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Impact Of Weather Variability On Productivity In Learning Among Secondary School Students In Cross River State

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Abstract: ***Weather event have pervading influence on human activities in all spheres. Human activity carried out with disregard to weather incidence have often failed. The essence of recourse to weather incidents prior to programms of event inform the sole essence of weather forecasts for purposes of creating awareness or providing "early warning" signals. With particular reference to educational programms, they is direct necessity of understanding of weather trends. In the development world regions of United State and other First World much attention is given to the essence of a clearly understanding of weather events. In Nigeria like other developing world regions, there is grave apathy in consideration of weather lends in educational policy implementation. This apathy provides the gap on which this research attempt to close. Our objective in this research focus on an understanding of weather patterns across the two broad ecological zones. There is also attention paid to weather incidence on temporal scales. Our investigation is carried along this line by formulation of two hypotheses focused on spatial/ temporal variation in weather events. While hypothesis two looks at these trends on learning activities in the area. Considering the disparate patterns of weather event in the intra and inter-zonal regimes of weathers multivariate analysis using the one way analysis of variance was employed in testing the hypothesis. Hypothesis I direct attention to the spatial and temporal variation in weather regimes. The results from the findings revealed that there was significant variation in the overall weather regime. Spatially and temporally. This findings was further corroborated by the results of hypothesis two which focused on analysis of impact of weather trends in affecting productivity in learning. Deriving from the convergent findings from our investigation, it was concluded that weather variability has both direct and indirect impact on productivity in learning in the area under investigation. This has significant implication for policy framework in education planning and development. Such implications have been outlined as recommendations.***

I. INTRODUCTION/BACKGROUND OF STUDY

Weather variability is the broad view conception of the variable requires of atmospheric cycles overtime and phases. It is considered based on the analysis of oscillation of different weather parameters of weather using the indices of different elements such as temperature, rainfall, insolation (sun shine) clouds, pressure, wind and relative humidity among others. (Oguntoyimbo 2006). Climatologcal analysis recognize the overriding significance of the impact of three of these elements namely; Temperature, rainfall, and insolation.

Inter-Governmental Panel on climate change (IPCC 2007) working Group I & II have designated different impact scenarious following climate change studies. Cross River State is located in the sub-equatorial/tropical climatic zone with high rainfall/high insolation incidents. These locations have conferred on it some peculiarities of weather impact scenarios using surrogate indices of frequent occurrence of flood in the Southern Calabar area and high receipt of ultraviolet radiation in central Ikom area to the Northern Ojodabelt. implicit in this recognition is the fact that the impact dimension across the different zones will be variegated. weather/climate impact studies is receiving fresh currents of attention due to its significance in human activities domain.

Nigerian Meteorological Agency (NIMET Abuja 2012) has explored different impact scenarios using based on sectoral review. This review covered such sectors as

agriculture, health, aviation, hydrology, and education. With regards to Education the report state interalia that flood disrupted academic activities in most schools leading to relocation and evacuation of pupils and students in primary and secondary schools respectively.

Specific cases cited were such as Bayelsa where schools were closed due to rising water levels caused by floods. Following the report, the Niger Delta University NDU, in Amassoma, Bayelsa State was submerged by flood. Accordingly, the report was also given about Lagos State where torrential down poor resulting in flood led to the rescheduling of NECO Examination from Wednesday 20th of June to Thursday 28th of 2012. Report such as above provided a little glimpse of the impact of weather phenomena on human activities with particular reference to Education.

Solar fluxes are also a major source of concern for the overall analysis of weather effect on human productivity. The tropical location of Cross River State generally confers on it high receipt of urer as stated earlier in this text. Gurou (1976) in his evaluation of the effect of tropical environment on development maintained that the incidence of excessive radiation characteristics of this region produced enervating effect on human productivity. This clearly substantiates why consideration must be given to school-hour duration in the planning of school Calendars.

Wind effect is another source of concern in evaluation of weather phenomena on learning productivity. Overtime and in different locations in the state, windstorm devastation has caused the destruction of school plants and facilities leading to disruption of school activities in short and long term. These considerations among others spurred the concern for the research study.

STATEMENT OF THE RESEARCH PROBLEM

Variability in weather events is an index of climate change, climate change has altered the general cycle of weather events in recent times (UNEP 2000). The general meridional flux of weather events have been significantly altered by the climate change trend. This has altered the macro weather patterns leading the creation of Mosaics of microclimates over regions. A pronounced element of the micro climate scenario over this areas is the Urban Heat Island phenomena (UHI) which refers to the differences in the temperature of the urban and rural areas. UHI studies was carried in Calabar metropolis with corroboratory result of the heat trend being higher in the Calabar inner area than the suburbia.

Unpredictability of weather events is also a variant of weather variability in temporal scale which also is a significant evidence of climate change. Considering the all-pervasive influence of climatic trends in human activities generally, attention needs to be paid to an understanding of how climate adaption or mitigation can be achieved in planning. Educational planning requires a clear knowledge of weather/climatic trends in order to achieve maximum productivity in learning. Overtime, most school programmes have been disrupted by unfavourable weather conditions due to little regard to the essence of weather knowledge.

In Cross River State, the two broad ecological zones have clearly distant weather patterns due to the marked influence of marine environment in the South and the incidence of continentalityin the Northern Savanna ecotone. So far there is paucity of literature to sub-stantiate the extent to which weather events at different locations and different times. This research is therefore instigated by the need to acquire the true essence of these uncertainties.

AIMS AND OBJECTIVES OF THE RESEARCH

AIMS OF THE RESEARCH

The overall aim of this study is to investigate the extent to which weather events are affecting learning activities in secondary schools in Cross River State.

RESEARCH OBJECTIVES

The following specific objective have been derived from the above aim

- ✓ To investigate the spatial and temporal variation in weather phenomena in the study area
- ✓ To investigate the impact of weather variability on learning productivity in the study area
- ✓ To make recommendations for policy implementations

RESEARCH HYPOTHESES

In line with the objectives of this research the following hypotheses have been formulated:

Hypothesis One: Ho – There is no significant variation in the weather pattern spatially and temporally in the study area

Hi: There is significant variation in the weather pattern spatially and temporally in the study area.

Hypothesis Two: Ho – There is no significant variation in the impart of weather variability on learning productivity in the study area.

Hi: There is significant variation in the impact of weather variability on learning productivity in the study area.

SIGNIFICANCE/JUSTIFICATION OF THE STUDY

Weather/climatic events have overriding influence on all human activities. Meteorecological information is vital in the general planning of day-to-day activities in all sectors of human society right from antiquity, the all-importance of weather knowledge in human undertakings have been sufficiently recognized.

Educational significance of meteorecologcal information is guite overriding. It is helpful in the choice of location of schools in order to avert catastrophies arising from such hazards as flood, windstorm disasters and terrain evaluation. School plant design and maintenance can equally benefit from findings garnered from research of this nature.

The findings of this research will aid significantly in decisions bordering on school calendrics, school-hour duration, daily timetable for lesson delivery and other related activities. Curriculum design and planning will equally depend on information about the nature of weather prevailing in an

area. In all, no activity domain can effectively succeed without prior consideration of the weather regime in an area. This calls for the dire necessity of this research endeavor.

SCOPE OF THE STUDY

This study covers Cross River State as geopolitical entity. The State comprises 18 local government areas which are demarcated unto four Educational zones namely Calabar, Ugep, Ikom and Ogoja zone. The study focused mainly on investigating effect of weather phenomena on learning productivity in secondary schools in the area. Both public and private owned secondary schools were included in the population of this study.

Information elicited involved data collection for investigation of pattern of weather variability in the area and consequently impact of such variation on learning-activities in the sampled schools across the zones.

II. LITERATURE REVIEW

THEMATIC CONCEPTUALIZATION

Here, we are focused on clarifying the overall paraphernalia of the term "Weather variability." From our point of view and the views of other authorities in the field, the explanation is quite variegated.

In our views weather variability explains the general diversity in weather patterns and events in particular local areas or regions. This borders on the dynamic flux of atmospheric regimes over place and time. Predicated on the preceding argument, weather variability can be assessed on two scales:-Spartial and temporal variabilities (Upla and Ibiang 2012).

Spatially, this relates to variation in weather phenomena over a region. In the case of Cross River State, Nigeria, this trend is well marked due to the prevalence of different ecological niches. Inherently, two broad zones are well recognized, i.e. the coastal forest weather pattern and the Savanna Hinterland Econtone.

Temporally, the variability incidence can be viewed based on hourly, daily, weekly, monthly or seasonal scales. These trends are well recognized and provide impetus for this inquiry.

Using the premises of other authors, evidences are scant in the direction of this term. Akpoaliogaga, Po (2010) in his submission on "General overview of climate charge and climate variability." Provided insight on this point of view.

A clear distinction was made by the above author between climate change and what he called "Climate fluctuation or climate variability." He substantiated that climate variability or fluctuation operates on either monthly, seasonal, annual, decadal or periodic scales.

Nigerian Meteorological Agency's (NIMETS) Climate Review (2012) reports evidences of climate/weather variability over Nigeria as indices of climate change. The Review featured important elements of weather such as rainfall, temperature, sunshine, winds and storms, and pressure systems. The reports highlights the significant features of weather regimes by clear identification of weather anomalies in the elements so explored.

Cross River State falls within two broad ecological zones, namely, the forest per humid south ecological zones and the Savanna and ecological zone to the hinterland. Within these zones, there are mosaics of variation according to land cover configuration, hydrological regimes and landscape/ topographical peculiarities. Hence, variability is explained on these unique images of the micro environments over place and time. Intense solar radiation, extreme temperature events, thunderstorms and line squads, severe pressure systems, drought and excessive rainfall in some areas all characterize the weather events that constitute the basis of variability.

Spatially and temporally, these events produce marked impact on human society in their different activity domains.

CLIMATE IMPACT ASSESSMENT AND HUMAN ACTIVITIES DOMAINS

Extremes of weather events have been co connected with current climate change and global warming scenarios. NIMET (2012), has included a number weather anomalies as surrogates of climate change. The review stated intercolia, that the climate of Nigeria has shown considerable signals of a changing climate through the careful study of meteorological data. Analysis of long term trends of meteorological parameters such as rainfall in terms of onset and cessation of rainy season, hail frequency and average maximum temperature, during the hot season, (February – April) Land Support to this deduction."

This view is corroborated by the findings of Trendbarth, Miller, Means and Rhode (2000) in their review of "Effects of changing climate on weather and human activities. They held that "As climate changes the frequency of different weather events, particularly extremes will be changed." They further likened such trends to hourly or daily periodicity in the weather regime."

Bordering on impact assessment, NIMETS (2012) weather review, reported the incidents on sectoral basis including education.

The report (NIMET 2012) stated that flood incidents disrupted academic activities in most of the schools of the impacted states.

The report categorically mentioned that some state governments such as Bayelsa and Adamawa ordered the closure of schools in their states dues to the rising water levels. Following this report the Niger Delta University (NDU) in Amasoma, Bayelsa State was said to have been submerged in the flood water.

Along similar lines, Ekpoh, Devalsan and Okpiliya (2014) have reported on Episodes flooding incidents in Calabar which caused the displacements of many residents as well as the disruption of other activities in the area. Besides flood which is used above as surrogate index of weather effect, sporadic torrential rainfall, thunderstorm/linesqual activities have significantly caused the destruction of school buildings, destruction of bridges/culverts leading to school sites. Field data reports by the researchers as garnered from defacto interview of school. Principal/heads in school revealed that storm incidents have been the most devastating weather

incident that caused low productivity in learning activities (Ushie and Upla, 2017).

EVENTS HUMAN PRODUCTIVITY

Another pernicious impact of weather events on human productivity generally and on mental equinanimity is the urban heat discomfort index (Balogun and Balogun, 2014). Using the model of the Thorms Thermodynamic index, these scholars explored the heat susceptibility parameters across the population spectrum in the urban locale based on their findings in the assessment of the Bio-climatological conduction in Akure, Nigeria. From their report (Balogun and Balogun, 2014) it was revealed that heat susceptibility/resilience varies between age, sex and body morphology.

Evidence have profusely been provided in the literature regarding the human effect of urban heat as an element of weather event. A study carried out by National Oceanographic and Atmospheric Administration (NOAA, 1995) showed that women are better at heat acclimation than men because they perspire less and loose less of salt than men.

Following the same report, over 8000 deaths reported from incidents of heat waves and solar radiation in the United states. Also, in the same report, over 300 persons lost their lives in Saint Louis in 1966 due to incidents of heat waves. Working on "The influence of weather on students academic performance in college of Education, Maiduguri, Nigeria." Manauno, Jimme and Manauno (2017) provided useful insights on the interconnection between weather effects on learning productivity. Their investigations revealed that extreme temperatures whether hot or cold have implications for both teaching and learning outcomes. Citing Dunn and Dunn in Pitel (2006), they reported further that severe cold or hot room temperatures affect pupils learning because the brain will be constantly reminding the body to respond appropriately until the required temperature is achieved. Accordingly, they concluded that these reminders are likely to affect learning and learning outcomes. It was inferred based on the above conclusion that memory required attention and so thermal stress on the individual will may result in poor memory using Pilmans (2001) experiment on the effect of temperature on learning, it was further corroborated that extremes of temperature have adverse effects on productivity in learning.

Another study carried out by United States Environmental Protection Agency (USEPA, 2010) revealed that within school settings, poor management of indoor temperature and humidity have adverse effects on not only learners performances but also those of the teachers. Following this, it was recommended by USEPA that extreme temperature be avoided to enhance teaching and in schools. Another recommendation cited from the conference of the National Union of teachers in U.K directs that the maximum indoor air temperature should not exceed 26% for optimum learning of pupils.

Manauno, Jimme and Manauno (2017) in their conclusion based on their findings from the study earlier cited, maintained that there is an existing relationship between seasonal temperature variation in Maiduguri and school achievement of students in Keshim Ibrahim College of Education, Maiduguri. They further reported that the relationship between seasonal variation and school achievement is strongest among science students and least for students in Arts and Humanities disciplines.

WEATHER EVENTS AND MENTAL HEALTH

National Sleep Foundation (2018) produced three reasons that the sun makes you tired. Following the above authority "there is no doubt that weather affect our mental health as any one mood can be affected by the weather". Accordingly, it was stated that "summer weather affects our mental heat by wearing down your body. Spending time in the sun can make you feel tired." Deriving the source on "How weather can cause sleeplessness, lethargy, lack of appetite and dehydration, all of which can lead to aggress behaviour and anxiety. It was also further reported by Ryo (2017) that warmer can also attribute to high crime and suicide rates. Hence, that warm weather and sunlight can also be dangerous for those using photo tropic medication. In other words heat can affect psychiatric patients."

Cunha (2018) the combination of certain medications and sunlight can cause photo sensitivity, an inflammation of the skin, similar to sun burn. Heat stroke and Heat related diseases are common incidents of the use of this medicaments.

Carolyn (2017) reported on "ways that weather can affect your health and wellbeing." The report highlights on a particular ailment called Seasonal Affective Disorder (SAD). This disorder is reported to occur more in colder climates with dark winters and that sufferers usually feel better when exposed to light, especially in the morning. In this report, it was further highlighted that in winter there is less crime and lower suicide rates, but that many people feel tired and isolated from staying indoors.

Substance Abuse and Mental Health Service Administration (2017) reported on the "Effects of Severe Weather on behavioural Health. The report held that those in high risk areas such as coastal cities or Tornado Alleys are susceptible to mental and physical stress due to heightened states of alert. It further stated that the aftermath of a storm can cause depression Post Traumatic Stress Disorder (PSTD) anxiety substance abuse, violence and suicide." Further on, it states that rebuilding after a storm can be exhausting and that the stress and sleeplessness have lead to the misuse of drugs and alcohol. Prodigious literature abounds on explanation of the relationship between weather events and mental health.

Blair (2018) presented an argument premised on Maclaren position that it is not completely logical to rush to a conclusion on how we feel in particular weather situations. He said mood swing could derive from how we interpret weather trends. In the same report, it was concluded after a careful assessment of the issues that extremes of can be very stressful and stress can trigger mental illness. It was further maintained that stress would exacerbate a whole host existing. Mental health condition including depression, anxiety and obsessive compulsive disorder. Seasonal Affective Disorder (SAD) is clearly associated with changing weather condition caused by seasonal changes. This condition worsens during cold months. Other ailments identified alongside SAD are (1) Bipolar

disorder which is characterized by two major alternative mood patterns: Manic Episodes occur when a person diagnosed Bipolar disorder has elevated mood, insomnia, impulsivity.

It is also stated that anxiety like Bipolar Disorder, can also fluctuate with the weather. Several ailments associated with weather conditions have been recognized. Weather phobia or Astraphobia (feet of thunder and lightning are, do exist policy frameworks/strategies for average impact of weather incidents:

ADAPTION/MITIGATION OF WEATHER EFFECTS

A whole range of measures abound as policy dimensions for mitigating or averting weather/climatic effects in learning environment or school setting. All programmes of climatic mitigation or adaptation require the model of situation specific strategy (S^3 Model). This approach requires the evaluation of scenarios and appropriately attending to them accordingly.

While mitigation requires a proactive/preventing approach to climate impact incidents, adaptation involves post incidence adjustments to climatic events.

Fusel & Klien (2002) in their seminar paper on "Assessing Vulnerability and Adaptation to climate change, "have provided insights on several approaches to be employed.

Amanchukwu, Ali-Amadi and Olobube (2015), in their works "Climate change Education in Nigeria: The Role of Curriculum Review" have stressed on the importance of awareness and education in mitigating climate change and extreme weather events in Nigeria.

They draw inference from an existing climate change initiative, "Building Nigeria's Response to Climate Change (BNRCC) which is an offshoot of an earlier initiative called the Canadian-Nigeria Climate Change Capacity Development Project (C-NCCCDP) funded by the Canadian International Development Agency (CIDA) between 2001-2004 and the Nigerian Study Action Team (NEST). This initiative was said to have facilitated awareness programmes as well as mobilize multi-sector assessment of climate change impacts. Following the report, the scope of the BNRCC programme of activities was for reaching."

The second advocacy of this payer is on the emphasis of education of the citizenry as a sure way to inculcating adequate knowledge of climate/weather effects on human society.

Grossly, adaptation/mitigation measure may take a variety of approaches such green development programmes, carefully designed architectural structures to avert weather effects, improvement in school facilities and learning environments. Well planned school calendars and time tables to suit to ameliorable temperature or seasonal cycles, federation in school hour duration and distance travelled to school among others.

III. RESEARCH METHODOLOGY

RESEARCH DESIGN

This research design is a field survey design aimed at collecting data using bio physical and socio-cultural instruments. Biophysical explanations will focus on areal mapping to designate ecological domains in line with the natural environment of areas. Socio-culturally, the instrument used involved the questionnaire which is designed to elicit information on climate impact perception by students and teachers in the area under investigation.

AREA OF STUDY

The study area is Cross River State of Nigeria which is one of the thirty six geopolitical entities/states in Nigeria. With its headquarters at Calabar, it has 18 Local Government Areas. The eighteen local government areas are categorized into four Educational zones e.g. Calabar, Ugep, Ikom and Ogoja. It spans over two ecological biomes which are the coasted forest ecological biome and the Northern Savanna ecological biome.

Human activities in agriculture, lumbering, hunting and domestic energy requirements have caused the depletion of the enormous mangrove, rainforest and the Savanna woodlands in the area. These interventions have caused marked alteration in the ecosystemic niches across the area. Within the two broad zones, there is marked disparity in the rainfall, temperature and vegetation distribution across the area. These disparities underscore the sheer prevalence of weather variability in the region.

POPULATION OF THE STUDY

The study population comprises secondary school students and staff personnel in the secondary schools in the area. Staff personnel form part of this study population due principally to the recognition that they are more enduring in appreciating the changing regimes of weather in the area.

SAMPLING TECHNIQUE

Multi stage sampling was employed in the data collection process. First, purposive-cluster sampling was adopted by selecting Educational Zones based on ecological distinctions. Next was stratified sampling based on selection of private and public schools using the ratio of the comparative population of the schools. Finally, random sampling was employed based on selection of representative population.

INSTRUMENTS FOR DATA COLLECTION

Biophysical data was captured by the use of digital cameral, geographical positioning system and voice recorders. The questionnaire was employed in eliciting information from respondents to investigate effect of weather variability.

IV. RESULTS AND DISCUSSION

GENERAL DESCRIPTION OF RESEARCH VARIABLES

This section is focused on the results of data analysis, interpretation and discussion. The research work was aimed at assessing the impact of weather variability on learning activities across educational zones in Cross River State. The major independent variable of the study was impact of weather variability. Ten (10) sub-groups were identified from this variable and these are:

- ✓ Effect of rainfall incidence
- ✓ Effect of thunder storm incidence
- ✓ Annual flooding events
- ✓ Effects of nights hours duration
- ✓ Early morning rainfall incidence
- ✓ Seasonal disease incidence
- ✓ Temperature extreme effects
- ✓ Gender dimension of weather effects extreme cold weather events
- ✓ Seasonal mortality rate

The dependent variable of the study was effect on learning activities of students across the educational zones in Cross River State. Table 1 shows the mean scores and standard deviations of all the dimension of the study variables.

S/NO	VARIABLES	N	$\bar{X}$	SD
1.	Effects of rain fall incidence on school activities	1285	15.08	2.15
2.	Effect of thunder storm incidence	1285	14.46	2.28
3.	Annual flooding events	1285	15.73	2.25
4.	Effects of Night hours duration	1285	14.53	2.28
5.	Extremely cold weather events	1285	14.43	2.24
6.	Early morning Rainfall incidence	1285	15.08	2.15
7.	Seasonal Disease incidence	1285	14.46	2.25
8.	Seasonal mortality rate	1285	14.73	2.25
9.	Temperature Extreme effects	1285	14.53	2.28
10.	Gender dimension of weather effect	1285	14.46	2.28

Table 1: Mean scores and standard deviation of the study variables

HYPOTHESIS ONE (1)

There is no significant variation in the impact of climatic variable on learning activities across the educational zones in the study area.

The hypothesis was tested using one-way analysis of variance test statistic and the results analysis are presented in table II.

As presented on tables, the result of data analysis show that the calculated f-value for the variation in the impact of climate variable on students learning activities (7.325) is greater than the critical f-ratio of 2.99 at 0.05 level of significance with 2 and 1282 degrees of freedom. This means that variation in the impact of climatic variable has a significant influence on the overall learning activities of the students. Further examination of the table shows that variation in impact of climatic variable has significant influence on each dimension of the learning activities of the students.

S/ NO	VARIABLES	Impact of Weather Variability on learning Activities	N	$\bar{X}$	SD
1.	Effects of Rainfall incidence on school Activities	High	278	15.72	1.66
		Medium	493	14.85	2.30
		Low	521	14.86	2.23
		Total	**1285**	**15.08**	**2.15**
2.	Effect of thunder Storm incidence	High	271	14.61	1.74
		Medium	493	14.57	2.38
		Low	521	14.27	2.51
		Total	**1285**	**14.46**	**2.28**
3.	Annual Flooding Events	High	271	15.06	1.79
		Medium	493	14.47	2.34
		Low	521	14.50	2.42
		Total	**1285**	**15.73**	**2.25**
4.	Effects of Night hours Duration	High	271	14.68	2.37
		Medium	493	14.66	1.75
		Low	521	14.26	2.49
		Total	**1285**	**14.53**	**2.28**
5.	Extremely cold Weather event	High	271	14.35	2.20
		Medium	493	14.30	1.71
		Low	521	14.25	2.35
		Total	**1285**	**14.43**	**2.24**
6.	Early morning Rainfall incidence	High	271	15.38	2.17
		Medium	493	15.00	2.53
		Low	521	14.96	1.95
		Total	**1285**	**15.08**	**2.15**
7.	Seasonal disease Incidence	High	271	14.65	2.23
		Medium	493	14.42	2.31
		Low	521	14.35	2.28
		Total	**1285**	**14.46**	**2.28**
8.	Seasonal mortality	High	271	15.97	2.24
		Medium	493	14.65	2.18
		Low	521	14.64	2.41
		Total	**1285**	**14.73**	**2.25**
9.	Temperature Extreme effect	High	271	14.73	2.23
		Medium	493	14.47	2.28
		Low	521	14.41	2.31
		Total	**1285**	**14.53**	**2.28**
10.	Gender dimension of Weather effect	High	271	15.08	2.15
		Medium	493	14.65	2.23
		Low	521	14.42	2.31
		Total	**1285**	**14.46**	**2.2**

S/ NO	VARIABLES	Source of Variation	SS	Df	MS	F
1.	Effects of Rainfall incidence on school Activities	Between	202.475	2	101.238	22.352*
		Within	6052.885	1282		
		Total	**6255.360**	**1284**		
2.	Effect of thunder Storm incidence	Between	32.609	2	16.304	3.135*
		Within	7005.185	1282	5.201	
		Total	**7037.793**	**1284**		
3.	Annual Flooding Events	Between	65.749	2	32.875	6.548*
		Within	6762.251	1282	5.020	
		Total	**6828.000**	**1284**		

4.	Effects of Night Hours Duration	Between Within **Total**	45.932 6958.712	2 1282 **1284**	22.966 5.966	4.446*
5.	Extremely cold Weather event	Between Within **Total**	44.322 6211.038 **6255.360**	2 1282 **1284**	22.161 4.611	4.806*
6.	Early morning Rainfall incidence	Between Within **Total**	16.688 2021.105	2 1282 **1284**	8.344 5.212	3.601*
7.	Seasonal disease Incidence	Between Within **Total**	27.619 6800.381 **6828.00**	2 1282 **1284**	13.809 5.049	3.735*
8.	Seasonal mortality	Between Within **Total**	19.909 6984.734 **7004.644**	2 1282 **1284**	9.955 5.185	1.920
9.	Temperature Extreme effect	Between Within **Total**	41.782 9008.806 **9049.588**	2 1282 **1284**	20.891 16.879	3.079*
10.	Gender dimension of Weather effect	Between Within **Total**	46.802 9802.611 **9949.704**	2 1282 **1284**	25.911 20.102	3.19*
	Total impact of Climatic effect on Learning activities	Between Within **Total**	57.901 70951.502 **82506.209**	2 1282 **1284**		7.325*

P<.05; Critical F = 2.99

Table II: One0way analysis of variance (ANOVA) of the impact of weather variability on learning activities across the educational zones

Since the results were significant, a pos-hoc comparison of the means was carried out to find out the mean pair difference(s) responsible for the variance. Fisher's Least Significant Difference (LSD) was used and the analysis showed significant pair-wise influence on all the dimensions of climatic variable.

However, the analysis in table II indicated greater variation and impact of climatic variable on learning activities of the students during early morning rainfall incidience (t-value of 3.09) extremely cold weather effect (t-value of 3.12) and temperature extreme effects (t-value of 8.37).

As presented in table III. The result of the LSD analysis show significant pair-wise influence of the impact of weather variability on learning activities of students across the educational zones of Cross River State.

VARIABLES	Variation of impact of climatic variable on learning activities	High (n=2710)	Medium (n=493)	Low (n=521)
Rainfall incidence Effect on learning Activities	High Medium Low	15.72* 5.86*[c] 5.99* (MSW=4.494)	0.876 14.85 0.00	0.87 0.00 14.85
Effect of thunder Storm incidence	High Medium Low	14.61* 0.25 2.11* (MSW- 5.201)	0.04[b] 14.57 2.08	0.34 0.30 14.27
Annual Flooding Events	High Medium Low	15.06* 2.02* 3.5.* (MSW=5.020)	0.324[b] 14.74 1.69	0.56 0.24 14.50
Effects of Night Hours Duration	High Medium Low	14.68* 0.12 2.16* (MSW=5.166)	0.02[b] 14.66 2.78*	0.42 0.40 14.26
Extremely cold Weather event	High Medium Low	14.30 0.25 3.12* (MSW=5.005)	0.04[b] 14.25 2.09	0.36 0.38 14.35
Early morning Rainfall incidence	High Medium Low	15.38[a] 2.28*[c] 3.09* (MSW=4.611)	0.38[b] 15.00 0.25	0.42 0.04 14.35
Seasonal disease Incidence	High Medium Low	15.87[a] 3.99*[c] 8.13* (MSW=4.425)	0.65[b] 15.22 4.13	1.21 0.55 14.96
Seasonal Mortality rate	High Medium Low	15.30[a] 4.61*[c] 7.58* (MSW=4.611)	0.65[b] 15.22 4.13	1.21 0.55 14.67
Temperature Extreme effects	High Medium Low	17.70[a] 6.23*[c] 8.37* (MSW=4.820)	0.06[b] 14.63 1.73*	1.30 0.24 14.40
Gender dimension of Weather effect	High Medium Low	15.32[a] 4.33*[c] 7.20 (MSW=5.010)	0.75[b] 14.57 2.75*	1.14 0.39 14.17

- *P < 0.05*

a. *Group means are along the principal diagonals.*
b. *Differences among means are above the principal diagonals.*
c. *T-values* are below the principal diagonals.

Table III: Fisher's lease Significant Difference (LSD) analysis of the influence of variation in impact of climatic variable on learning activities of students

HYPOTHESIS TWO (2)

There is no significant variation in the impact of climatic variable on learning activities within the different ecological belts in the study area.

The hypothesis was tested using one-way analysis of variance test statistic and the results of the analysis are presented in table IV. As presented in tables, the result of the data analysis show that the calculated F-value for the variation in the impact of climatic variable on learning activities of students within the different ecological belts in the study area (17.323) is greater than the critical F-value of 2.99 at 0.05 level of significance with 2 and 1282 degrees of freedom. This means that there is significant variation in the impact of climatic variable on learning activities of students within the ecological belts in the study area.

Further examination of the table shows that there is significant variation in the impact of the climatic variable on each dimension of the variables on the overall learning activities of students within the study area.

Since the results were significant, a post-hoc comparison was carried out to find out the mean pair difference(s) responsible for the variance. The method used for the post-hoc was fisher's least significant difference (LSD) (Table V).

Also as presented in table V, the result of LSD analysis show significant variation in the impact of weather, variability within the ecological zones in the study area; especially in the following sub-variables.

- ✓ Rainfall incidence effect ($t = 5.86$; $P < 0.05$)
- ✓ Extremely cold weather effect ($t = 5.005$: $P < 0.05$)
- ✓ Early morning rainfall incidence ($t = 4.611$; $P < 0.05$)
- ✓ Temperature extreme effect ($t = 8.37$; $P < 0.05$).

VARIABLES	Impact of weather Variability on learning Ac.	n	X	SD
Effects of Rainfall incidence on school Activities	High	240	15.28	1.93
	Medium	518	15.10	2.11
	Low	572	14.28	2.20
	Total	**1285**	**15.11**	**2.10**
Effect of thunder Storm incidence	High	240	25.26	1.97
	Medium	518	14.62	2.42
	Low	527	14.37	2.29
	Total	**1285**	**14.70**	**2.49**
Annual Flooding Events	High	240	15.64	1.97
	Medium	518	14.71	2.59
	Low	527	14.78	2.42
	Total	**1285**	**14.99**	**2.46**
Effects of Night Hours Duration	High	240	15.69	2.01
	Medium	518	14.70	2.61
	Low	527	14.61	2.50
	Total	**1285**	**14.93**	**2.47**
Extremely cold Weather event	High	240	15.21	2.18
	Medium	518	15.22	2.14
	Low	527	15.01	2.04
	Total	**1285**	**15.11**	**2.10**
Early morning Rainfall incidence	High	240	15.30	2.07
	Medium	518	14.66	2.37
	Low	527	14.53	2.27
	Total	**1285**	**14.70**	**2.29**
Seasonal disease Incidence	High	240	15.60	2.30
	Medium	518	14.98	2.39
	Low	527	14.47	2.46
	Total	**1285**	**14.99**	**2.42**
Seasonal mortality rate	High	240	15.58	2.34
	Medium	518	14.94	2.44
	Low	527	14.36	2.50
	Total	**1285**	**14.93**	**2.47**
Temperature Extreme effect	High	240	15.15	1.99
	Medium	518	15.15	2.16
	Low	527	15.05	2.10
Gender dimension of Weather effect	High	240	14.89	2.27
	Medium	518	14.63	2.25
	Low	527	14.53	2.33
	Total	**1285**	**14.70**	**2.29**

S/NO	VARIABLES	Source of Variation	SS	Df	MS	F
1.	Effects of Rainfall incidence on school Activities	Between	19.199	2	9.600	2.186
		Within	5915.441	1282	4.392	
		Total	**5934.60**	**1284**		
2.	Effect of thunder Storm incidence	Between	168.173	2	84.087	16.437*
		Within	6890.900	1282	5.16	
		Total	**7059.073**	**1284**		
3.	Annual Flooding Events	Between	214.481	2	107.241	18.786*
		Within	7689.222	1282	5.708	
		Total	**7903.222**	**1284**		
4.	Effects of Night Hours Duration	Between	283.874	2	141.937	24.138*
		Within	7920.770	1282	5.880	
		Total	**7204.593**	**1284**		
5.	Extremely cold Weather event	Between	13.694	2	6.841	1.558
		Within	5920.946	1282	4.396	
		Total	**5934.640**	**1284**		
6.	Early morning Rainfall incidence	Between	44.272	2	22.139	4.251*
		Within	7014.796	1282	5.208	
		Total	**7059.073**	**1284**		
7.	Seasonal disease Incidence	Between	205.13	2	102.577	17.948*
		Within	7698.551	1282	5.715	
		Total	**7093.704**	**1284**		
8.	Seasonal mortality	Between	205.13	2	119.274	17.948*
		Within	7698.551	1282	5.914	
		Total	**7039.704**	**1284**		
9.	Temperature Extreme effect	Between	2.338	2	1.169	1.558*
		Within	5932.302	1282	0.00	
		Total	**5934.640**	**1284**		
10.	Gender dimension of Weather effect	Between	34.6776	2	17.338	3.325*
		Within	7024.397	1282	5.215	
		Total	**7059.073**	**1284**		
	Total Variation in the Impact of Climatic Variable on Learning Activities within the study area.	Between	2310.003	2	1155.001	17.323*
		Within	89811.683	1282	66.675	
		Total	**92121.083**	**1284**		

Table IV: One-way Analysis of Variance (ANOVA) of the impact of weather variability on learning activities within the different ecological belts in the study area

VARIABLES	Variation of impact of climatic variable on learning activities	High (n=2710)	Medium (n=493)	Low (n=521)
Rainfall incidence Effect on learning Activities	High	15.26*	0.64[b]	0.89
	Medium	4.00*[c]	14.62	0.25
	Low	5.56*	1.75	14.37
		(MSW=5.116)		
Effect of thunder Storm incidence	High	15.64[a]	0.93[b]	0.86
	Medium	5.50*[c]	14.71	0.07
	Low	5.09*	0.46*	14.78
		(MSW- 5.708)		

Annual Flooding Events	High	15.69[a]	0.99[b]	0.08
	Medium	5.77*[c]	14.70	0.09
	Low	6.30*	0.59*	14.61
		(MSW=5.880)		
Effects of Night Hours Duration	High	15.03*	0.37[b]	0.50
	Medium	2.09*[c]	14.66	0.13
	Low	6.30*	0.81*	14.53
		(MSW=5.208)		
Extremely cold Weather event	High	15.60[a]	0.62[b]	1.13
	Medium	3.35*[c]	14.98	0.51
	Low	7.47*	3.02*	14.47
		(MSW=5.715)		
Early morning Rainfall incidence	High	15.60[a]	0.64[b]	1.22
	Medium	3.40*[c]	14.98	0.51
	Low	7.93*	3.37*	14.47
		(MSW=5.914)		
Seasonal disease Incidence	High	14.89[a]	0.26[b]	0.36
	Medium	1.80*[c]	14.63	0.10
	Low	2.49*	0.62	14.53
		(MSW=5.215)		
Seasonal Mortality rate	High	15.344[a]	0.42[b]	1.07
	Medium	2.79*[c]	15.02	0.65
	Low	7.11*	3.86*	14.37
		(MSW=5.666)		
Temperature Extreme effects	High	15.38[a]	0.41[b]	1.08
	Medium	2.67*[c]	14.97	0.67
	Low	7.04*	3.91*	14.30
		(MSW=5.883)		
Gender dimension of Weather effect	High	15.52[a]	0.59[b]	0.59
	Medium	3.66*[c]	14.93	0.00
	Low	4.01*	0.00*	14.93
		(MSW=4.332)		

- *P < 0.05*

a. Group means are along the principal diagonals

b. Differences among means are above the principal diagonals.

c. *t-values are* below the principal diagonals.

TABLE V: Fishers Least Significant Difference (LSD) analysis of variation in the impact of the climatic variable on learning activities of students within the study area

V. DISCUSSION OF FINDINGS

The primary objective of this study was to find out the impact of weather variability on productivity in learning among secondary school students in Cross River State.

This section is therefore devoted to discussion of findings based on each hypotheses.

IMPACT OF CLIMATE VARIABLE AND LEARNING ACTIVITIES ACROSS THE EDUCATIONAL ZONES IN CROSS RIVER STATE

The result of data analysis revealed that the impact of climatic variable has a significant influence on the overall learning activities of the students across the educational zones in Cross River State.

Also, the findings indicated greater variability and impact of climatic variable on learning activities of students during early morning rainfall incidence (t-value of 3.09), extremely cold weather effect (t-value of 3.12) and temperature extreme effects (t-value of 8.37).

This findings agrees with Balogun and Balogun (2014) who found that the impact of climatic variability on human activities has within the last decade impacted negatively on human activities. The researchers particularly emphasized that effect of extreme temperature resulting from especially on urban dwellers.

This view is corroborated by the findings of Trendborth, Miller, means and Rhode (2000) in their review of "Effects of changing climate on weather and Human activities." They held that the impact of climatic variability on human activities especially extreme weather variabilities such as flood incidents has disruptive effects on academic activities.

Empirical research results of Manauno, Juinme and Manauno (2017) as well as Citing Dunn and Dunn in Pytel (2006) are all in support of the research findings above specially, citing Dunn and Dunn Pytel (2006) noted that severe cold or hot room temperatures affect learners' learning because of poor memory.

The findings is also in line with Carolyn' (2017) conclusion that extreme temperature affects especially in the months of February-April in the tropical world results in high risk of Meningitis transmission which may not enhance academic activities during the period. According to him the seasonal disease incidences result from climatic change and weather variability.

The result also agreed with Nwachukwu and Ali-Amadi (2015) who emphasized that impact of weather variability due to climatic change affects schooling. The researcher stated that many children are absent from school during, heavy rains, especially in the villages where there are no means of transportation. Such absenteeism obviously affects their learning activities and performance. Serious drought due to weather variability may lead to food scarcity, which leads to hunger, which in turn affects the ability to learn.

IMPACT OF CLIMATIC VARIABLE AND LEARNING ACTIVITIES WITHIN THE DIFFERENCE ECOLOGICAL BELTS IN THE STUDY AREA

The result of analysis of data revealed a significant variation in the impact of the climatic variable on each dimension of the variables on overall learning activities of students within the study area.

This research findings agree with various empirical research results in this area especially those cited in the literature review.

For instance, Okpilya (2014) reported serious effects of rainfall incidence resulting in episodic flooding in some parts of Cross River Sate causing displacement of many residents as well as disruption of school activities within the area.

The findings is also not different from that of Monuano, Jimme and Monauno (2017) who stated high temperature extreme effects on academic activities in cities experiencing high temperature effects.

The researchers personal experiences and observation shows that early morning rainfall incidence, and extreme cold weather events also have significant impact on learning activities of students within the research area. The effects results from learners either staying away from class or going late for school activities very often.

Again, the findings of hypothesis two(2) agrees with the report of National Sleep Foundation (2018) that impact of climatic change and extreme weather can affect learning activities especially our mental health.

Specifically, the report state that worm weather and extreme smityhl is dangerous to those using psychotropic medication resulting in photosensitivity. Inflammation of the skin and high risk of heatstroke, and other heat related diseases.

VI. SUMMARY & CONCLUSION

From the foregoing discussion, it was established in this study that there is significant impact of weather variability on productivity in learning among secondary school students in Cross River State. Ten (10) sub-variables of weather variability were identified as follows.

- ✓ Effect of rainfall incidence
- ✓ Effect of thunderstorm incidence
- ✓ Annual flooding events
- ✓ Effects of night hour during
- ✓ Early morning rainfall incidence
- ✓ Seasonal disease incidence
- ✓ Temperature extreme effects
- ✓ Gender dimension of weather effects
- ✓ Extreme cold weather events and seasonal mortality rate.

The findings also shows that there is greater variation and impact of climatic variable on learning activities of the students during early morning rainfall incidence, extreme cold weather and temperature extreme effects.

Based on the findings, the paper therefore recommends governments intervention at all level so as to curb climate change effect.

Also, at local level, management should decongest classroom and possibly equip them with air conditional.

Finally, environmental education can also be infused in the secondary school curriculum to create awareness even at the level.

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