33.30	13.057	1.262
	Female	133	31.59	12.635	1.096

Table 5 shows that the mean and standard deviation of male students on the measure of their challenges of climate change and global economic recession are mean = 33.30 5 & S D = 13.057 and that of female = 31.59 & S D = 12.635. This shows that there is no difference in their means. Table 6 buttressed this finding.

Table 6: Independent Samples Test of effect of gender on challenges of climate change and economic rescission

		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error
Challenges	Equal variances assumed	1.001	.318	1.028	238	.305	1.713	1.665
	Equal variances not assumed			1.025	223.856	.307	1.713	1.671

c.

Hypothesis 3. There is no significant age difference on challenges of climate change and global economic recession among students in a Nigerian University.

Table 7: Descriptive Statistics of mean and Standard deviation of effect of age on challenges of climate change and global economic recession among students

	Age groups	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval	
						Lower Bound	Upper Bound
Challenges	16-18 years	76	33.00	14.057	1.612	29.79	36.21
	19-21 years	108	32.13	12.369	1.190	29.77	34.49
	Above 21 years	56	31.89	12.120	1.620	28.65	35.14
	Total	240	32.35	12.826	.828	30.72	33.98

Table 7 shows that the mean and standard deviation of effect of age on challenges of climate change and global economic recession among students in a Nigerian University are: 16-18

years = 33.00 & 14.057, 19-21 years = 32.13 & 12.369 and above 21 years = 31.89 & 12.120. This finding shows there is no difference in their means. Table 8 supported this finding

Table 8: ANOVA of effect of age on challenges of climate change and global economic recession among students

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	49.058	2	24.529	.148	.862
Within Groups	39269.542	237	165.694		
Total	39318.600	239			

Table 8 shows that $F_{(2,237)} = 0.148$ and that $p = 0.862$, and since the p-value which is 0.862 is greater than 0.05, then there is no statistically significant difference between the variables. Hence, the null hypothesis was not rejected. In other words, there was no significant effect of age on challenges of climate change and global economic recession among students in a Nigerian University. Students do experience these challenges irrespective of their ages.

Discussion

This study investigated influence of educational technology in mitigating challenges of climate change and global economic recession among students in a Nigerian University. Findings from the study reveal that challenges of climate change and global economic recession is so severe among more than half of the students and that almost two-third of these students are favourably disposed to adoption of educational technology in mitigating these challenges. This agrees with the position of Ofoegbu, Amalu & Uchegbu (2020), who stated that students have adopted several untoward ways in tackling the excruciating pains posed by the climate change and economic down turn in the country. Also, Akhtar et al. (2019) discovered that young people/students believed technology can enable humans provide solutions to challenges of global warming, pandemic, climate change and economic crisis. This unarguably points to the fact a lot of young people and students believed technology is the way out of any human challenges.

The first hypothesis which stated that there is no significant effect of educational technology on challenges of climate change and global economic recession among students in a Nigerian University was rejected. In other words, there was a significant effect of educational technology on challenges of climate change and global economic recession among students. This shows that challenges of climate change and global economic recession on students who are highly inclined to educational technology were insignificant and vice versa. This finding agrees with the position of Motta (2018) who established the fact that the influence of science and technology on students trust in climate-related issues has greatly increased. In addition, Akhtar et al. (2019) said young people/students believed technology can enable humans provide solutions to challenges of climate change and economic crisis and that educational technology can serve as an essential source of information to ultimately contribute to the mitigation of these challenges (Chowdhury, *et al.* 2021).

The second hypothesis which stated that gender will not significantly affect challenges of climate change and global economic recession among students in a Nigerian University was not rejected. In other words, challenges of climate change and global economic recession among students is not gender based. This is in agreement with Ofoegbu, Amalu & Uchegbu, (2020) who stated that both male and female students agreed that economic recession affect undergraduate students; but the finding is at variance with Chowdhury, *et al.* (2021) who opine that females were more concerned about climate change than males and that women are more aware of climate change than men. Plausible reasons for these discrepancies could be attributed to the differences in the nature and locations where those studies were carried out. In addition, the insignificance of gender in this study could also be as result of severity of challenges of climate change and global economic recession among students across African continent.

The third hypothesis which stated that there is no significant age difference in challenges of climate change and global economic recession among students in a Nigerian University was also not rejected. In other words, university students irrespective of their ages do experience challenges of climate change and global economic recession. This disagrees with Salem, et al (2022) who stated that global climate change-related knowledge was statistically higher in participants above 30 years. The insignificance of age in this study could be attributable to the fact African University students cluster around the same age-range and challenges could affect the irrespective of their age range.

Recommendations

This study investigated influence of educational technology in mitigating challenges of climate change and global economic recession among students in a Nigerian University. As a result of findings from this study, the following recommendations are made. They are:

1. There should be adequate acceptance and promotion of educational technology in developing countries, especially Africa, because it is the catalyst for innovations that could be used in combating challenges of climate change and global economic recession.
2 Educational authorities should support educational technology because it can serve as an essential source of information that will ultimately enable humans provide solutions to challenges of global warming, pandemic, climate change and economic crisis.
3. African leaders should embrace educational technology because it would help in easing challenges of climate change and global economic recession through promotion and adoption of hybrid learning. This will help in reducing heavy reliance on paper work. With this, woods and other fibers used in paper production would be preserved, and this will ultimately help in conserving natural vegetation,
4 Government and all educational authorities should put policy in place that will support educational technology, so that schools can successfully adapt to fewer days of instruction. This will help in mitigating the risk of learning loss when teachers lose access to their students and overcome unscheduled school closures due to climate change and other crises.

5. Adopting educational technology would enhance regular, up-to-date engagement and conversation with students and this will promote climate actions awareness,
6. With exposure to educational technology, the problem of unemployment and poverty would be solved because it would promote and enhance collaboration and creativity which are 21st century skills needed for multiple perspectives in learning

Conclusion

The essence of this study is to find out influence of educational technology in mitigating challenges of climate change and global economic recession among students in a Nigerian University and to possibly see ways of mitigating these challenges among students. Findings from the study underscore urgent need for the adoption of various educational technological approaches in reducing severity of these challenges. This could be achieved through hybrid learning strategies, reduction in the use of paper, need for promotion of big data untilisation and enhancement of information dissemination real time online among students. Also, promotion and adoption of educational technology strategies would go a long way in mitigating challenges of climate change and global economic recession among students in particular and in the society in general.

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