

Laboratories and Sustainable Teaching and Learning About Senior Secondary School (SSS) Geography in Nigeria

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Abstract *The relevance of Geography cannot be over emphasised; but teaching and learning about the subject have not been sustainable. The objective of this paper is to examine the adequacy or otherwise of Geography Laboratories and Gardens for effective teaching and learning in Nigeria using Ogun State as case study. Twenty schools and colleges were randomly selected across the state. Conditions of the Gardens and Laboratories were examined. 100 sstudents, 20 teachers and 5 principals of schools were interviewed and so also 100 Geography graduates of Schools and colleges. Human and physical environments of the schools were studied. Over 85% of the schools have neither Geographical Garden nor Meteorological Garden or Laboratory. No school has any classroom dedicated to Geography. There must be radical departure from the observed. Well equipped Laboratories, Meteorological and Geographical Gardens should become integral part of the facilities and amenities. It is imperative that a room is adorned with maps, charts, figures, models, samples and others; and designated as Geography Classroom where lessons on geographyy topics must be held. Teachers of Geography should perceive the physical environment, natural and cultural, as Geography Laboratory. Philanthropies should be implored and encouraged to come to the aid of schools.*

Keywords: *Geography, laboratories, sustanability, teaching, learning*

Introduction

The objectives of teaching Geography at this level of education are spelt out by West African Examination Council (WAEC) (2004) and National Examination Council (NECO) (2004). The WAEC has been reviewing its syllabi over the years to reflect contemporary issues, respond to public concerns and adjust to realities of time, (Akande, 1982 and Aderogba and Ogunnowo, 2010). The NECO also fashioned its syllabus closely to the WAEC's; Appendix A. The Appendix shows details of geography syllabus as provided by the two national examination bodies and implemented by schools and colleges. This is broken into six parts that are taught over a period of nine terms of an average of thirteen weeks each, that is, three sessions. The relevance of the subject cannot be over emphasised. Boehim, (1996) in his "*Careers in Geography*" gave a comprehensive list of where geographers have and can be employed profitably and with job satisfactions, Appendix B.

Locally in Nigeria, many have documented the relevance of Geography to the society: Ologe (1978) and Akande (1982) discuss very succinctly the roles of Geographers in the present day socio-economic dispensations. Similarly, Areola (1978), and Aderogba (1990, 2001, 2010 and 2011) identify the professions and different areas of human endeavours that Geographers can be relevant. Aderogba (2010) particularly produced a list of disciplines and school subjects that combine with Geography to pursue a profession. The relevance and application of Geography concepts, information and tools are growing by the day.

Also, scholars have worked consistently on the problems associated with the teaching and learning about Geography, the most difficult aspects of Geography, why Students fail Geography, Dearth of Materials for Geography studies and others, (Adetuberu 1983, Ajaegbu 1971, Akande 1982 and Aderogba 2001 and 2010). Specifically, Akande (1982) like Ajaegbu (1971) dwelt on the "Pull" and "Push" factors in the study of Geography among students generally. Similarly, Adetuberu (1983) in his study of "Odds against the Teaching of Map Work" gave a critical analysis of the challenges in the teaching and learning of Map Work (among male and female students) in Ondo State Secondary Schools. Recently, Aderogba (2010 and 2011) worked on "Registrations, Participation and Performances of Female Students in SSS" and "Global warming and implications for SSS Geography in Nigerian schools and colleges" respectively. No work has ever been done

to examine the available Laboratory resources, animate and inanimate for effective teaching and learning about Geography at the SSS level in Nigeria. The earlier work of Aderogba (1990) on resources for teaching and learning about Geography is superficial and inconclusive: In particular, the aspects of adequacy or otherwise of Laboratories and Geographical Gardens have not been investigated. Therefore, the objective of this paper is to examine the adequacy or otherwise of the resources for effective teaching and learning about Geography in Nigerian schools and colleges of Nigeria using Ogun State as a case study. Emphases are on Geography Laboratories and Meteorological Garden.

Materials and Methods

Twenty schools, five public and ten private, of Ogun State were randomly selected for study. The schools' facilities and amenities for effective teaching and learning, particularly about Geography, were examined and studied. Geography Classrooms, Laboratories, gardens and meteorological Gardens were visited and the content examined. The classrooms, laboratories and gardens were compared with the corresponding facilities and amenities for teaching and learning about other related subjects – Physics, Biology, Chemistry, Fine Art and others. "Classes" of Field Work, Physical, Regional and Human, Practical and Map Work were observed in session. Materials used for the Lessons were perused. Fifty teachers of Geography, twenty Principals and ten proprietors of schools and colleges were interviewed on the available resources, the dearth or otherwise of them and what needs to be done to make teaching and learning about Geography sustainable. Similarly, one hundred graduates of Geography were randomly selected and interviewed on their perception of the relevance of Geography Laboratory and Gardens for effective teaching and learning about the subject at the SSS level of education. They also provided modest list of items that must be in the Geographical Garden, Meteorological Garden, the Laboratory and classroom per school. Immediate environment of the schools and colleges visited were examined to ascertain what is available where for adoption for teaching and learning purposes. Three Zonal Inspectors of Education were randomly selected for the same purposes. They were all quick to enumerate what materials will be very crucial for effective and sustainable teach and learning about various aspects of the subject as required by WAEC, NECO and Joint Admission and Matriculation Board. The work is devoid of any statistical analysis but Tables and Figures only. Geographical and Meteorological Gardens, Laboratories and Classrooms are referred to as part of facilities and amenities of schools and colleges in this work.

Results

All the twenty schools teach Geography up to Senior Secondary Class III and certain proportion of their students offer Geography in their final WAEC, NECO; and Joint

Table I: Schools' Geographical and Meteorological Gardens; Laboratories and Rooms

S/No	Schools & Colleges	Geog. Garden	Meteor. Garden	Geog. Lab.	Geog. Room
1	Abeokuta Grammar School	*	-	-	-
2	Egbado College	*	-	-	-
3	Ijebu-Ode Grammar School	-	-	-	-
4	Ade Ola Odutola College Ijebu-Ode	-	-	-	-
5	Mac Job Grammar School Abeokuta	-	-	-	-
6	St Augustine Grammar School Ijebu-Mushin	-	-	-	-
7	Our Lady of Apostle Grammar School I-Ode	-	-	-	-
8	Premier Grammar School Abeokuta	-	-	-	-

9	Greenland Hall Agbado	*	-	*	*
10	Molusi College Ijebu-Igbo	*	-	-	-
11	Ammec College	-	-	-	-
12	The Bells	*	*	-	-
13	Alpha High School	-	-	-	-
14	Luba Comprehensive High School	-	-	-	-
15	Ansar-Ud-Deen Grammar School Abeokuta	-	*	-	-
16	Odogbolu Grammar School	-	-	-	-
17	Iganmode Grammar School	-	*	-	-
18	Comprehensive High School Aiyetoro	*	-	-	-
19	Remo Secondary School	*	-	-	-
20	Abusi Edumare Comprehensive High School	-	-	-	-
	TOTAL	7	3	1	1

Note: * = Available regardless of conditions; - = Nothing is available

Source: Aderogba, K. A. (2011) Field Work

Admission and Matriculation Board Examinations. There are also university graduates in all the schools as Class Teachers. There is none of the schools that is less than ten years old. They are all Government approved schools and colleges and they are being inspected for purpose of quality check, at least once in a session by their respective Zonal Education Offices (Inspection Section). More than 50% of them were located within urban settings; about 35% are located in the rural urban fringe and the rest are in rural areas. There were ample opportunities therefore to make use of the localities for Field Work/Experience/Study/Trip/Excursion/Exercises in their respective local domains as stipulated by the WASEC, NECO and JAMB syllabuses. Table I shows the status of the Geographical Classrooms, Laboratories, Gardens and Meteorological gardens in the schools and colleges visited. Only 35 % of the schools have Geographical Garden; 15% have Meteorological Garden; and 5% each has Geographical Laboratory and Classroom. Except two schools, Greenland Hall and The Bell, there is none of the schools that have two categories of the facilities. None of the schools has the four – Geographical Garden, Meteorological Garden, Geography Laboratory and Geography Classroom. It is only Greenland Hall again that has a separate Classroom designated as Geography Classroom. Even in the schools that have Geographical Garden, the so called gardens are overgrown with weeds and there is scarcely any thing to show that it is for purpose of teaching and learning about Geography. No school has any Survey Instrument. The observed best equipped Meteorological Garden has one dilapidated Rain Gauge and a dysfunctional Wind Vane. The Stevenson's Screen contains nothing. Others are glorified Meteorological and Geographical Gardens. As for the Geography Laboratory and Classrooms, there is no significant difference between schools and colleges; and between private and public schools. But, in terms of the Gardens, the public schools care least but the privates are making some attempts. Where there are any Meteorological and Geographical Gardens at all, they are combined on the same plot and whatever is located inside are clustered therein. Unexpectedly, 85% of the schools and colleges teach the so called difficult concepts, ideas and names and make the student learn about Geography without any of these salient facilities and amenities.

Discussion

Geography is a living subject, but it is not treated as such and neither is it particularly recognised as a science subjects such as Biology, Physics, Chemistry and others. Laboratories, Gardens (Geographical and Meteorological) are not common. The physical and cultural environments are underutilized too. AS common as it is suppose to be, Atlas Maps are not available for over 90% of the students in over 85% of the schools and colleges. The subject is taught with high level of abstractions in spite of the numerous “concepts,” “ideas” and “names” that students have to contend with. This condition might account for poor interests at registrations, participation in the classes and performances of students in external examinations: WAEC, NECO and JAMB. Suffice it to say that there is this common statement that Geography is a wide subject; and that it is a difficult subject. This may explain why there are decreasing number of students that register for the subject over the years (Akande 1982 and Aderogba 2001 and 2006). The onus is therefore on schools and colleges, proprietors and governments to ensure adequate equipment, facilities and amenities for teaching and learning about the subject if geography will still find its relevance among school subjects; and for professionals.

For Sustainable SSS Geography

Tables II and III; and Figures 1 and 2 provide lists of modest materials for use in the schools and colleges. There may not be any need to have more than four each of Wet and Dry Bulb Thermometers and Chart of Weather Symbols; two each of Barometers and Rain Gauge for ease of demonstration, teaching and learning. Other items may be one each; see Table II. The Garden must be set up at such locations that will not have any interruption that will affect

Table II: Essential Components of a Meteorological Garden for schools

S/No	Instruments	No
1	Stephenson Screen	1
2	Fortin (Mercury) Barometer	2
3	Aneroid Barometer	2
4	Six's Maximum and Minimum Thermometer	2
5	Barograph	1
6	Wet and Dry Bulb Thermometer	4
7	Cup Anemometer (10 m above ground level & clear of roof top)	1
8	Tube anemometer	1
9	Wind vane (tube anemometer built into the end of wind vane)	1
10	Sunshine Recorder	1
11	Rain gauge	2
12	Chart of Weather Symbols	4

Source: Aderogba, K. A. 2011. Field Work

Table III: Essential Surveying Instruments for a Class of 35 Students.

S/No	Instrument	Required Amount
1	Gunter's Chain	2
2	Dumpy Level	2
3	Prismatic Compass	6
4	Hand Level	6
5	Theodolites	2
6	Alidade	4

7	Measuring Tape	3
8	Pegs	8
9	Iron Arrow	12
10	Ranging Pole	12
11	HB Pencils	36
12	Booking Sheet	36
12	Plane Tables and Stands (Tripods)	3
13	Sop-With-Staff	3
14	Plum Bulb	3
15	Scientific Calculator	7

Source: Aderogba, K. A. 2011. Field Work

the performances and readings of these equipments: reasonable distances away from roof tops and tall trees is desirable and recommended. Similarly, Table III shows essential equipments for teaching and learning about Simple Land Surveying: Out of the 12 items Theodolite and Dumpy Level could be the most expensive. Ranging Poles and Pencils, Iron Arrow, Booking Sheets are not. Recommended for use in Geographical Laboratories/Classrooms are about forty items ranging from maps, charts, figures, tables, pictures, photographs, paper cuttings, film clips, video clips, and others. See Figure 2. Private and Corporative philanthopies could be supported and or encouraged to assist schools and colleges. The physical and cultural environments around the schools and their immediate environments can provide varieties of samples and examples: People, sex, age tribes, occupations and professionals; transport and lines of communication; observeable daily.

Figure 1: Selected Materials that should be in a Geographical Garden.

Impermeable Rock	Basic glaciated land forms
Permeable Rock	Vegetation - Swamp
Karsts	- High Rain Forest
Loess	- Derived Savannah
Outcrop	- Savannah
Pervious Rocks/Porous Rocks	- Grass land
Rejuvenated River/Stream	- Semi Desert
Rift Valley (Graben)	- Desert
Block mountain/Horst	- Mountain Vegetation
Plateau	- Xerophytes
Folds (Fold Mountain System)	Islands
Knoll (Isolated Hill)	Lakes
Escarpment	Oasis
Faults	Bridges across Rivers
River Valleys	Settlement Patterns
Drainage Patterns	Mountain Ranges
Confluence	Transport Routes
Sediments	Dams across Rivers
Sand Dunes and seif dunes	Others

Source: Aderogba, K. A. 2011. Field Work

weather conditions – thick clouds, bright days, dew, torrential rains, dews, hammatan haze, hot and cold days; vegetation covers, erosion and erosion passages; coexisting businesses and trades, natural and cultural landscapes and others could be observed as they exist in situ for teaching and learning purposes as the needs arise. Most of the required items could be improvised without jeopardizing the purported aims and objectives of the topics to be taught if appropriately harnessed and applied. Apart from the teachers that must

be certified and qualified, it is imperative that the Gardens and Laboratories are manned by qualified personnel.

Figure 2: Selected Materials that should be in Geography Laboratory/Classroom

Climate Chart	Station Model
Weather Chart	Atlas Maps
Temperature Chart	Temperature Maps
Rainfall Chart	Rainfall Maps
Relative Humidity Chart	Relative Humidity Maps
Charts of Weather Symbols	Weather symbols
Pie Charts	Romer and Grid References
Flow Charts	Maps showing National Grids
Proportional Circle	Soil Profiles
Density Maps	Ordinance Survey Maps
Isopleths Maps	Topographical Maps
Dot Maps	Thematic Maps
Bar Graphs	Gradients Examples and formula
Line Graphs	Conventional Signs and symbols
Climate Maps	Common Abbreviations and Meanings
Weather Maps	Catalogue of reference Materials
Rock Samples	Soil Samples
Film/Video Clips	Pictures
Paper cuttings	Tape/Video Recorder/players
Photographs	Appropriate Furniture *

* There are special purpose Tables for use in Geography Laboratories.

Source: Aderogba, K. A. 2011. Field Work

Conclusion

It is one thing for these items to be available; it is another for them to be applied. They should not become artefact for decorations. When the learners fiddle with the materials during each of the lessons and at their spare times, they will be more familiar with them. Their levels of abstractions of the concepts and ideas will drastically reduce if not completely eliminated. Harnessing resources from the physical and cultural environment may be the beginning of tapping National Local Content as prescribed by the nation for Nigerian Content in all facet of Human endeavour if the Nation must grow and develop. It should not be forgotten too that the Classroom theories and the materials in the gardens, Laboratories and classrooms will be complementing each other; and all must be supplemented by contemporary text books, reference materials and Teachers' Guides. Atlas Books, one each for every student must be compulsory. Teachers, Laboratory Attendants and Gardeners must be made to attend, at regular intervals, relevant workshops, seminars, conferences and shorts courses that will update and upgrade their knowledge and experiences from time to time.

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APPENDIX A

The West African Examination Council (2004) Regulations and Syllabuses.

CONTENTS	NOTES
ELEMENTS OF PRACTICAL AND PHYSICAL GEOGRAPHY Map Work	Map reading and interpretation based on a continuous survey map of part of West Africa: scale, measurement, distances, direction and bearing, map reduction and enlargement, identification of physical features such as spurs, valleys etc and cultural features such as city, walls, settlements, communication routes etc, measurement of gradients, drawing of cross profiles, inter-visibility, description and explanation of drainage patterns of communication settlement and land use.
Elementary Survey	Chain and Prismatic compass, open and closed traverse avoiding obstacles in the field.
Statistical Maps and Diagrams	Graphical representation of statistical data: Bar graphs, Line graphs, flow charts, pie charts, dot maps, proportional circles, density maps, isopleths maps.
Elements of Physical Geography	The earth as a planet in relation to the sun. Latitude, longitude and time. Structure of the earth (internal and external). Types, characteristics, formation and uses. Mountains, plateaus, plains, karst and coastal landforms.
(i) Rocks	Agencies modify landforms such as weathering, running water, underground water, wind and waves.
(ii) Major Landforms	Fieldwork covering local landforms such as coastal features, drainage features, gullies, etc.
(iii) Oceans	Ocean basins, salinity, ocean currents (causes, types and effects on the climates of coastlands), water as an environmental resource.
(iv) Weather and climate	Simple weather study based on local observation description of the Stevenson's screen and uses of basic weather instruments e.g. rain gauge, thermometer, barometer and wind vane etc.
(v) Elements of climate	Temperature, pressure, wind and precipitation and the factors affecting them e.g. altitude, latitude, ocean currents, land-and-sea breezes, continentality, aspect. Interpretation of climatic charts and data. Classification of climate (Greek and Koppen's). Major types of climate (Hot climate – equatorial, tropical and desert, temperate climate – warm and cool). The atmosphere as an environmental resource.
(vi) Soils	Definition, local types and characteristics. Factors and processes of soil formation and soil profile. Tropical soil types. Importance to man and the effects of human activities on soil.
(vii) Vegetation	Major types (tropical rainforest, cool temperate, woodland, tropical grassland and temperate grassland); characteristics, distribution, factors affecting their distribution, plant communities. Vegetation as an environmental resource.
(viii) Aspects of Environmental Interaction	Land ecosystem, environmental balance and intervention within the natural environment.
(ix) Environmental hazards	Soil erosion, drought, desert encroachment, deforestation and pollution, causes, effects and prevention of each.
HUMAN GEOGRAPHY	
(i) World Population	Factors and patterns of growth, distribution and movement; growth rate problems (e.g. Amazon basin, N.E. of USA, India, Japan, West coast of South Africa)
(ii) Settlement	Types (rural and urban); patterns and factors affecting location; growth and size; functions of rural and urban settlements (e.g. Western Europe, the Middle East and West Africa).
(iii)	
(iv) Transportation	Types (roads, railways, water, air). Transportation and economic development (movement of people and commodities, national and international trade,
(v) Manufacturing Industry	
(vi) World Trade	
REGIONAL GEOGRAPHY OF NIGERIA	

FIELDWORK	diffusion of ideas and technology, national integration); problems of transportation.
GEOGRAPHY OF AFRICA	Types (heavy and light industry); Factors of industrial location; contributions to Gross National Product (GNP) and problems. Factors, major commodities (agricultural, manufactured goods and mineral products, trade routes, with special emphasis on trade between candidate's home country and the outside world. Nigeria on broad outlines (location, position, political divisions, physical setting, population distribution of mineral and power resources, industry and commerce, transportation). Geographic Regions of Nigeria (Eastern Highlands, Eastern Scarplands, North-central Highlands, Sokoto Plains, Chad Basin, Niger Trough, Cross River Basin and Southern Coast.
SELECTED TOPICS	Each of these geographical regions should be under the following sub-headings:- (i) Physical settings; (ii) Peoples and population; (iii) Resources and economic activities; (iv) Transportation; (v) Problems of development. Field work on any one of the following should be based on local geography of candidate's home town. (This aspect of the syllabus should be examined in schools as part of the continuous assessment and should account for 25% of the total mark of continuous assessment): (i) Land use (rural or urban): Rural – crop farming (e.g. rice, cocoa etc), mining (e.g. coal, tin, petroleum etc), fishing. Urban – commercial activities, ports, factories, recreational etc. (ii) Market survey – rural or urban (iii) Traffic flow – rural or urban (iv) Patterns of journey to work – rural or urban (v) Rate of erosion in the locality etc Africa on broad outlines – location, size, position, political divisions and associated islands, physical setting (relief, drainage, climate and vegetation); distribution of major minerals. (a) Lumbering in equatorial Africa (with particular reference to Cote d'Ivoire and Zaire). (b) Irrigation agriculture in the Nile Basin and the Niger Basin. (c) Plantation agriculture in West and East Africa. (d) Fruit farming in the Mediterranean Regions of Africa. (e) Gold mining in South Africa. (f) Copper mining in Zaire and Zambia. (g) Oil production in Nigeria, Algeria and Libya. (h) Population distribution in West Africa. (i) International Economic Co-operation in West Africa (e.g. ECOWAS).

Source: West African Examination Council (2004) *Regulations and Syllabuses for Senior School Certificate Examination (SSCE) for Candidates in Nigeria*. Lagos: WAEC pp 248 – 255.

APPENDIX B

Major Geographic Fields and Employment Opportunities

Major Fields of concentration	Employment Opportunities
Cartography and Geographic Information System	— Cartographer for Federal Government (agencies such as Defence Mapping Agency, US Geographical Survey or Environmental Protection Agency or Private Sector (e.g. Environmental System Research Institute, Integral or Bentley); Map Librarian, GIS specialist for Planners, land developers, estate agencies, local government, remote sensing analyst, Surveyor.
Physical Geography	— Weather forecaster; outdoor guide; coastal zone manager; hydrologist; soil conservation/agricultural extension agent.
Environmental Studies	— Environmental manager; forestry technician; park ranger; hazardous waste planner.
Cultural Geography	— Community developer; Peace corps volunteers; health care analyst.
Economic Geography	— Site selection analyst for business and industry; market researchers; traffic/route delivery manager; real estate agent/broker/appraisers; economic development researcher
Urban and Regional Geography	— Urban and Community Planner; transportation planner; housing, park and recreational planner; infrastructure and services planner.
Regional Geography	— Area specialist for Federal and State Government; International business representative; travel agent; travel writer.
Geographic Education or General Geography	— Elementary/Secondary School teacher; College Professor, Overseas teacher.

Source: Career in Geography "By Richard G. Boehm. Washington DC: National Geographic Society, 199