

SCHOOL MAPPING AND DATA INDICATORS: INSTRUMENTS FOR MICRO-PLANNING IN THE NIGERIAN EDUCATIONAL SYSTEM

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ABSTRACT

The resources allocated to education by the various tiers of government in Nigeria are not adequate to keep pace with the rising cost of education and increasing student population. This means that existing facilities of learning and other related educational resources should be put into optimal use. It is in this context that this paper attempts to present school mapping as a diagnostic evaluation of the educational system, with the specific aim of projecting the number of Universal Basic Education school-going age children in Nigeria for the next ten years 2010-2020, and determining how best existing facilities can be utilized. This analysis attempted to relate micro-planning to school mapping and highlighted the role of school mapping and data indicators as fundamental tools in determining optimal utilization of scarce educational resources, and concludes that in order to avert waste of scarce educational resources, school mapping should be given its rightful place in planning education in Nigeria.

INTRODUCTION

Educational planning involves the process of consciously and systematically developing a course of future action that will control the process of educational growth in such a manner that the identified goals are achieved with the best possible level of efficiency (Ndu, 1991). According to Combs (1974) educational planning is the application of rational systematic analyses to the process of educational development with the aim of making education more effective and efficient in responding to the needs and goals of students and society. From these view points, educational planning can be seen as a systematic process in which deliberate efforts are made to devise a course of future action in education for the purpose of attaining specific goals in an effective and efficient manner. The underlying factor in these definitions is that planning is future oriented, rational, minimizes waste, and tries to control future events.

Educational planning takes place at two major levels, the national or state levels and local or institutional levels. When planning is undertaken at the national or state level, it is referred to as macro level planning. Planning at the local or institutional level is termed micro planning. The macro level reflects the fundamental aspects of educational development, such as educational reforms, financing, and manpower development in a country. Micro-planning deals with educational problems at the grassroots or institutional levels and how these problems can be solved to enable such institutions to benefit from the allocation of educational facilities and equipment (Hitte, 2008).

Educational planning, whether at the macro or micro level, is a problem in developing nations of which Nigeria is one. These problems include wasteful imbalances within the educational system, rising costs of education, and demand for education far in excess of capacity of the system (Combs, 1974). For instance the increasing population of students seeking admission into Nigerian schools can not match the capacity of these schools in terms of space, human, and material resources. Inadequate resources for accommodating the number of students seeking admission in part arise from poor planning projections (Hallak, 1977).

School mapping is used in planning education at the micro-level in order to identify educational needs of the community or institutions on a regular and sustainable basis. As an instrument of educational planning, school mapping is very useful in determining the availability of facilities and the extent of their utilization in the overall education system.

CONCEPTUAL FRAMEWORK

School mapping as a technical exercise has become a relatively normalized and institutionalized practice in education micro-planning. Its function in offering technical input into any educational micro-planning effort has become virtually self-evident. It is also pertinent to note that school mapping is not the same as a school map. More than simply being a tabular, graphical, or cartographical representation of a particular space or place, school mapping is used to investigate and ensure the efficient and equitable distribution of resources within and between school systems when large-scale reform or significant expansion of an educational system takes place (Caillods, 1983). It is a process of planning the location and spacing of educational institutions, taking into consideration the demographical, pedagogical, economic, geographical, social, administrative, political, and manpower factors (Igwe, 1998). School mapping is a normative approach to the

micro-planning of school locations. School mapping can be described as a technique or practice of determining where educational institutions should be sited by using demographical data to estimate the school age population of a particular area or locality at a future date, and not simply a map showing the location of educational institutions.

According to available accounts, school mapping originated in France in 1963 (Caillods, 1983; Galabawa, Agu, & Miyazawa, 2002). This is briefly described by Caillods (1983, p.6)

In 1963 the Government of France decided to extend the period of compulsory schooling to the age of 16, which required the establishment of a large number of new schools. It quickly became apparent that the Ministry of Education could not itself plan the location of all the new schools, nor did the regional offices have the methodological means to decide what types of schools were needed and where. A collection of circulars, regulations, standards and procedures were prepared at the time and given the name the school map.

School mapping in developing countries such as Nigeria is one most often used strategies to facilitate one or more of six functions:

- Create the necessary conditions for achieving universal primary and secondary education (UBE);
- Increase access for females and members of other traditionally under-represented socio-economic groups;
- Promote the equitable distribution of educational benefits within and between different regions and populations;
- Improve the quality of educational efforts;
- Optimize the efficient use of existing capital, human, and financial resources; and
- Organize, coordinate and rationalize efforts at technical, vocational, and post-secondary education (Varghese, 1997).

A typical methodology in implementing a school mapping process would include steps and considerations such as:

- The selection of a unit or units of analysis for the school mapping process.
- A diagnosis of the existing educational situation in the base year, including:
 - Existing inequalities in access by impacted area(s) and group(s);
 - Efficiency issues such as repetition and drop-out rates (wastage); and
 - Disparities in elements impacting quality such as faculties, teachers, equipment and supplies.
- Detailed projections of enrollment demand potential, including definitions of optional catchments area(s) for the school(s).
- Estimation of the numbers and identification of location where schools are to be opened (and perhaps closed), considering:
 - Teacher transfers and distribution;
 - School calendar modifications to increase student participation; and
 - Measures to encourage attendance such as school meals and free school book programmes.
- Estimation of faculties, resources, and supplies to be provided in schools.
- Cost estimations (Ibara, 2006)

Given that school mapping is typically defined as a micro-planning exercise, the expectation is that it operates at the sub-national or decentralized level. In the normal application of school mapping processes, institutional or decentralized participants must necessarily work and cooperate with central or national data and support services.

School Mapping and Situational Analysis

The scope of the application of school mapping varies according to educational situation. In Nigeria, three major educational scenarios are identifiable. These are:

- Educationally Disadvantaged Areas (EDAS);
- Educationally Advantaged Areas (EAAS); and
- Areas Undergoing Educational Changes/Reforms.

Educationally disadvantaged areas are usually characterized by low enrollment and participation rates. The purpose of school mapping in these areas is to expand the availability of educational facilities taking into account the existing inequalities in the distribution of educational facilities and the economic requirements of the area, such as provision of vocational and technical components in primary and secondary schools.

Educationally advantaged areas are characterized by high enrollment and participation rates and also have existing widespread educational facilities. The role of school mapping in these areas is correction of past mistakes in the allocation of educational facilities, taking into account rural to urban population movement.

Areas undergoing educational reforms, particularly structural reforms, require extensive re-organization. Some of the problems to be encountered in these areas involve finding answers to such questions as: What type of physical facilities should be erected at different stages of implementation of educational reforms? How can an existing school network be used in setting up new ones? What are the new schools to be established, and what are the financial implications of the educational reform (Oluchukwu, 1999)

It is also important to note that the three categories of educational areas in Nigeria as educationally disadvantaged, educationally advantaged, and areas undergoing educational changes/reforms are not mutually exclusive. This is because it is very rare that an educational situation in a given area in Nigeria falls into only one of the three categories as described.

THE OBJECTIVES OF SCHOOL MAPPING

The major objective of school mapping is to ensure that educational institutions are located at their most advantageous sites. Some of the objectives of school mapping include:

School mapping enhances the establishment of a school network which will meet in the most efficient and equitable manner the future demand for education.

Providing for equality of educational opportunity which is achieved by a geographical leveling out of the conditions of supply through the creation of equal intake, capacities, and equitable distribution of human, material, and financial resources over the various areas.

Reforming structures, curricula, and methods. Here school mapping would help in determining how schools may be reconverted and school sites re-allocated geographically so as to adjust to the school system's new characteristics as laid down in the reform policy.

Ensuring the advantageous location of educational institutions from the point of view of accessibility to the learner and full utilization of educational resources. This ensures that educational institutions are efficiently run.

School mapping ensures that pupils attend schools at a considerable short distance. In this way, the mapping exercise takes into consideration the catchments area.

Making the school system more efficient by improving the ratio between costs and performance. This means enhancing the input and output ratios (Arinze, 1991)

Factors to Consider in School Mapping

School mapping as an instrument for micro-planning aims at setting up a school network which will meet in the most efficient and equitable manner the future demand of education. In determining the future school map it would be necessary to consider some factors as follows:

Demographic Factors

These are factors that relate to birth rate, mortality rate, migration and immigration rates. School mapping makes use of demographical data in order to estimate the school age population of a particular area or locality at a future date. This enables educational planners to determine whether or not an educational institution sited in that locality will have adequate client. By way of illustration, the projected number of Universal Basic Education (UBE) school-going children in Nigeria can be computed for the next ten years (2010-2020). Using the projection of 41,394,708 as the number of UBE school-going children for 2010 (Adeyemi & Igbineweka, 2001), the number of UBE school-going aged children in Nigeria can be projected for the next ten years (2010-2020). The projection is based on the 2.83% official population growth rate (National Population Commission, 2006), and it is also expected that this growth rate will remain constant during the planning period. The author used the base figure of 41,394,708 for the computation as indicated in Table 1.

Table 1

Projection of School Going Age Population in Nigeria for Ten Years (2010–2020)

Year	Projected Population
2010	41,394,708
2011	42,566,178
2012	43,770,801

2013	45,009,515
2014	46,283,284
2015	47,593,100
2016	48,939,984
2017	50,324,986
2018	51,749,183
2019	53,213,685
2020	54,719,632

The 2020 population figure obtained (54,719,632), in consideration with other factors of school mapping, will help to determine the number and sizes of primary schools that should be sited in Nigeria by the year 2020. It may be necessary to classify the estimated school-age population by sex because it will enable policy makers to determine whether to establish boys only, girls only, or co-educational institutions.

Pedagogic Factors

These factors relate to consideration of the normal period of utilization of the school buildings and the teaching force, class sizes, the possibility of double shifts, and the possibility of a variety of courses being offered by the school. This also involves consideration for availability or suitability of the area for special teaching facilities. For instance, it may be relevant to establish a marine engineering school in a riverine location. In this way, facilities for practical teaching may be easily provided.

Economic Factors

These factors have to do with the cost of establishing a school or the cost of maintaining a student in a school. For example, the costs of establishing schools in different areas, such as rural and urban areas, as well as the economic benefits that will accrue to such areas, are considered economic factors.

Geographical Factors

These relate to considerations such as accessibility, central location of the school with regard to population, transportation systems, water, telecommunications, and topography. The Government may use its policy on school mapping to attract population concentration into an area. For instance, the establishment of the University of Nigeria for many years at Nsukka, a remote village in the eastern part of Nigeria, attracted a large number of people who came from neighboring states to seek employment opportunities and for admission-related matters. Today, Nsukka is a big city and densely populated.

Social Factors

These relate to the use of school mapping to satisfy the social demand of education. This means that the peculiar circumstances of a community or locality should be considered, for instance, rapid migration of people from rural to urban areas. Hence, the government could use its policy on school mapping to encourage people to stay in rural areas and in this regard control rural – urban migration. For instance, the establishment of social amenities in rural areas, especially schools, ensures the presence of young people in the community where the school is established.

Manpower Factors

These factors involve consideration of special requirements in terms of manpower in a particular area. One implication of these factors in school mapping is that skills or occupations predominant within an area can also determine the type of vocational and technical schools that may be located in that area.

Catchment Area

This factor may be described in terms of the geographical area from which the school gets learners or the geographical area which a school serves. The rationale for the location of schools on the basis of catchment areas is that there will be a school close to every potential learner's home and that the learner will also by choice attend that school. If the catchment area is properly designed, the distance between home and school in each case will be short and could save time and expenses for students and parents. Also, many more students would be in a position to attend schools from their homes, thereby increasing school participation rates.

Size of School

The issues of school size are an essential factor in school mapping. It is important to specify minimum and maximum sizes for all categories of schools. The minimum and maximum size may be seen as the optimum size which affords the best possibilities for administration and full utilization of facilities and staff. The minimum size of a school varies from locality to locality and according to the level of education. While the need for minimum sized schools is particularly acute in low population density areas, urban areas and densely

populated areas need maximum-sized schools. A major argument against large schools is the issue of effective management. Nevertheless, large schools have the advantages of ensuring maximum utilization of educational resources, thereby scaling down costs. The establishment of large schools is ideal in as much as factors of school mapping justify them. Large schools ensure maximum use of existing facilities.

It is important to note that all the factors considered above, are not mutually exclusive. In other words, they should not be considered in isolation, but rather integrated holistically.

Data Indicators in School Mapping

Indicators in this context are pointers which provide information for school mapping. There are different types of indicators that can be used in school mapping. Some of them are listed below.

Educational Disparities Indicators

This relates to educational disparities that may exist between and within states or between and within local government areas. Information on teaching and learning situations can be assessed with respect to the following indicators:

Size of schools and pupil: teacher ratios;

Transition rates from primary to secondary school;

Enrollment rates from primary to secondary school;

School facilities in rural and urban areas;

Class promotion rates;

Density of population in the school condition catchment areas for secondary schools; and

Ratio of primary schools to secondary schools.

Manpower Indicators

For the preparation of mapping of technical, vocational, and professional courses in formation, information should be collected on the following indicators:

Emerging, declining, and stagnant occupational families; and

Employment status of school leavers.

In order to find the level of utilization withdrawal, transfer, deaths, and project demand for teaching and nonteaching manpower, data such as teachers by age, sex, qualification, salary scales, training and experience are needed.

Internal Efficiency Indicators

In determining the internal efficiency of an educational system, information should be collected on the rates of retention and dropout, transition, promotion, growth of enrollment by double and single shift systems, growth of enrollment by sex, age, class, and stagnation rates (Oboegbulem, 2008)

Costs and Financial Resources Indicators

The costs of education can be computed per level, that is, the cost per student at the primary, secondary, or tertiary levels. Financial resources relate to both capital expenditure and recurrent expenditure (teachers' salaries, non-teachers' salaries, maintenance costs, and other routine expenditures).

Educational Quality Indicators

Three indicators can be used to show differences in quality of educational facilities in different areas. These include (a) pupil: teacher ratio, (b) percentage of trained teachers, and (c) average salary per teacher. Pupil: teacher ratio is a crude index of quality of instruction in a given area. The percentage of trained teachers and pupil: teacher ratio combined gives a good indication of the quality of instruction in a given area. Average salary per teacher is an indicator of quality of teachers in a given area.

Building Space Utilization Indicators

A major objective of school mapping is to ensure adequate utilization of resources available in a school. Three indicators can be used for the measurement of the use of building and equipment. These include:

Time Utilization Rate (TUR). The time utilization rate measures the percentage of effective teaching hours over official hours of use. Mathematically this is represented as:

		Average number of hours of use per week x 100
TUR	=	Time of use per week

For instance, if a school is opened for eight hours daily (5 days), in a week it should be open for 40 hours. If the effective teaching time is 35 hours for one week, the time utilization rate can be calculated as below:

$$\begin{aligned}\text{Official Hours} &= 40 \text{ hrs} \\ \text{Actual Teaching Hours} &= 35 \text{ hrs} \\ \text{TUR} &= \frac{35 \times 100}{40} = 87.5\%\end{aligned}$$

The extent of underutilization with respect to time is $100 - 87.5\% = 12.5\%$. This means that the classroom is underutilized by 12.5%.

Space Utilization Rate (SUR). The time utilization rate alone does not show if a classroom is utilized at full capacity. The space utilization rate, therefore, compares the average size of the class occupying a classroom with its theoretical capacity. That is, the number of students utilizing a particular classroom compared with the actual capacity such classroom can hold. Assuming, the theoretical capacity is 40, and number of students occupying the space is 30, space utilization rate (SUR) is calculated as thus:

		Average number of pupils attending x 100
SUR	=	Places available in the classroom

For instance, a classroom has the capacity to seat 40 pupils and is actually occupied by 35 pupils. SUR for the room is calculated as follows:

$$\text{SUR} = \frac{35 \times 100}{40} = 87.5\%$$

This shows also that the classroom space is under-utilized. The extent of under utilization ($100 - 87.5$) is 12.5%.

Global Utilization Rate (GUR). This gives the percentage rate of the number of theoretical “hour-places.” Hour-places is a technical term used in school plant planning that connotes standard (official) teaching hours or class capacity rather than actual teaching hours or class capacity. That is, the teaching hours or class capacity that should exist rather than that which exists in practice.

$$\begin{aligned}\text{GUR} &= \text{TUR} \times \text{SUR} \\ &= \frac{\text{Average number of students in a classroom}}{\text{Number of theoretical capacity}} \times \frac{\text{Number of Effective Teaching Hours}}{\text{Number of theoretical hours per week}} \times 100 \\ &= \frac{35}{40} \times \frac{35}{40} \times 100 = 76.6\%\end{aligned}$$

Therefore GUR gives a more comprehensive picture of the utilization of facilities than TUR and SUR considered separately, as demonstrated in the GUR calculation which rendered a 76.6% combined space and time utilization rate, far less than the 87.5% utilization rates noted for space and time individually. In other words, the classroom facility is underutilized by 23.4% when both space and time are considered.

CONCLUSION

This paper has attempted to relate micro-planning to school mapping and examined the role of school mapping and data indicators as fundamental in micro-planning and optimal utilization of scarce educational resources. School mapping was identified as the process of planning the location of educational institutions taking into consideration demographic, pedagogic, economic, geographical, manpower, and other related factors as major elements in school mapping practice. Furthermore, the paper highlighted some indicators necessary for effective school mapping. Each of these indicators was described and the clues they can offer for improved school mapping and overall education development discussed. In the rationalization of the existing network of educational institutions, fundamental principles of educational planning (such as equity and efficiency) should serve as a guide. To avert waste of public resources in establishing unviable schools, school mapping should be given precedence in the planning of education in Nigeria. In effect, educational institutions should be established on the condition that the factors of school mapping justify their establishment.

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