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ANALYSES OF THE PERFORMANCE DISTRIBUTION OF JUNIOR SECONDARY SCHOOLS CERTIFICATE EXAMINATION/AVAILABLE FACILITIES
(A Case Study of Lagos Mainland Local Government Area of Lagos State)

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ABSTRACT: This research project focuses on the application of GIS to the performance distribution of Junior Secondary Schools Certificate Examination / available facilities in Lagos Mainland Local Government Area. The data used in the course of the project were results of the Junior Secondary School Certificate Examination in Lagos Mainland Local Government Area from 1997 to 2004, the Administrative Map of Lagos Mainland Local Government Area., the GPS point position coordinates of the various schools, the Digital photographs of the schools and data on the facilities available in each school such as library, sports field and laboratory. The data were structured in such a way that it can be queried to obtain the required result so as to achieve the aim and objective of the study. The AutoCAD 2000 was used to digitize the raster image of the study area. The attributes were attached in Arcview environment. Various queries were performed on the database created for all the junior secondary schools within the study area, and necessary conclusions and recommendations were made.

Keyword: GIS, Junior Secondary School Certificate Examination, Database, GPS.

Introduction

The Nigeria Educational structure is the 6-3-3-4, which was introduced in September 1982. It comprises of six years of primary education, three years of junior secondary education, three years of senior secondary education and four years of higher education. Under this system, the first six years are for basic general education, which serves as the primary education. The teachers base issue of certificate on continuous overall assessment.

The junior secondary school is both a pre-vocational and academic. A common diversified curriculum is offered in this stage. Students are taught all the basic subjects, which will allow them to acquire further knowledge and develop their skills. Based on a continuous assessment method and the end of course examination conducted by each State's Ministry of Education, the Junior School Certificate may be awarded at the end of three years of junior secondary education. The senior secondary is comprehensive in coverage and open to

students who are capable and willing to acquire a complete six years secondary school education. The senior secondary education leads to the award of the senior secondary certificate on a single subject basis. Candidates are allowed to sit for a minimum of eight subjects.

Importance of GIS to the Education Authority

The department vested with the responsibilities of administration of secondary schools in Nigeria at the state level is the Local Education Authority. This is due to the fact that they are the closest to the people and therefore are aware of the unique needs of the secondary schools and can also perform supervisory roles easily, which include maintenance of schools records, inspection of school facilities and analysis of student performance etc. (Okolie A et al., (1995) and Nwagugo J.U.,(1999). These various functions of the Local Education Authority is described as Educational Administration. Educational Administration deals with various factors, which includes: planning, human relations, decision-making, organizing, and delegation of authority, discipline and staff appraisal, (Omogunloye O.G and Oni A.M., 2005).

This entails the collection of different data sets which can either be spatial or non-spatial attribute data and can well be effectively administered within a Geographic Information System (GIS) environment since GIS is a constellation of hardware and software that integrates computer graphics with a relational database for the purpose of managing data about Geographic locations (Garson and Biggs, 1992) The spatial framework and data integration capabilities of GIS could potentially benefit all areas of educational administration. This research work is intended to display the various applications of GIS to educational administration and provide advice on how best to accomplish the GIS application in the analysis of students' performance and availability of facilities in the Lagos Mainland Local Government Area. This will further enrich the decision of policy makers and Government department in their considerations of several factors that would have a direct impact on the populace. Among other things, GIS plays the following prominent roles in school management; (Mosaku, A.I. and Olofinika O.M. 2005).

- Route planning of school bus to schools
- Placement and distribution of students to senior secondary schools
- Locating schools from a particular location within a pre-defined radius.
- Accessibility of schools to good road network.
- Site location.
- Administrative planning for schools, the ministries and the various examination boards associated with them.

Aims and Objectives

The aim of this study is to carry out an analysis of the distribution of junior secondary schools and its certificate examination (JSSCE) performance in the Lagos Mainland Local Government Area of Lagos State.

The objectives of this study are;

- To acquire data of Junior Secondary School Certificate Examination results for all Secondary Schools in Mainland Local Government Area of Lagos state from the Lagos state Examination Board in order to develop a detailed database for the storage of such data.
- To design a database for JSSCE performance for the mainland Local Government area of Lagos state for decision-making purposes.
- To design a GIS outfit (map forms) for the storage retrieval and display of these database for the purpose of analysis of the performance of each school in the study area.

Scope of Work

The scope of work shall be limited to the Junior Secondary Schools in the Lagos Mainland Local Government Area only. The scope of work shall include;

- Collection of necessary data from the existing records from the Lagos State Examination Board.
- To produce a digital format of the existing analogue files.
- Designing a database for these features in Arc VIEW.
- To design a GIS in map forms.

Limitation of Study

This study requires a large amount of data such as the grades on each subject such as: distinction; credit; pass and fail for six subjects (English Language, Mathematics, Integrated Science, Social Studies, CRK and Agricultural Science). The study will be limited to eight years; 1997, 1998, 1999, 2000, 2001, 2002, 2003 and 2004.

Methodology

Data Acquisition

The sources of data used in the study came from several different sources such as;

Field Survey, which involves actually going to the various secondary schools in Mainland Local Government Area with survey instrument such as Handheld GPS, to obtain the point position coordinates of the various schools. (Ezeigbo C.U. (1996), and Burrough P.A. (1986).

- Social Survey which involves going to the various schools to verify facilities present in these schools and obtaining the raw results of yearly junior School Certificate

Examination of all junior secondary schools in Mainland LGA at Iyana Ipaja and at the Local Educational District at Sabo.

The base map of the study area showing the entire streets and the Lagos State map was purchased at the State Survey Department, Alausa- Ikeja. The map was scanned in CorelDraw9 and imported to AutoCAD 2000 (CAD overlay) for Geo-referencing, using four points with known coordinates (coordinates obtained at Alausa-Ikeja), and subsequently digitized. Different layers were created for the various features such as; major road network, streets, boundary lines, railway lines etc. The coordinates of the various schools were now plotted on the digitised map. The layer for the schools was called junior secondary school. (Kufoniyi, O., 1998)

Database Design

The major effort in developing a GIS application package is the establishment of a spatial database. The database passes through the following stages;

- Conceptual design
- The logical design
- The physical design

Conceptual Design

This refers to the human conceptualization of reality where REALITY refers to the phenomenon, as it actually exists including all aspects, which may or may not be conceived by the individual. The VIEW OF REALITY is the mental abstraction for a particular application or group of applications (Kufoniyi, 1998). In this case the reality is the mental abstraction of the reality of JSSCE results distribution and the availability of facilities. The entities and attributes are the junior secondary schools, roads, railway lines, streets etc. The themes generated include;

- Major road network
- Street network
- Railway line
- Boundary
- Junior schools

Logical Design

This is the representation of the data model to reflect the recording of the data in the computer system.

The Physical Design

The representation of the data structure in the format of implementation software was made at the beginning of the database creation. The AutoCAD2000 (CAD overlay) was used in

converting the geometric entities to the digital formats. The geometric data was imputed through the on-screen digitization method. The database design is a process by which the real world entities and their inter-relationship are analysed and modelled in such a way that will maximise the benefits, while utilising a minimum amount of data. (Kufoniyi, 1998). The database creation involves the arrangement / organisation of data into the forms that are compatible with the relevant software. The model is designed in such a way that it allows for easy data exchange and easy linkage of graphics with attributes. The created tables were then populated with the input data after carrying out the necessary formatting and editing.

Implementation Strategy

Data acquisition

In the course of this project two types of data were acquired namely the spatial and attribute data.

The attribute data

Attribute is the characteristic of an entity selected for representation (DCDSTF 1988) usually non-spatial but not unrelated to the spatial character of phenomena under study. Attribute value is the value of the attribute that has been measured and stored in the database. An entity is almost always labelled and known by attributes, e.g. a road usually has a name and is identified according to its class- expressway, alley, freeway etc. The attribute data collected were;

- The names of streets on the map
- The pictures of the states of all the schools in the Lagos Mainland Local Government Area
- The yearly statistical results of the performance of each school in the Lagos Mainland Local Government Area.

Spatial attribute

The spatial data stores information about the location, shape and attributes of real objects. These data includes;

- The map of Lagos mainland Local Government Area of Lagos State.
- Coordinate position of each junior secondary school in the Lagos Mainland Local Government Area. (Micheal N. De mers, 2001). The spatial data came in paper sheets which was converted to digital format by scanning using CorelDraw9 and then transported to AutoCAD2004 (Raster Design) for digitizing and Geo-referencing. The characteristic of a spatial data varies as it source. The various forms of data acquired were encoded and manipulated in different ways so as to develop an integrated GIS database. Other methods by which analogue data can be converted to digital format are Keyboard and Electronic data transfer. Three methods were used in the course of this work. They were the Keyboard entry, scanning, and digitizing. [Niemann, Jr.et al, (1988), Parent, P and Church, (1987)].

Queries and Analysis

This involves the processing of information by retrieving, aggregating, comparing and combining various pieces of data stored in the database to generate information to support decision making.

This allows for the creation of new information about the objects of interest, which has already been linked up in the database by their spatial and attribute data. This was achieved using the Arc view 3.2a software.

Queries design

Any query to be executed has to be designed so as to reduce the time to be spent with the computer system. The design has to be made in such a way that it will be understood by the computer. For instance the following designs could be made;

- Query by 'performance'
- Query by 'population'
- Query by 'available facilities'
- Predictive query
- Query by 'year of establishment'

Query analysis

Query by 'performance' can return results such as; schools with highest performance in certain subjects, percentage failure in certain subjects etc. For decision makers this provides an opportunity to channel more academic and tutorial materials to these schools.

Query by 'population' returns such results as the school with the highest population of Males or Females. It also indicates schools with less staff strength.etc etc.

Query by 'available facilities' such as Libraries, Laboratories Sport facilities etc, returns 'Yes' or 'No' as output.etc, etc.

Results and Analysis Results

The final product of a GIS is a detailed map and a linked attribute table .The results obtained during the course of this project are the queries and database attributes tables that were created for the purpose of proper analysis of these cases. One unique aspect of this is that it allows the analysis of the existing data based on geographical relationships. The most important of all tools provided by a GIS are those involved with data base query and its ability to perform complex spatial analysis and modeling operations in support of environmental management planning and mapping

Chart Plotting and Results

Charts are also plotted to compare attributes and also generate some analysis based on the graphical interpretation. The charts were created in Arc review environment and are as follows;

- Chart displaying schools with Laboratories and their performances in Science from 2000-2004.The result is shown in Chart 1.
- Chart display showing schools with library and performances in Maths and English in year 2004. The result is shown in chart 3.
- Chart displaying schools without Laboratories and their performances in Science from 2000-2004.The results is shown in chart 2.

Database Query

A query is a precise definition of what you want to select or retrieve from a database or the relevant investigation that is of interest to the user. Information within the database, retrieved, and edited using the command of a query language is part of the DBMS. Such command can be issued directly to answer unique demands. Alternatively, they can be access through a programming language to allow the development of application programs.

Clearly, a number of possible queries can be answered using the information contained in the database. An intelligent map understanding system should be capable of analyzing, interpreting and query and extract relevant information from the map and present the answer to the user in an appropriate format. The system should infer certain attributes and parameters using standard conditions and pattern behaviour. It must also segment the map into meaningful entities, while maintaining the spatial and measurable signal. The queries were created in Arc view environment and are as follows;

- A query showing the schools with Sports field. The result is shown in Query 1
- Queries showing all schools that have Laboratories. The result is shown in Query 2.
- A query showing all schools that have Laboratories, Library and Sports field. The result is shown in Query 3.
- A query showing the schools that have Laboratory in which at least 10% of the students had an 'A' (80-100) in Science in 2002.The results is shown in Query 4.
- A query showing Private school having Laboratory and Library in which at least 50% of the students had an 'A' (80-100) in science in 2003.The result is shown in Query 5.
- A query returning 'No result' for Private school without Laboratory and Library in which at least 50% of the students had an 'A' (80-100) in science in 2003.The result is shown in Query 6.
- A query showing Public school having Laboratory and Library in which at least 40% of the students had an 'A' (80-100) in science in 2000.The result is shown in Query 7.

- A query returning' No result 'for Public school without Laboratory and Library in which at least 40% of the students had an 'A' (80-100) in science in 2000.The result of this Query display is shown in (Query 8: appendices)
- A query showing all schools with Laboratories and Library in which at least 50% of the students had an 'A' (i.e. 80-100) in Math, English and Science in 2004.The result is shown in Query 9.
- A query showing the highest number of facilities such as Library, Laboratory and Sports field. Schools that have all the above facilities are given a weight value of 3 while that of two facilities are given a weight value of 2 etc etc. The result is shown in Query 10.
- A query showing schools with the best structure and it is given a weight value of 10. The result is shown in Query 11.

Database Query Results Analysis

1. All the schools that have sports facilities as well as their spatial distribution on the map of Lagos mainland LGA are known through this query. The ministry of Sports, through its State appendages of the Lagos mainland LGA, needs this result in order to facilitate distribution of Sports facilities to these schools and also find a way of merging very close schools in order to provide sports fields in such schools.
2. All the schools that have Laboratories are known through this query. Also its spatial distribution the map of Lagos mainland LGA (see Query 2). This query result is necessary for prospective parents to enable them place their science oriented wards in schools that have Laboratories. The Ministry of Education also needs this information in order to provide Laboratories in schools that do not have. Refer to Query 2.
3. The school with the best structure throughout the Local Government Area is retrieved by this query. The best structure is given a weight value of 10 while the worst is given a weight value of 3. This result is necessary for parents who want to place their wards in schools with good structures. The State Government also needs this result for purposes of renovation of dilapidated school structures. It is basically needed for decision-making purposes. Refer to query 11 appendices.
4. This query returns all schools that have Laboratories and Library in which at least 50% of the students had an 'A' (i.e. 80-100) in Maths, English and Science in 2004.The result is necessary in order to verify the impact of available facilities on the performance of the students and also for parents who wants to place their wards in the best schools available. (Query 9.)
5. This query returns all Private Schools that have Laboratories and Library in which at least 50% of the students had an 'A' (80-100) in science in 2003.The result is shown in Query 5.
6. Queries 5 & 6 return the importance of Facilities on student's performance. While in query 5, the students did well in the sciences as a result of available facilities such as

Laboratory, in query 6 the students did not do well as a result of lack of Basic facilities. This is a clear indication of the effect of facilities on the performance of students. The Government needs this information in order to ascertain the effect facilities on student's performance and to provide such for the schools.

Conclusion and Recommendation

Conclusion

The capacity of any GIS that has been properly built is only limited by the user's imagination and capacity to manipulate it. Depending on the specific objective to be met, the performance distribution of GIS can perform many tasks. However, the GIS are useless without the user defining the task to be performed and the result expected to be achieved. This study has successfully demonstrated the usefulness of the Geographic Information System for analyzing the performance distributions of the Junior Secondary School Certificate Examination and also shown how the available facilities affect students' performances. The data can easily be updated, stored, processed and corrected and another set of analysis can be made with little effort.

It was shown that schools in the Local Government Area of Lagos Mainland do not have a particular distribution pattern for the period of the years, which the analysis was based on. The schools located within the study area are not consistent in their performance at the JSS level, hence the need for proper probing into consistency and examination irregularities which presently had invaded our educational sector.

RECOMMENDATIONS

Based on the work and experience I obtained from this research topic, I hereby recommend as follows;

- The various Examination Board Authorities i.e. Junior Schools Examination Board at Iyana Paja and the Local Examination Board, LEB, at Sabo should fully computerize their results so as to make research projects such as this to be carried out easily without running out of data in terms of school results.
- Decision makers should apply the GIS as a tool in their decision making process such as deployment of teachers in a particular subject area where students are not doing so well.
- The Lagos State Examination board and other Examination Boards should make use of the GIS to monitor Malpractices in schools, as the GIS analysis would show what an individual couldn't see. (Refer to charts).
- The Ministry of Education should employ the use of the GIS analysis of the JSSCE performance distribution as a way of monitoring the performance of Teachers in the State in order to take certain actions when necessary.

- The Local Educational District should use the GIS in placement activities so as to ensure nearness to the student's place of abode by geocoding and selecting schools within a specified radius to place students.

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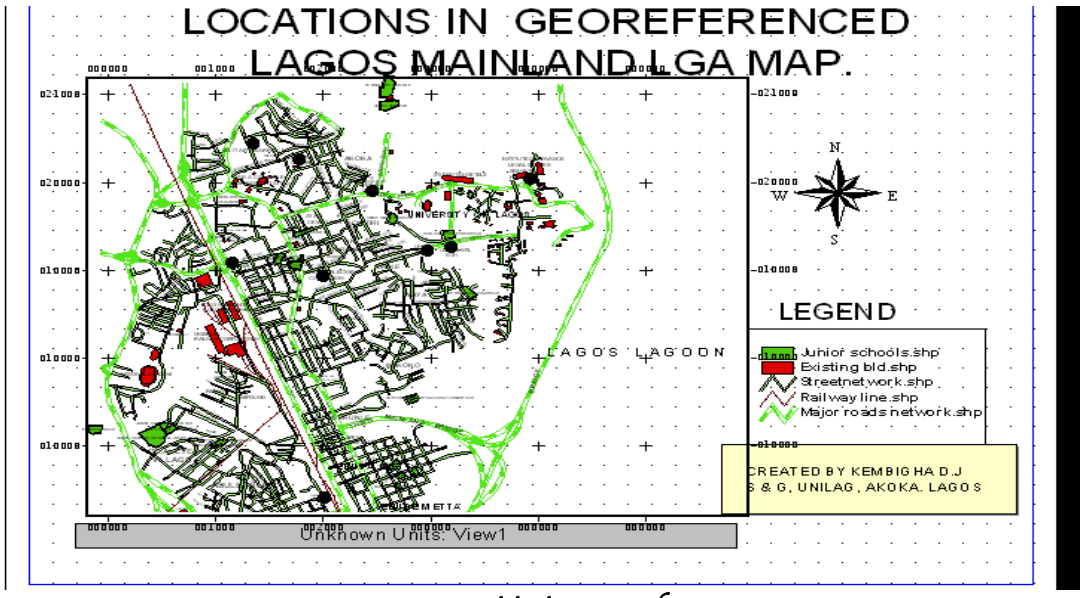
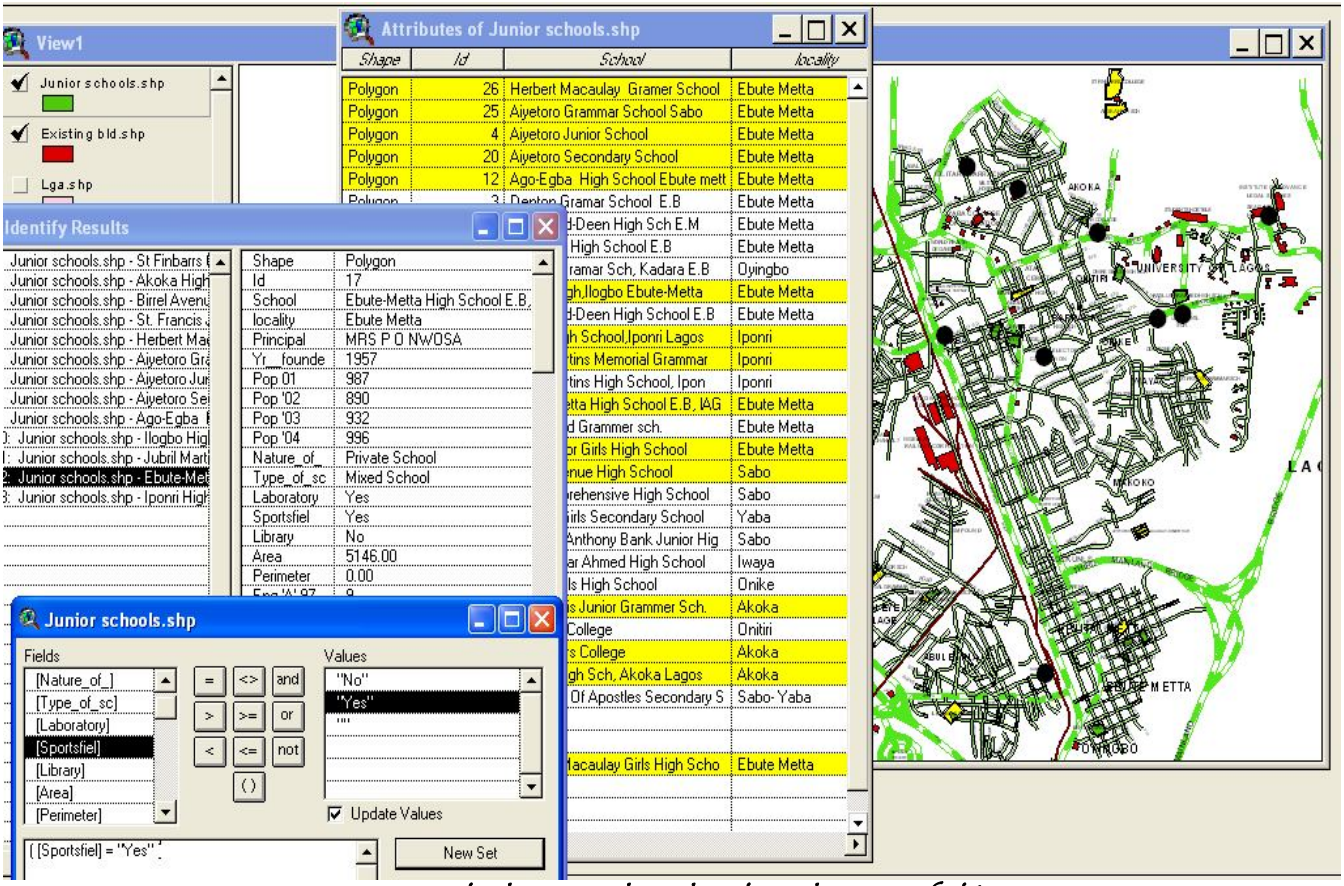
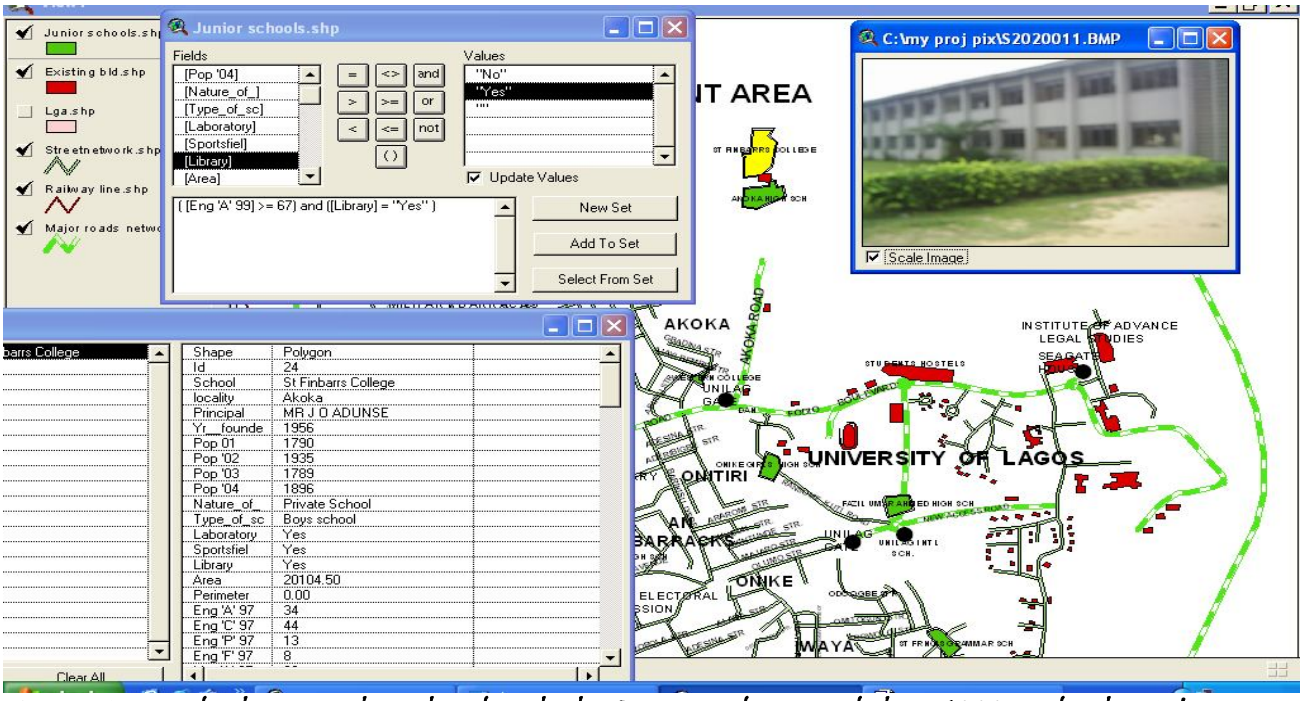


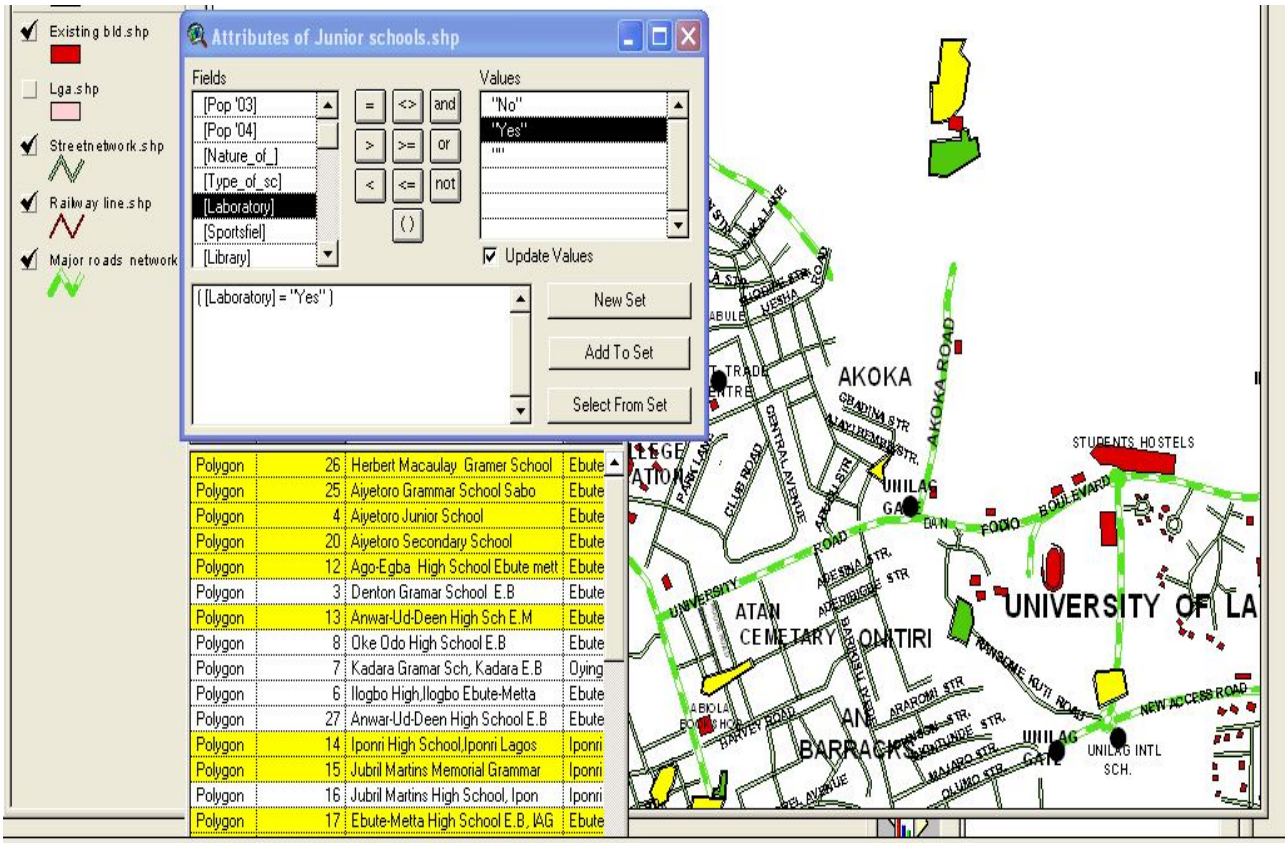
Gridded View of Project



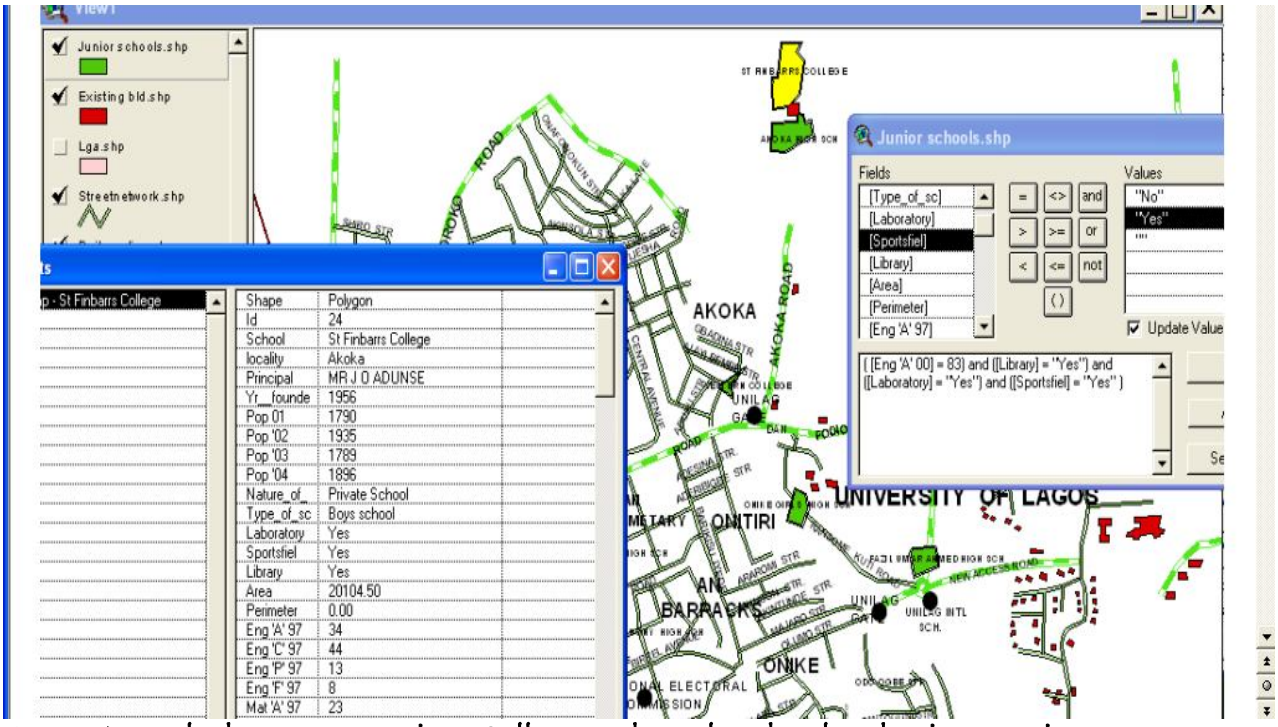
Query 1: Result showing the schools with Sports field



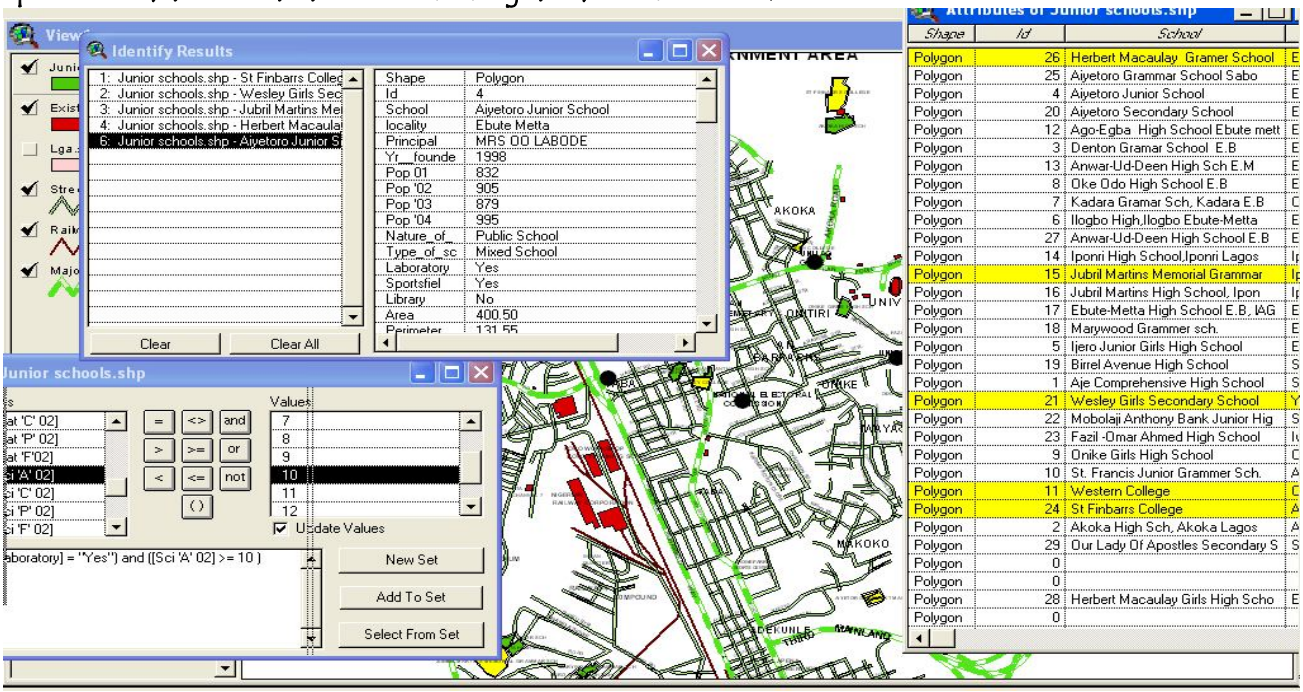
Query 2: Result Showing the School with the Best Result in English in 1999 & also has Library with Picture of Library.
Name of School: St. Finbarr's College, 67% of students had 'A' in English 1999.



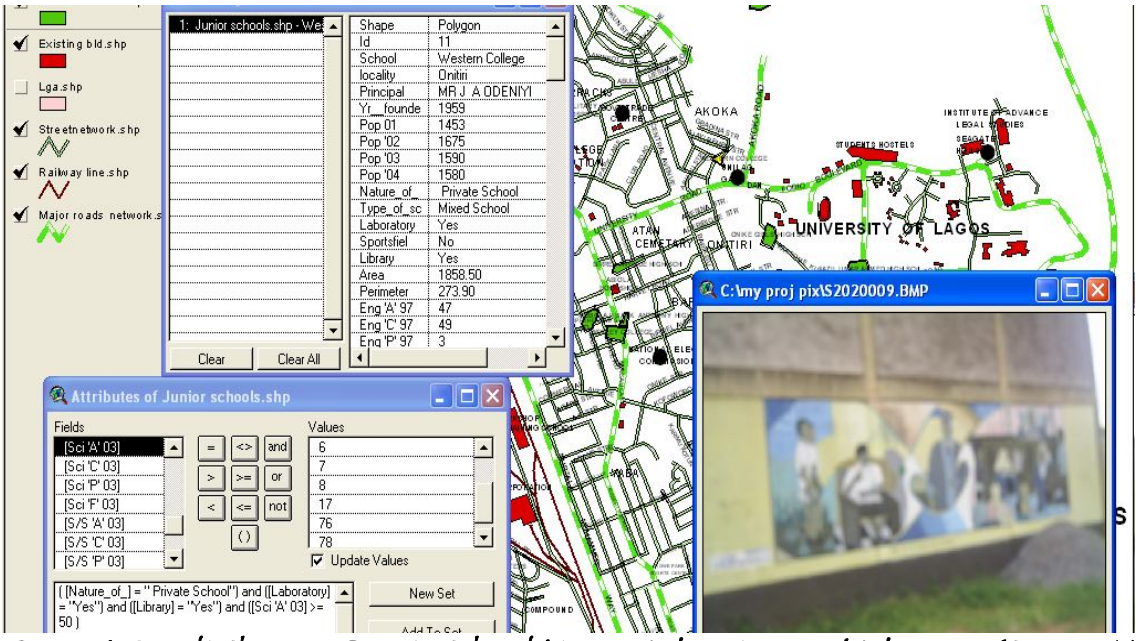
Query 3: Showing Schools with Laboratory.



Query 4:Result showing St. Finbars College as the only School with Library, Laboratory & Sports Field as Well as a Result in Integrated Science >= 83%.



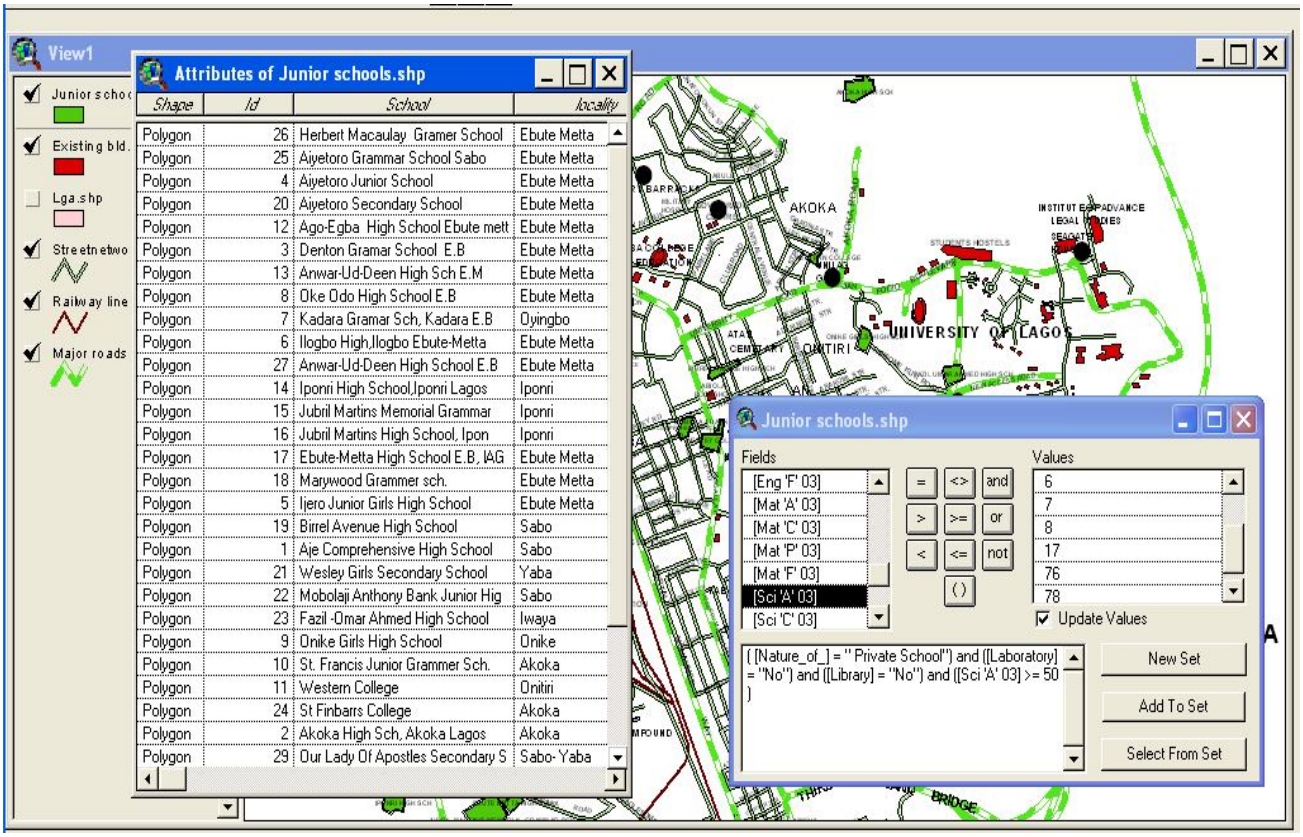
Query 5: Result Showing Schools where ("Science "A' 02)>= 10% and (Laboratory) = "yes")



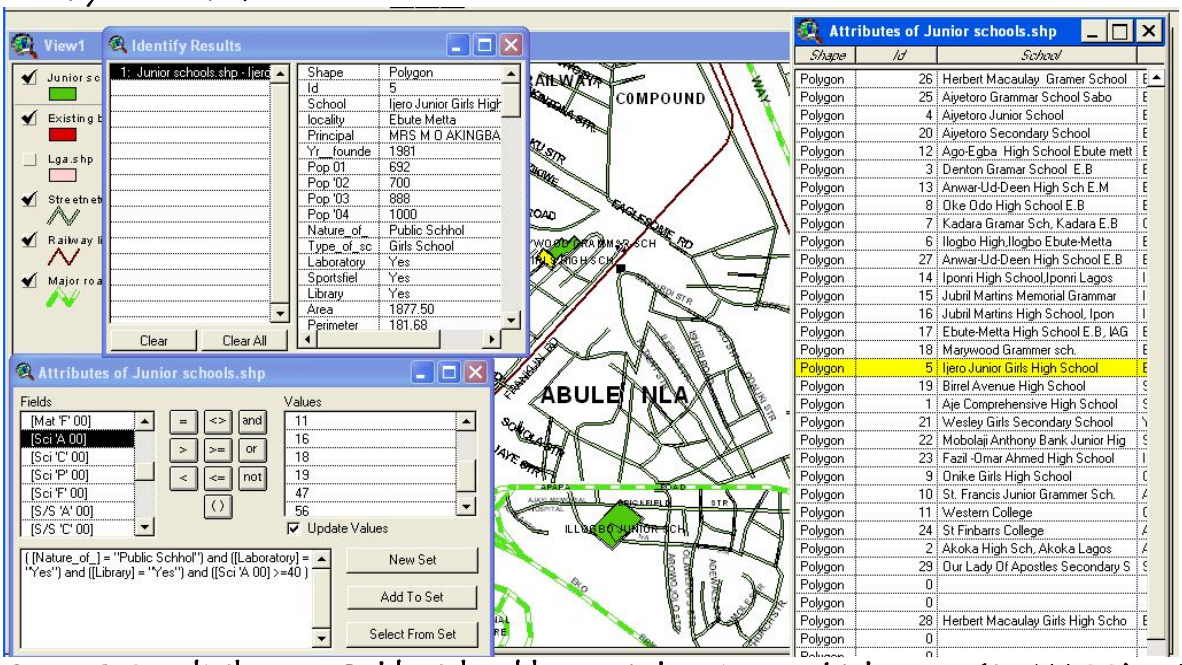
Query 6: Result Showing Private School Having Laboratory and Library & (Science 'A' 03)>-=50%

Name of School: Western College

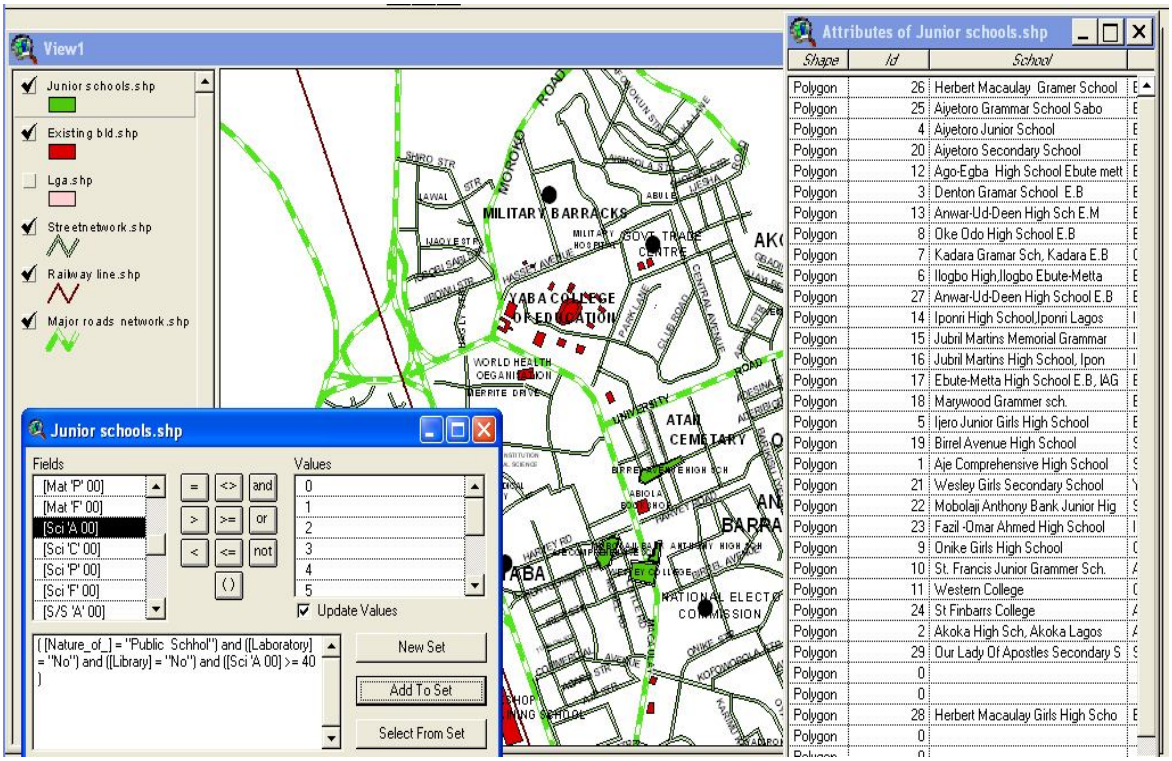
50% of Students had 'A' in Science 2003.



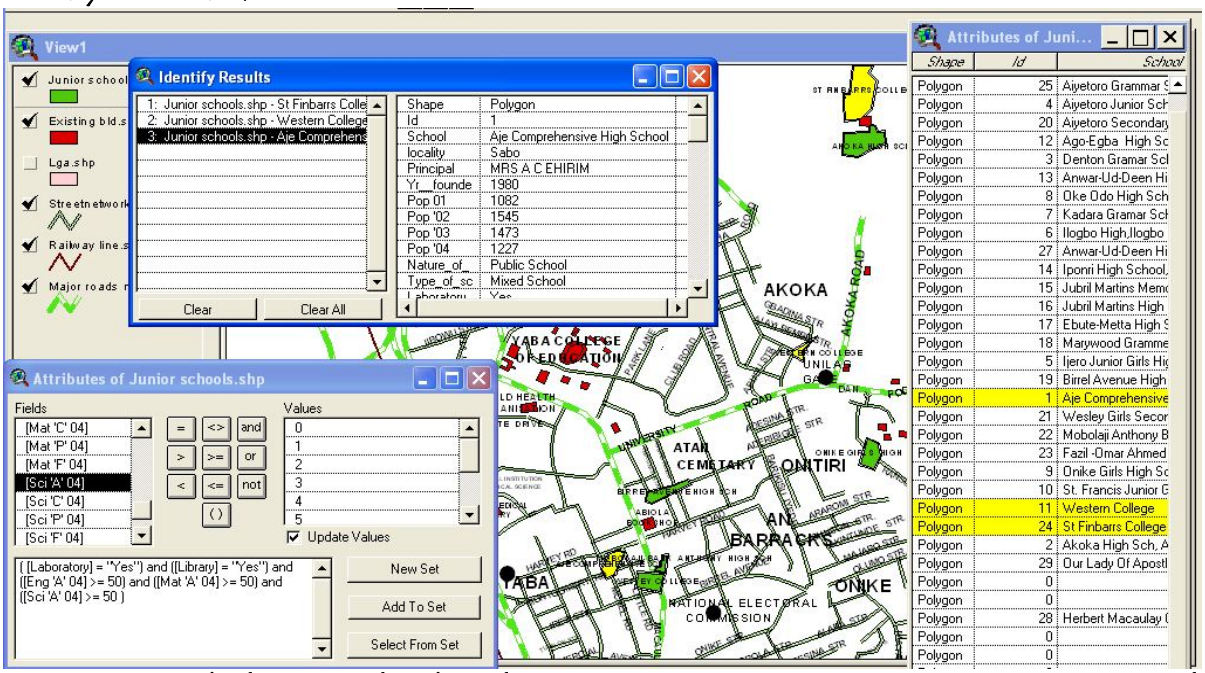
Query 7: Showing 'No Result' for (nature of school)= 'private school' and (lab)= 'No' and (library)='No' and (science 'A' 03)>=50%



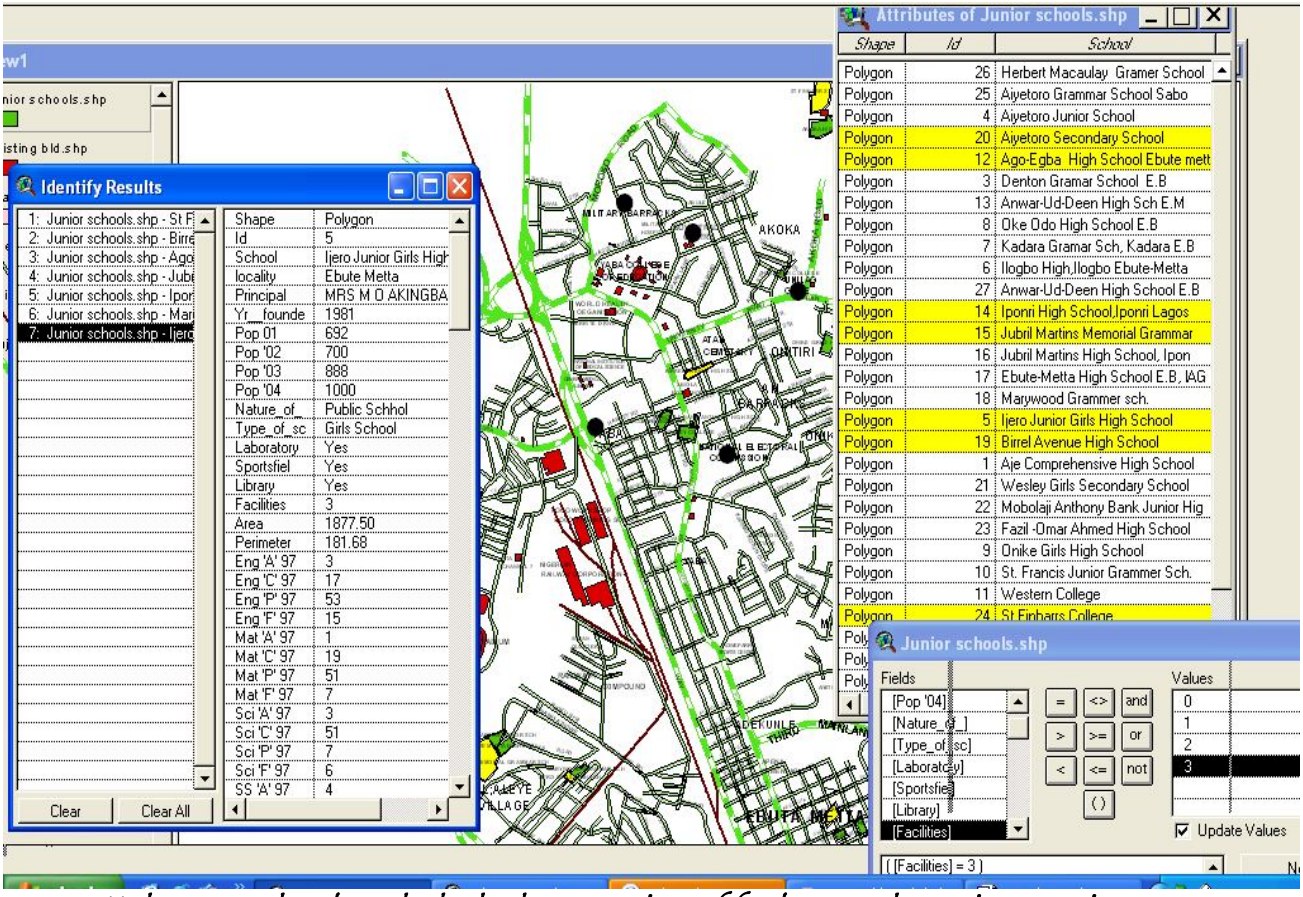
Query 8: Result Showing Public School having Laboratory and Library & (Sci 'A' 00)>= 40%.
Name of School: Ijero Junior Girls High School
40% of students had 'A' in Science 2000.



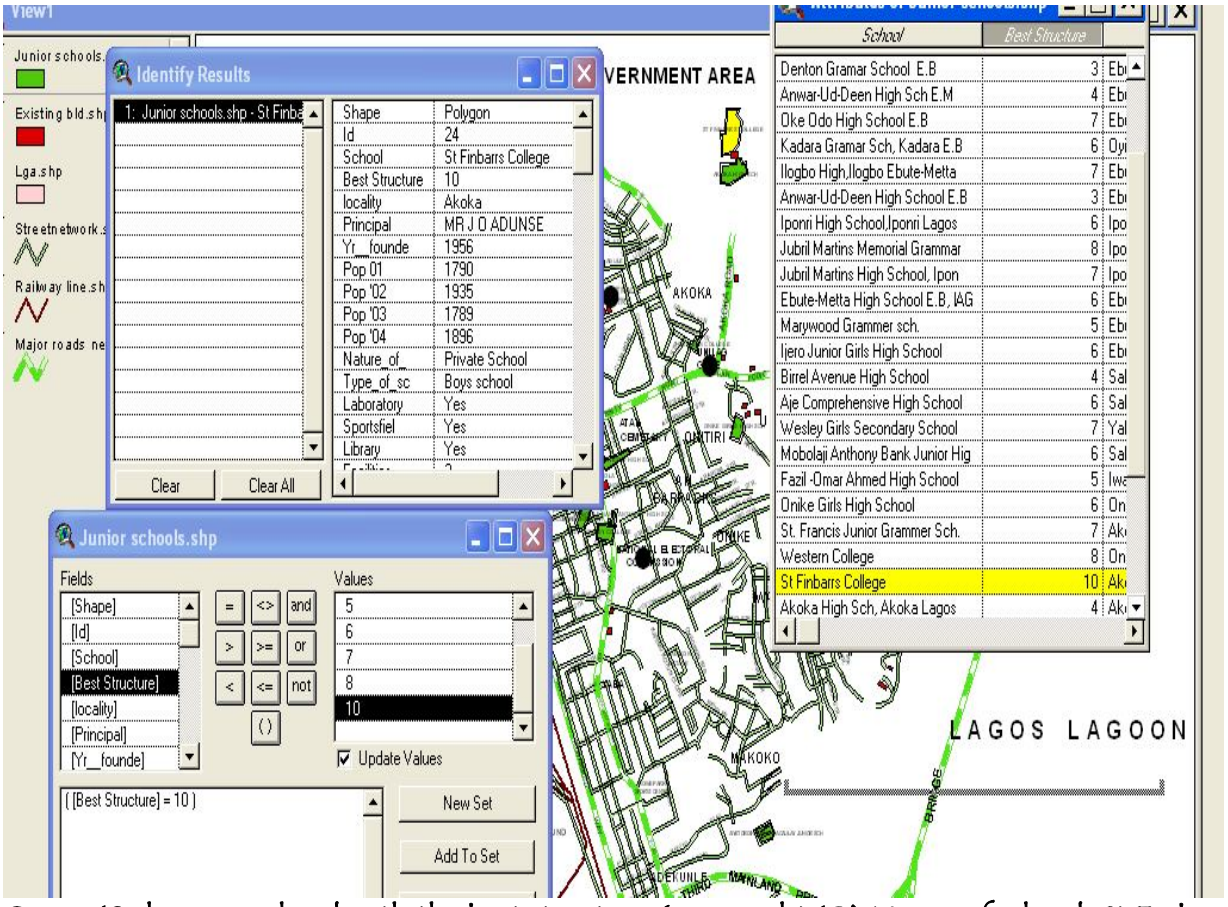
Query 9: Showing 'No Result' for (nature of school)= 'public school' and (lab)= 'No' and (library)='No' and (science 'A' 00)>=40%



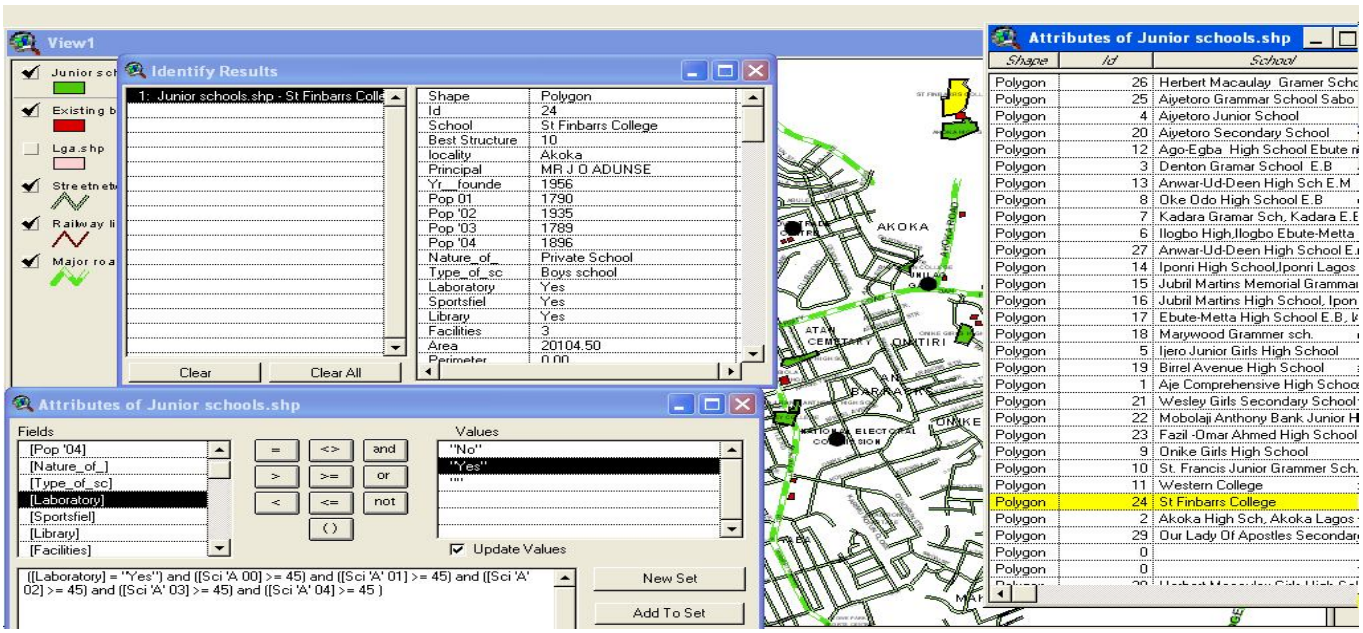
Query 10 Result showing schools with Laboratory & Library & (Eng. 'A' 04)>=50%,(Math 'A' 04)>=50%,
(Science 'A' 04) >=50%



Query 11 showing schools with the highest number of facilities such as Library, Laboratory & Sports field.



Query 12 showing school with the best structure (i.e. weight 10),Name of school: St Finbarr's college



Query 13: Showing School in which at Least 45% of the Students had an 'A' (i.e. 80-100) in Integrated Science from 2000 – 2004 and also has a Laboratory. Name of school: St Finbarr's college.

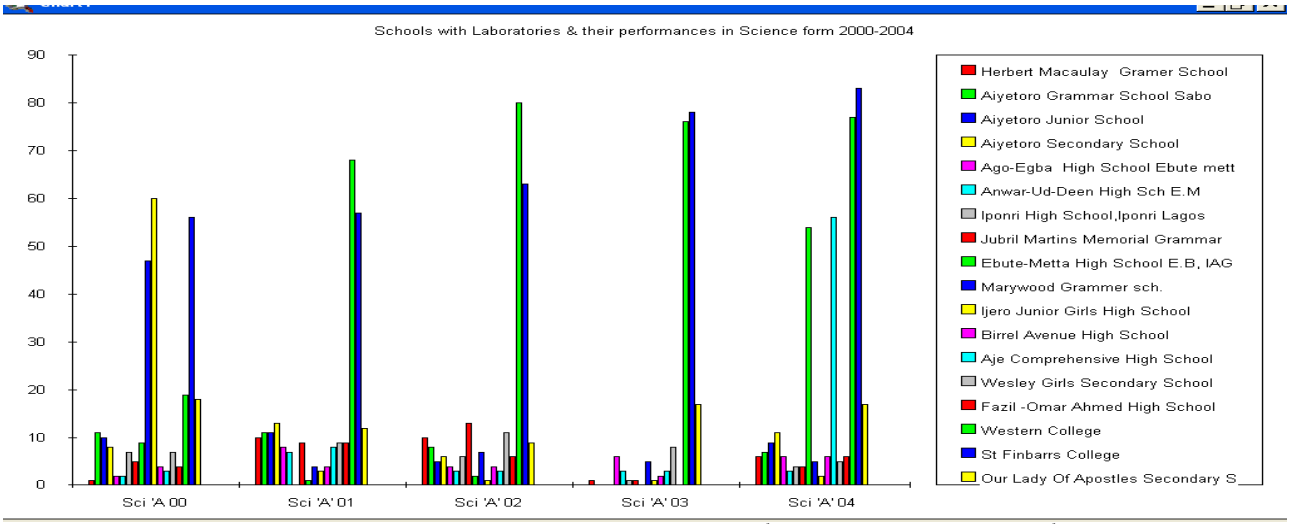


Chart 1: Showing Schools with Laboratories and their Performances in Science from 2000-2004.

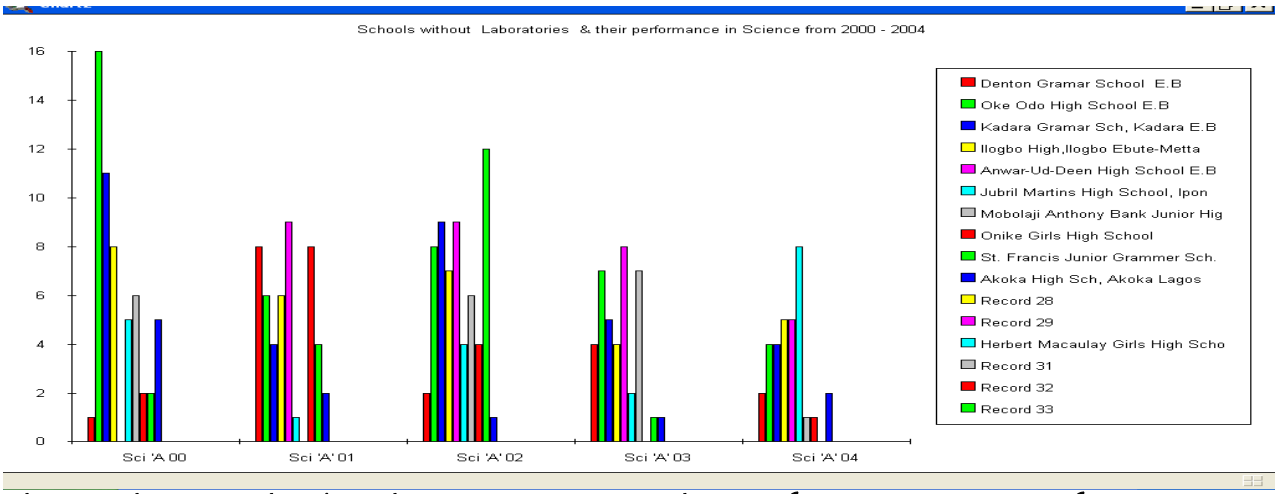


Chart 2: Showing Schools without Laboratories & their Performances in Science from 2000 – 2004.

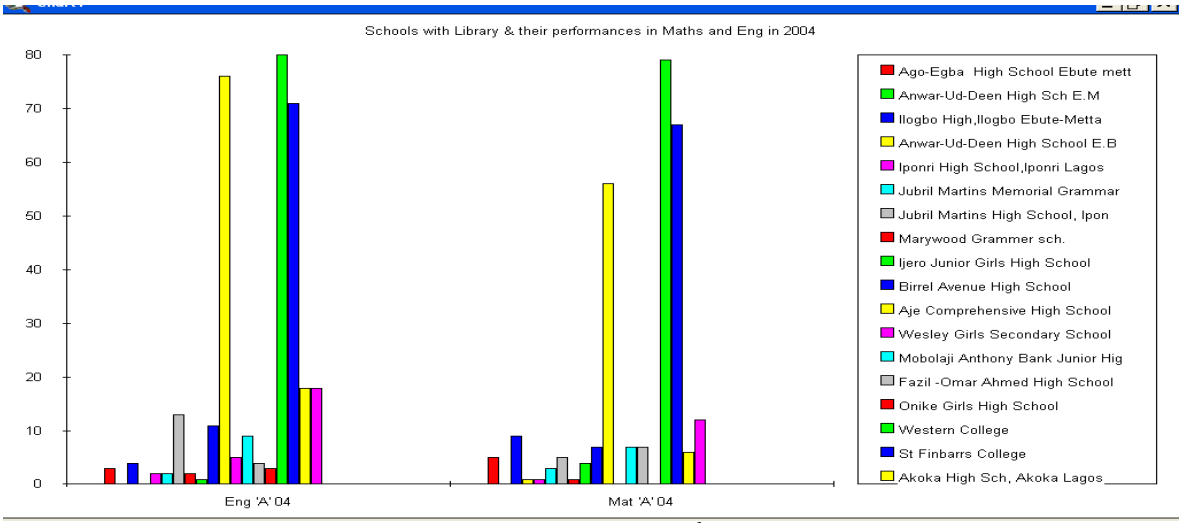


Chart 3: Showing Schools with Library and their Performances in Math and English in 2004.

Reference to this paper should be made as follows: Omogunloye O.G. *et al.*, (2013), Analyses of the performance distribution of Junior Secondary Schools Certificate Examination/available facilities (A case study of Lagos Mainland Local Government Area of Lagos State), *J. of Education and Policy Review, Vol.5, No.1, Pp. 27-47.*