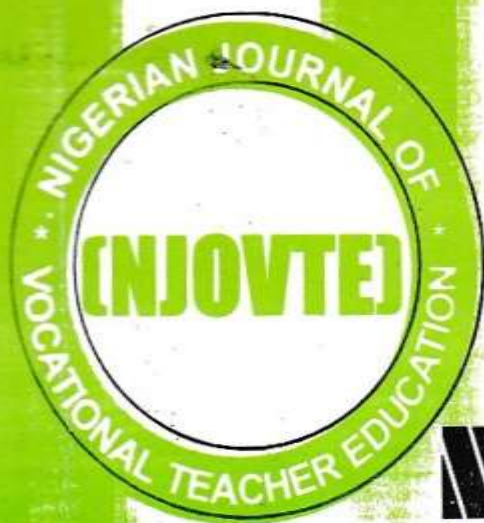


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## **DETERMINATING THE EFFICIENCY OF CLASSROOM TEACHERS USING DESCRIPTIVE STATISTICS**

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### **ABSTRACT**

This study aimed at determining the efficiency of classroom teachers through the use of descriptive statistics - mean, median, standard deviation and skewness on students' scores in tests. A case study was carried out using a school in Akwa Ibom State. A total of 23 students and three teachers were involved in the study. Three consecutive tests scores in English, Mathematics and Biology of SS 2 Students in the chosen school were analysed. The result showed the Biology teacher as being most efficient. A recommendation was made for replication of the present study as well as extending its scope.

### **INTRODUCTION:**

Dissatisfaction is often expressed by parents and the society at large on the "fallen" standard of education. While a lot of people, including parents are being blamed for the ugly situation, it should be mentioned that the standard of education per se has not fallen. A cursory look at the recent curricula in schools shows improved quality learning experiences prescribed for learners. In terms of quality and depth of coverage, the present curricula are of higher academic standard than the previous ones. The problem is really with the output of education not necessarily with the standard. School leavers and graduates from institutions of higher learning are no longer capable of functioning at the level expected of them. In every system, be it mechanical or human, to basic things determine the quality of the output. These are the input and the channel involved. The two are mutually related and inseparable.

The expected input is made up of all learning experiences provided for by the curriculum as well as extra curricula activities under the auspices of the school. These experiences (input) are influenced by teacher's familiarity with the experiences and his ingenuity. In most cases, therefore, the actual input is less than the expected input. The actual input could also be regarded as the "teacher's output". In other words, teacher's knowledge of the subject matter and the use of appropriate instructional strategies, learning materials and

assessment tools, his personal attitude to work and interest in students' progress, integratively determine the actual input.

On the other hand, the channel in educational system is the student. The intensity and quality of the output (Student's) depends not only on the actual input but also on the channel. Student's interest, readiness and willingness to learn cannot be overlooked. However considering the expected role of the teacher, it could be argued that even the channel(Student) is controlled by the teacher. A resourceful teacher can cause his student to be both interest and willing learn. Therefore, to a very large extent, the actual output by the student, that is, student's performance depends on the actual input which is the teacher's output.

It is against such background that it could be reasonable to determine the teacher's efficiency based on student's performance. This can be expressed as follows:

$$\text{Teacher's Efficiency} = \frac{\text{Actual input}}{\text{Expected input}}$$

This ratio is same as  $\frac{\text{Actual output by student}}{\text{Expected output by Student}}$

This shows that Teacher's Efficiency is directly proportional to the actual output by the student. It is therefore not out of place to measure teacher's efficiency using students' performance.

#### **Purpose of the Study:**

Generally, summative evaluation of staff may be defined as the act of doing one or more of the following:

- a) performance appraisal;
- b) merit rating; and
- c) efficiency rating (Ikueobe, 1981)

The present study focussed on efficiency rating. This has to do with periodic appraisal of employee's work performance, usually on the basis of factors which are seen to measure the most important qualities required on his job (Ikuenobe, 1981).

Specifically this study intends to employ some descriptive statistics in determining the efficiency of the teacher, using student's performance. The study is significant in the sense that the findings may serve as a working tool towards solving an age long problem of measuring productivity among teachers. Presently teacher's promotion is based primarily on years of service. This does not seem to be fair to the profession because it does not encourage excellence. Quality service should rather be the basis for promotion, primarily.

#### **Research Questions:**

The following questions are posed in the study:

1. How can the descriptive statistics be used in determining the efficiency of a classroom teacher?
2. What are the problems involved in using descriptive statistics for the purpose of determining teachers' efficiency?

Using descriptive statistics to determine the efficiency of the teacher

Descriptive statistics is of immense importance to both researchers in the field of education and classroom teachers. From the review of literature, a researcher can discover the trend of research studies on a particular problem, using the concept of the mode (Onwioduokit, 1977).

A classroom teacher who keeps weekly test scores records, for instance, could discover, through the use of a bar graph, the performance of the majority of students. All things being equal, the majority of students should have about an average score in the distribution. If this is not so, the distribution is said to be skewed. This can be positive or negative as shown graphically in Figures 1 and 2 below:

Figure 1: Positive skewness

Figure 2: Negative skewness

Positive skewness implies that the performance of most students in a test is less than the mean performance of the class. This is generally a poor result.

**Possible reasons include:**

- i) the test may have been too difficult;
  - ii) the teacher may not have gotten students of low and average ability levels fully involved in the lesson. He may have only concentrated on those with high ability.
  - iii) teaching may not have been done effectively
  - iv) students may not have generally understood the lesson.
- On the other hand, negative skewness implies that most students perform above the class average.

**Possible reasons include:**

- i) the test may have been too simple for the students;
- ii) the lesson taught may have been well understood by the students;
- iii) teaching may have been effectively done in terms of the use appropriate teaching method, instructional materials, etc.

It is worthwhile to note that students' performance depends largely on their understanding of the lesson from which test items were drawn. Students' understanding in turn, to a great extent, depends on the teacher and teacher related factors.

In assessing the teacher's efficiency, the mean, median (or mode) and the standard deviation of the students performance are required. While each of these could be used in isolation to show how efficient or otherwise a teacher is, the most reliable and best descriptive measure is obtained with the combination of all to give skewness. This is given mathematically as follows:

$$\text{Skewness} = \frac{3(\text{mean} - \text{median})}{\text{Standard deviation.}}$$

For example, a skewness of say 0.64 suggests that 64% of the class obtained scores lower than the class mean. A decrease in positive skewness implies better

performance and hence higher level of teacher's efficiency. An increase suggests the opposite. These deductions are reversed for negative skewness.

Judging from mean and standard deviation, the followings are deducible, given, for example, that three terminal results yielded; ( $\mu_1 = 58$ ,  $\mu_2 = 65$  ( $\mu_3 = 68$  and the corresponding standard deviations of  $\sigma_1 = 8$ ,  $\sigma_2 = 5$  and  $\sigma_3 = 3$ , respectively.

In this example, assuming the levels of difficulty of the tests is not significantly different, the increased mean performance indicates an improvement in the achievement of students and a corresponding improvement in the efficiency of the teacher. In a similar way, the decrease in the standard deviation (and also variance) from term to term indicates that the students' achievement becomes more homogenous each new term. This means that the gap between the high achievers and the low achievers is reduced from term to term so that the scores cluster more and more round the mean. Every teacher should aim at such results - increasing class mean and decreasing standard deviation. Absence of such a trend suggests inefficiency on the part of the teacher.

**Method:**

The study made use of tests performances of Senior Secondary two (SS 2) students in the same school. Performances in three tests, each, in English, Mathematics and Biology were used. The rationale for using the same school and same students was to control for school and student variables likely to adversely interact with the research setting. The three subjects were chosen because majority of the students in the chosen school offered the subjects.

A total of 23 (twenty-three) students had three tests scored in each of the three subjects considered. The performances of the students were analysed using mean, median, standard deviation and skewness index. These altogether were used to determine the most efficient of the three teachers.

**Result and Discussion:**

From a case study of a school in Akwa Ibom State, the performance of students in three subjects are as shown in Table 1

Table 1: Test Results of SS 2 Students in English, Mathematics and Biology.

Maximum Score for each Test = 30

S/NO	ENGLISH			MATHEMATICS			BIOLOGY		
	1	2	3	1	2	3	1	2	3
1.	9	8	7	3	2	8	5.0	5.0	5.0
2.	1	2	3	3	4	5	8.0	7.0	6.5
3.	5	7	5	4	7	0	7.0	6.5	7.0
4.	9	3	4	2	3	6	5.0	5.0	5.0
5.	8	2	1	6	3	7	5.3	6.5	6.0
6.	7	1	0	3	2	5	7.2	6.5	5.0
7.	4	2	4	3	7	6	7.0	6.0	6.5
8.	7	7	3	3	3	4	6.0	5.0	5.5
9.	8	4	1	6	6	7	6.0	6.0	5.0
10.	0	2	1	3	6	5	6.0	6.5	6.8
11.	8	9	7	3	1	0	5.0	5.0	5.0

S/NO	ENGLISH			MATHEMATICS			BIOLOGY		
	1	2	3	1	2	3	1	2	3
12.	0	0	0	0	0	0	6.0	6.5	6.0
13.	0	1	0	6	1	0	7.0	6.5	6.0
14.	0	2	0	5	1	6	6.0	6.5	5.0
15.	6	9	7	3	6	9	6.9	5.7	6.0
16.	0	0	0	0	0	0	5.0	6.0	5.0
17.	8	2	7	4	1	5	6.8	7.1	6.0
18.	8	8	9	4	1	5	6.8	7.1	6.0
19.	8	5	5	2	3	4	7.7	5.7	6.0
20.	2	4	2	4	5	6	6.9	7.2	5.5
21.	8	3	0	6	7	0	5.0	5.0	5.0
22.	5	1	0	8	5	5	3.0	5.0	3.0
23.	3	9	0	4	8	8	6.0	6.2	5.8

Using the raw scores of students in the tests as shown in Table 1, mean, median standard deviation and skewness were computed for each test and for each subject, as shown in Table 2.

**Table 2:** Mean, Median, Standard Deviation and Skewness of Students' Performance on English, Mathematics and Biology Tests.

Descriptive Measures	English			Mathematics			Biology		
	1	2	3	1	2	3	1	2	3
Mean, X	4.96	3.96	2.87	3.91	3.78	4.48	6.16	5.97	5.61
Median	06	03	02	4	3	5	6	6	5.8
Standard deviation	3.43	3.10	2.97	2.09	2.52	2.98	1.10	0.76	0.87
Skewness	-0.91	0.93	0.88	-0.13	0.93	0.52	0.44	-0.12	-0.66

As shown in Table 2 above, judging from the mean performance of the students in each subject, it could be seen that the Mathematics teacher has the best performance best seconded by the Biology teacher. Although mean performances of English and Biology students decreased from term to term, and change is more pronounced in English than in Biology.

Using standard deviation, the table shows that students' scores in English clustered closer and closer with terms, implying a gradual bridging of the gap between the high and the low achievers. This was a complete opposite with respect to students' scores in Mathematics. In this case, the scores in the first test clustered most around the mean while those from the third test clustered least. This in general is a poor trend and does not show progress in the performance of the teacher. In Biology the scores clustered most in the second test. The decrease in the standard deviation between 1st and second tests shows progress in the performance of the teacher. However, the value increased in the last test.

Using skewness as a comprehensive index of teachers' efficiency, Table 2 shows that the English teacher performed poorly between the first and the second test. At first 91% of the students have scores which were higher than the mean. But in the second

test 93% of students have scores below the mean even though the mean of the second test was lower than that of the first. This is a serious twist. The percentage was however reduced to 88% at the third test. A similar trend is seen for Mathematics. The performance of the Mathematics teacher is almost as poor as that of the English teacher. The best performance is seen with Biology. At the first test, 44% of the students have scores below the class mean performance. There was an improvement in the second test in that 12% of the students had scores above the mean. This improvement was however not maintained.

In order to get the index of efficiency of the teacher, it is necessary to find the mean of skewness for each subject. In doing this, only the skewness suggesting the percentage of students with performance above the class mean was used. In English therefore the mean skewness equals  $(0.91 + 0.07 + 0.12) / 3$  which is 0.37. For Mathematics it is  $(0.13 + 0.07 + 0.48) / 3$  which is 0.23.

Biology has the mean value of skewness as  $(0.56 + 0.12 + 0.66) / 3$  which is 0.45.

From Table 2 therefore the indices of efficiency for English, Mathematics and Biology teachers in the case study, are 0.37, 0.23 and 0.45, respectively. Biology teacher is therefore the most efficient of the three, based on the tests scores. He could therefore be rewarded or promoted based on his efficiency which suggests his productivity.

Biology teacher being most efficient here could result from the fact that students often consider Biology as being simpler than Mathematics or English. This depends more on attitude than facts. Attitude itself can be changed by a skillful teacher. However, attempting to determine the efficiency of a classroom teacher using descriptive statistics is not without some problems. The foremost include unequal distribution of learning materials, difference in difficulty indices of subjects and other environmental conditions. But it is worth noting that although the exercise could be cumbersome, it is useful.

### **Conclusion and Recommendations:**

The problem of assessing and using the productivity of teachers as the basis for rewards or promotion in teaching profession is an age-long one. The present study has attempted to proffer solution by applying descriptive statistics on the students' scores in three consecutive tests in three subjects.

It is recommended that more studies be carried out to investigate other ways of establishing the efficiency index of the teacher. The present study is also recommended for extension in scope and cross-validation.

### **REFERENCES**

- Ikuonobe, A. O. (1981). Staff Evaluation. In J. A. Aghenta and E. A. Arubayi (eds) *Towards Efficiency in School Administration*. Benin: Institute of Education, University of Benin.
- Onwioduokit, F. A. (1997). *Educational Research Methodology and Statistics* (in Press).