

Vol. 13, Issues 1 and 2; 2007

# **NIGERIAN JOURNAL OF CLINICAL AND COUNSELLING PSYCHOLOGY**

ISSN: 1118 - 4035



**Nigerian Journal**  
**of**

**Clinical and Counselling Psychology**

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**Vol. 13, Issues 1 and 2; 2007**

**ISSN: 1118 – 4035**

# **Nigerian Journal of Clinical and Counselling Psychology**

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**Vol. 13, Issues 1 & 2    ISSN: 1118 – 4035; May & Nov., 2007**

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# **Nigerian Journal of Clinical and Counselling Psychology**

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- (2) A concise abstract of not more than 150 words should be included.
- (3) Authors should follow the reference and citation styles as prescribed in the publication manual of the American Psychological Association (APA).
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**Subscription Rates**

Single copy: US\$10.0

Annual subscription (Two copies): US\$18

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## Editor's Note

This issue marks the thirteenth publication of the *Nigerian Journal of Clinical and Counselling Psychology* and throughout its history has focused on areas of psychology and other related disciplines. The *Nigerian Journal of Clinical and Counselling Psychology* has featured research and theory that have shown understanding of areas of difficulties peculiar to our environment. The quality of submitted manuscripts has steadily increased and our associate editors and assessors confirm this. With the level of enthusiasm shown, researchers in the discipline appreciate the effort of the editor, associate editors whose central role in the ongoing activity of reviewing, processing manuscripts, and recommending publication decisions to the editor. We have had a hard time with some of the publishers producing articles with several errors and this really affected the quality of some of the volumes. Regardless of these handicaps we continue to ensure that we present a high quality Journal.

As from the next edition of the Journal, a new Editor of the Journal, Dr. Oyesoji Aremu, would emerge. Dr. Aremu who is a senior member of the academic is a distinguished alumnus of the University of Ibadan. He has a very sharp research mind with emphasis on cutting edge research works. On this note, this editorial is a valedictory one in which I am bowing out of the University of Ibadan after a service that spans over 30 years. I wish the in-coming editor and his team an all-round success in their endeavours. It is my believe that the excellence the NJCCP is known for will be sustained by the new team.

Cheers!

**Helen O. Nwagwu**  
*Founding Editor*

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# **Assessing the Performance of Secondary Schools Using Data Envelopment Analysis (DEA)**

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## **Abstract**

This study was carried out to evaluate the performance of secondary schools in Ejigbo Local Government Area of Osun State, Nigeria, using Data Envelopment Analysis (DEA). Stratified sampling technique was to select ten schools out of the 17 secondary schools in the Local Government. The sampled schools constitute about 58.8% of the secondary schools in the Local Government Area. A questionnaire tagged: "Secondary School Performance Evaluation Questionnaire" (SSPEQ) was used to collect the data for the study. The results revealed that 50% of the schools were technically efficient, while about 70% of the schools were scaled inefficient. The study also revealed a mean technical efficiency of 92.7% and a mean scale efficiency of 55.7%. The study also showed that there was a need for 7.30% reduction in the inputs of the schools. On the whole. It was found that only two schools were operating at the most productive scale size (MPSS). Based on the findings of this study, recommendations were made that the required amount of inputs needed by each school should be made available and that standard operating procedure should be strictly adhered to in order for the schools to be efficient.

## **Introduction**

Performance measurement of secondary schools is of considerable importance to researchers and practitioners. This is because huge resources are committed to secondary schools. The public want to know whether the outcome of schooling justify the resources expended on them. As a result, there is a need to measure the performance of these schools such that the intended outcome will be revealed and to determine whether the revealed outcome commensurate with the resources used. In achieving this, the first step is the choice of an appropriate measure of performance.

A commonly accepted measure of a performing school is based on the records of its students in public examinations, class size, teacher-student ratio and location of the school. (Maragos and Despotis, 2002). The main issue in school evaluation is the definition of the factors that reflect the performance of the school. A current approach to school evaluation considers the school as production unit that uses multiple inputs (resources) and produces multiple outputs (outcomes). In such a setting, the definition and measurement of the inputs and outputs that reflects the operation of a school for evaluation purpose is not an easy task (Maragos and Despotis, 2002).

In the traditional measure of efficiency, a simple and commonly used method for measuring the efficiency of schools is the performance ratio of output to input (Thanassoulis, 2000). For example, in the school system, the ratio of enrolment to the graduating students is often used as a performance indicator to determine the efficiency of schools (Abdul Kareem, 1998). However, this approach of using traditional measure of efficiency to evaluate the performance of schools may not yield a realistic performance measure in the presence of multiple input and output as in the school system. This approach does not reflect how multiple inputs affect the transformation process of the school being evaluated.

Furthermore, besides giving only the efficiency value, the traditional approach of estimating the efficiency of

schools say little or nothing on what to do on recognizing an inefficient school. It fails to identify the efficient school whose operating practices an inefficient school may attempt to emulate in order to improve its performance. Also, it does not estimate target input and output level which an inefficient school should, in principle, strive to attain to render it efficient.

To this end, an alternative approach of evaluating efficiency of schools that addresses the shortcoming of the traditional approach is inevitable. It is as a result of the shortcoming of the traditional methods of measuring efficiency that motivated the researchers to delve into this study.

Data Envelopment Analysis (DEA), introduced by Charnes, Cooper and Rhodes (1978), is a linear programming method for calculating the relative efficiencies of a set of organizations that possess some common functional traits but whose efficiency may vary due to internal differences such as management style (Mahgary and Lahdelma, 1994). Furthermore, DEA is an empirically based methodology that eliminates the needs for some of the assumptions and limitations of traditional efficiency measurement approaches (Bowlin, 1998).

DEA is commonly used to evaluate the efficiency of a number of producers. It is an extreme point method that compares each producer with only the "best" producers. A fundamental assumption behind DEA is that if a given producer A is capable of producing Y (A) unit of output with X (A) inputs, then other producers should be able to do the same if they are to operate efficiently. In the same vein, if producer B is capable of producing Y (B) unit of output with X (B) inputs then other producers should also be capable of the same production schedule.

Data Envelopment Analysis (DEA) analyses each school by measuring its comparative or relative efficiency with respect to the entire schools being evaluated taking into account all input and output factors at the same time rather than one output to one input at a time. It is an analytical technique that can be used to identify best practice performance in the use of resources among a group of similar

organization (Abbott and Doucoulaigos, 2003). A group of similar organization refers to a set of homogenous units known as Decision Making Unit (DMU) (Charnes et al., 1994).

Different analysis options are available in DEA. Input minimization (or input orientation) instructs DEA to reduce the inputs as much as possible without dropping the output levels. Alternatively, when focus is on raising performance without increasing the resource base, output maximization (output orientation) could be specified. Under this specification outputs are raised without increasing the inputs... The choice of the appropriate orientation is not as crucial as it is in the econometric estimation case and, in many instances, the choice of orientation will have only minor influences upon the scores obtained, (Coelli and Perelman, 1990). Since the introduction of DEA there had been its application to assess the performance of secondary schools in various parts of the world. Notably among these studies are: Chakraborty (2002), in the Kansas State of the United States. Maragos and Despotis (2002) in Greater Athens Area (GAA), Greece. Borge and Naper (2005) in Norway. Alexander and Jaforullah (2004) in New Zealand. Mante and O'Brien (2002) in Australia and Waldo (2002) in Sweden. The application of DEA in determining the performance of secondary schools in most parts of the world is a justification of its ability to estimate comparative rather than absolute performance. This study is therefore carried out to contribute to the existing knowledge in this field.

### **Statement of the Problem**

The growth in importance of performance assessment in recent years has been linked with a concern to ensure that the service represent "value for money". Increasing concern over funding of schools by government and the limitation of the resources available to the education sector has given rise to the demand for greater efficiency and public accountability. This concern reflects the need for comprehensive techniques to assess the degree to which school management practices and education industry structure to promote efficiency in education (Mante and O'Brien, 2001). Premised on the above,

this study was designed to estimate the efficiency of secondary schools, using Ejigbo Local Government Area of Osun State, Nigeria as a case study.

In order to guide this study and explore the problem, the following research questions were raised:

- (i) What are the technical and scale efficiencies scores of secondary schools in Ejigbo Local Government Area of Osun State?
- (ii) Which efficient schools (s) should inefficient schools copy in order for them to be efficient?
- (iii) What target input-output level should inefficient schools strive to attain if they are to operate efficiency?

### **Objectives of the Study**

Due to the shortcomings of using one input to one output ratio approach in evaluating the efficiency of schools there is a need to conduct performance evaluation of schools based on measuring the efficiency of schools relative to other schools. This will give us a more practical and productive efficiency measures as well as information on where to improve efficiency in identified inefficient schools.

The major objective of this study is to estimate performance of secondary school in Ejigbo local government, using DEA as a measurement tool.

This study was conducted to achieve the following specific objectives:

- (ii) Estimate the technical and scale efficiencies of secondary schools,
- (iii) Determine the peer, which inefficient schools should emulate or copy in other for them to be efficient.
- (iv) Estimate the target Input- output level which inefficient schools should be capable of attaining under efficient operation.

## **Methodology**

### **Sample and Sampling Techniques**

The population for this study comprised of the 17 secondary schools in Ejigbo Local Government. Stratified sampling technique was used to select 10 secondary schools for the study and this represents about 58.8% of the total number of secondary schools in Ejigbo local Government. Four schools were selected in Ejigbo central while six schools were selected in the suburbs. Questionnaire, tagged "Secondary Schools Performance Evaluation Questionnaire" (SSPEQ) was used to collect data for the study. The data were analyzed using DEA models developed and descriptive statistics (ANOVA).

### **Data and Model Specification**

Data for this study were collected from the office of the Local Inspector of Education, Ejigbo through a questionnaire tagged, "Secondary School Performance Evaluation Questionnaire" (SSPEQ). The data collected were based on the input and output data needed for the study. They included number of teachers (NOT), number of students (NOS) and teaching hours (TCH) and performance of students in Senior Secondary Certificate Examination (SSCE). Data were also collected on students' academic performance on two important subjects: English Language and Mathematics.

### **Input data**

The teaching resource was the main resource used to increase students' Knowledge. As the first input in the model Number of students (NOS) was used. The students were viewed as a necessary input in the school. The second input was the Number of Teachers (NOT). NOT refers to the number of regular full-time teacher in the school and was used to compute full-time equivalent (FTE) over the school year. The third input was the Teaching Hour (TCH). This is defined as the time allocated to each subjects on the time table per week.

This varies according to school and subject. To handle the teaching hours, the number of periods allocated to each subject was determined and converted to time.

## **Output Data**

In this study the output from educational process was the grades of students in English Language and Mathematics in the Senior Secondary Certificate Examinations (SSCE) between 1998 and 2002. These subjects were regarded as the compulsory and important subjects offered in SSCE. The output measures followed a model for school efficiency developed by Maragos and Deposits (2001). Knowledge was operationlized as the number of students achieving different quality levels, that is, different grades.

## **Model Specification**

DEA models developed in this paper followed the idea of Olesen and Petersen (1995) in measuring transformation of school resources directly into outcomes. These resources include number of students, number of teachers and teaching hours. The model is the overall model that measures for the individual school, the teaching resources required for reaching observed number of students and their distribution among possible grades.

This model was built around the students as an input. The idea is that school produces any output. As a model developed to evaluate the overall activities of each school, three inputs and two outputs were: Performance in English Language (PEL) and performance in Mathematics (PMT).

The model was estimated using input orientation for both a constant return to scale (CRS) and a variable return to scale (VRS) DEA. DEA identifies "peer" schools for an individual school by comparing performance with that of the "best practice" herein is not theoretical as it is practically possible through this analysis that school(s) performing best among its peer is assigned an efficiency score of 1 or 100%.

**Data presentation and Analysis****Table 1: Inputs and Outputs Data**

| School | Number<br>Students<br>(NOS) | Number<br>Teachers<br>(NOT) | of Teaching<br>Hour (TCH) | Performance<br>English in<br>Language<br>Mathematics<br>(PMT) | in<br>(PEL) |
|--------|-----------------------------|-----------------------------|---------------------------|---------------------------------------------------------------|-------------|
| S1     | 1693                        | 31                          | 3.2                       | 35.3                                                          | 44.3        |
| S2     | 1288                        | 33                          | 4.0                       | 72.2                                                          | 65.0        |
| S3     | 498                         | 13                          | 4.2                       | 7.0                                                           | 7.7         |
| S4     | 472                         | 10                          | 4.0                       | 7.0                                                           | 7.7         |
| S5     | 640                         | 19                          | 4.0                       | 4.5                                                           | 5.3         |
| S6     | 688                         | 19                          | 4.0                       | 7.7                                                           | 5.6         |
| S7     | 553                         | 12                          | 3.2                       | 58.2                                                          | 64.5        |
| S8     | 1210                        | 26                          | 3.2                       | 89.4                                                          | 91.3        |
| S9     | 1599                        | 16                          | 3.2                       | 90.7                                                          | 95.6        |
| S10    | 808                         | 13                          | 4.0                       | 40.0                                                          | 30.0        |

**Source: Computed from the data collected**

Table 1 shows the inputs and outputs used in this study. The Table shows that school 1 (S1) had a total of 1693 students with 31 teachers and used 3.2 hours per week to each English Language and Mathematics. The performances in English language and Mathematics were 44.3% and 35.3% respectively. Furthermore school 4 (S4) had a total of 472 students (lowest), 10 teachers and used 4.0 hours per week to teach both subjects. The performance in English Language and Mathematics were 4.5% and 5.3% respectively.

**Table 2: Descriptive Statistics of inputs and Outputs Data\***

| Variable      | Mean  | Standard<br>Deviation | Variance  | Minimum | Maximum |
|---------------|-------|-----------------------|-----------|---------|---------|
| <b>Input</b>  |       |                       |           |         |         |
| NOS           | 945   | 330                   | 109223.07 | 472     | 693     |
| NOT           | 18    | 5                     | 24        | 10      | 33      |
| TCH           | 3.7   | 0.41                  | 0.17      | 3.2     | 4.2     |
| <b>Output</b> |       |                       |           |         |         |
| PEL           | 40.76 | 35.26                 | 1242.95   | 2.6     | 90.7    |
| PMT           | 41.99 | 33.41                 | 111.23    | 5.3     | 95.6    |

\* Computed by the Researchers

**Research Question 1:** What are the technical and scale efficiency scores of secondary schools in Ejigbo Local Government?

**Table 3: Efficiency Scores by BCC and CCR and Scale Efficiency**

| School | Efficiency Score By<br>BCC (T.E) | Efficiency Score by<br>CCR | Scale Efficiency |
|--------|----------------------------------|----------------------------|------------------|
| S1     | 100                              | 46                         | 46               |
| S2     | 80                               | 71                         | 89               |
| S3     | 96                               | 13                         | 14               |
| S4     | 100                              | 10                         | 10               |
| S5     | 84                               | 11                         | 13               |
| S6     | 80                               | 13                         | 16               |
| S7     | 100                              | 100                        | 100              |
| S8     | 100                              | 100                        | 100              |
| S9     | 100                              | 100                        | 100              |
| S10    | 87                               | 60                         | 69               |

Table 3 shows that seven schools (S2 - S5 and S7 - S9) were technically efficient with efficiency score of 100% each, while the remaining three schools (S1, S6 and S10) were technically inefficient. On the scale efficiency, only two schools were scale efficient while eight schools were scale inefficient. This shows that S7 and S8 were both technically and scale efficient. This

means that S7 and S8 operating at the most productive scale size (MPSS).

### Research Question 2:

What efficient school(s) should inefficiency schools copy in order for them be efficient?

**Table 4: Efficient Peers for Inefficient Schools**

| Inefficient School | Efficient Peers | Lambda (/\$.)<br>Values | Most Suitable<br>Efficient Peers |
|--------------------|-----------------|-------------------------|----------------------------------|
| S2                 | S7              | $\lambda_7 = 0.59$      | S7                               |
|                    | S9              | $\lambda_9 = 0.431$     |                                  |
| S3                 | S4              | $\lambda_4 = 0.953$     | S7                               |
|                    | S7              | $\lambda_7 = 0.047$     |                                  |
| S5                 | S4              | $\lambda_4 = 0.196$     | S7                               |
|                    | S7              | $\lambda_7 = 0.804$     |                                  |
| S6                 | S4              | $\lambda_4 = 0.012$     | S7                               |
|                    | S7              | $\lambda_7 = 0.988$     |                                  |
| S10                | S4              | $\lambda_4 = 0.339$     | S7                               |
|                    | S7              | $\lambda_7 = 0.661$     |                                  |

Table 4 indicates that for S2, S3, S5, S6 and S10 to be efficient, they should copy the operating practices of S7 which is an efficient peer operating at the most productive scale size. This is because S7 appears as an efficient peer for all the inefficient schools. Hence, it is the most suitable efficient peer whose operating practices should be studied and emulated by the inefficient schools.

### Research Question 3

What target input-output level should inefficient schools strive to attain if they are to operate efficiently?

**Table 5: Target inputs and Outputs for inefficient schools  
S2, Efficiency: 80%**

|               | <u>Actual Target To Gain(%)</u> |      |      |
|---------------|---------------------------------|------|------|
| <b>Input</b>  |                                 |      |      |
| NOS           | 1288                            | 1004 | 22   |
| NOT           | 33                              | 14   | 57.6 |
| TCH           | 4.0                             | 3.2  | 20   |
| <b>Output</b> |                                 |      |      |
| PEL           | 72.2                            | 72.2 | 0    |
| PMT           | 65.0                            | 77.9 | 16.8 |

**S3, Efficiency: 96%**

|               | <u>Actual Target To Gain (%)</u> |     |     |
|---------------|----------------------------------|-----|-----|
| <b>Input</b>  |                                  |     |     |
| NOS           | 498                              | 476 | 4.4 |
| NOT           | 13                               | 10  | 13  |
| TCH           | 4.2                              | 4.0 | 4.8 |
| <b>Output</b> |                                  |     |     |
| PEL           | 7.0                              | 7.0 | 0   |
| PMT           | 7.7                              | 8.1 | 5.2 |

**S5, Efficiency: 84 %**

|               | <u>Actual</u> | <u>Target</u> | <u>To Gain(%)</u> |
|---------------|---------------|---------------|-------------------|
| <b>Input</b>  |               |               |                   |
| NOS           | 640           | 537           | 16                |
| NOT           | 19            | 12            | 36.8              |
| TCH           | 4.2           | 3.4           | 15                |
| <b>Output</b> |               |               |                   |
| PEL           | 7.7           | 47.7          | 519.5             |
| PMT           | 5.6           | 52.9          | 844.6             |

**S6, Efficiency: 80%**

|               | <u>Actual</u> | <u>Target</u> | <u>To Gain (%)</u> |
|---------------|---------------|---------------|--------------------|
| <b>Input</b>  |               |               |                    |
| NOS           | 688           | 552           | 19.8               |
| NOT           | 19            | 12            | 36.8               |
| TCH           | 4.0           | 3.2           | 20                 |
| <b>Output</b> |               |               |                    |
| PEL           | 2.6           | 57.6          | 2115               |
| PMT           | 10.6          | 63.8          | 501.9              |

**S10, Efficiency: 87%**

|               | Actual | Target | To Gain (%) |
|---------------|--------|--------|-------------|
| <b>Input</b>  |        |        |             |
| NOS           | 808    | 526    | 34.9        |
| NOT           | 19     | 12     | 15.4        |
| TCH           | 4.0    | 3.5    | 12.5        |
| <b>Output</b> |        |        |             |
| PEL           | 40.0   | 40.0   | 0           |
| PMT           | 30.0   | 44.4   | 48          |

Table 5 shows the target input and output levels which S2, S3, S5, S6 and S10 must strive to attain if they were to operate efficiently. For instance, for S2 with efficiency score of 80% to be efficient it needs to reduce the number of its students from 1288 to 1004, reduce the number of its teachers from 33 to 14 its teaching hour from 4.0 to 3.2. This will increase the performance in English Language from 65% to 77.9% while the performance in Mathematics remains 72.2%.

### Discussion of Findings

The results of the study showed an average technical efficiency for all the schools evaluated to be 92.7 (SD 8.47) and an average scale efficiency of 55.7 (SD 38.07). Overall, the technical efficiency. Score of the secondary schools appears to be high. This suggests that they were using the right amount of inputs to produce their inputs by 8.3% and still maintain the present level of performance. In the same vein, the low scale efficiency score indicates that an increase in the level of output of the efficient schools will not yield a corresponding increase in the output except in S7, S8 and S9 which were both technically and scale efficient. Therefore, S7, S8 and S9 were operating at the most productive scale size. It could therefore be deduced that the problem being faced by most of these schools had to do with their scale of operation and not managerial problem which would have arisen if they were technically inefficient.

The result has shown that for S2, S3, S5, S6 and S10 to be efficient they needed to copy the operating practices of S7

which was the most suitable efficient peer in terms of frequency of use as an efficient peer and contribution to be efficient peer. To do this, they needed to adjust their operating practices in line with the referent school (S7). Also the inefficient schools should adjust the values of their inputs and outputs to attain the set targets (Table 5). These targets are input-output levels which, in principle the schools should strive to attain to become efficient. Consequently, adjustment to the inputs and/or outputs of an inefficient school to reach the set targets would mean that, in principle that school would get a relative efficiency of 1.0.

### **Management implications of the Findings of this Study**

The fact that most schools evaluated in this study were technically efficient implies that they were using the needed amount of inputs to produce their present levels of output. This means that resource allocation to schools in Ejigbo Local Government should be based on the need of individual school as shown by the results of this study. This is because most schools were over-resourced.

On the other hand, the low scale efficiency observed in most of the school implies that their present inputs usage was not leading to proportionate increase in outputs. Therefore the institutional management should reduce their inputs to maintain their present level of outputs as it is also shown by the outcomes of this study.

In the same vein, the time allocated to each subject on the timetable should be based on the needs of subject and should be managed in such a way that would achieve the desired results shows that most schools which allocate extra periods for English Language Mathematics were not efficient. The result therefore does not go against allocating extra periods for subjects, but it stresses that the time be managed to achieve the objective for which it is allocated.

## Conclusion

Taken as a group, the secondary schools in Ejigbo Local government were performing well relative to each other. This is as a result of the high level of technical efficiency scores recorded by most of the schools evaluated. However it cannot be concluded that there is no scope for improvement in efficiency. The results indicate homogeneity in performance of secondary schools across the Local Government. We do not rule out the possibility that the entire system may be under performing, nor can it be concluded that the schools evaluated were efficient when compared with other secondary schools within the state.

The high mean technical efficiency score suggests that the management, both at system and school levels were performing well while low mean scale efficient score indicates that most of the schools had problems with their size. That is, they were not operating at productive scale size. Overall, the study indicates that there was room for improvement in many schools. More importantly, state-wide and national comparisons are needed since the secondary schools surveyed were also producing students to the same labor market.

## Recommendations

Based on the findings of this, the following recommendations were made:

1. The required amount of inputs needed by each school to perform optimally should be made available.
2. The inefficient schools should be allowed to emulate or copy the operating practices of the most productive schools so as to improve their performance.
3. The schools should maintain their present scale of operation or scale size in order for them to be scale efficient.
4. The standard operating procedure of schools should be followed by each school as laid down by the Teaching Service Commission, the coordinating body in the management of secondary schools in the state.

5. This would assist the schools to achieve the objectives for which they were established.

## References

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