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# Efficiency of Primary Education in Bangladesh: A Case Study of Jhenaidah District

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## Abstract

Attempt is made in this paper to develop a measure of efficiency for education system based on academic performance of students. Advantage of the proposed measure is that it can be used at each and every situation, for individual school to national level, for sub system to aggregate system and for uniform and multi-channel education systems. Efficiency of the existing multi-channel primary education is compared with a proposed uniform and universal primary education in Bangladesh by using the proposed measure. Results obtained are observed to be useful and encouraging.

**Keywords and Phrases:** System efficiency, Efficiency measure, Multi-channel education, Universal Primary education.

**AMS Classification:** $97B_{xx}$.

## 1 Concept of Efficiency in Education

At the verge of the First World War, Britain desired to speed out its munition products. But it was reported that the total cost of production increases with the speed out of work performance because speeding up of production involves a definite increase of energy needed. This leads to the investigation, as reported by Major Greenwood (1919), "..... What are the conditions, excluding those determining the efficiency

of inanimate machines, which help or hinder industrial output? In other words – what are the factors of human efficiency?" With this end in view, perhaps, the first systematic study on organizational behavior started. As desired by Greenwood (l.c), British Institute of Management (BIM) formulated a Standardized measure of efficiency for comparing the health of different industries from the economic point of view.

For a given set of inputs, efficiency of the industry is defined as the ratio of actual to maximum possible output which is always less than or equal to one. Murray and Frenk (1999) defined health system efficiency in the same line. In case of a industry, actual output may be zero in the absence of inputs. But it is not true for health system because all people cannot be ill simultaneously.

The notion of efficiency, in the modern times, applies to a remarkably large number of fields beyond industry or economy, including education. Though the educators often feel ambivalent about the per suit of efficiency in education. Some people think that efficiency is a good and worthy goal; while others are worry that efforts to improve efficiency will ultimately undermine the quality education. The concept of efficiency is often connected to a moral imperative to obtain maximum output from limited resources. In relation to education various outcomes can result from a variety of different combinations of inputs such as teachers, buildings, class size, curriculum etc. A teacher may be thought of as an ingredient of input while teaching is an important part of output process. Callahan (1962) viewed the educational efficiency as a function of scientific management. Sheenan (1973) discussed this problem at length and concluded that education system in practice have no single well defined function as such no single defined indicator of output.

## 2 International Indicators of Educational Efficiency

Having no unique relationship between the resources invested and education results, policy decisions are heavily dependent on indicators, as tools for analyzing these relations. Education committee of OECD countries in collaboration with World Bank (B. Bruns, A. Mingat and R. Rakotomalala, 2003) considered four indicators for quality and efficiency of education. These are,

1. Average annual teacher's salary as compared to per capita GDP,
2. Pupil – teacher ratio,
3. Expenditure on teaching aid and co-curricular activities, and
4. Average failures rate.

The member states of European Union (EU) considered the following indicators of education for the improvement of the quality and effectiveness in the EU (European Council, Lisbon, 2000):

1. Overall education expenditure,
2. Per pupil/student expenditure,
3. Relationship between the PISA testing results and cumulative expenditure per pupil,
4. Drop-out rate,
5. Average schooling duration.

In USA, education is the responsibility of states and the states have made efforts to define the outcomes they seek from their education system, popularly known as standards. Each state articulate their desired outcomes and provide flexibility to the districts, schools, administrators, teachers and students to meet the standards in ways that make the most sense given local circumstances. Generally, states are setting minimum standards that can be exceeded by local authorities, individual students. The American system recommends the following indicators as measures of educational efficiency (Tayck, 1974):

1. A relative mix of performance outcomes of standardized test scores and value added by schooling,
2. The degree of performance across students,
3. The level of capacity at which the system operates.

## 3 Literature Review

Ruben Klein (1998), in measuring internal efficiency of Brazilian school system recommended the following indicators of efficiency:

1. The enrolment by grade and age,
2. The transition rates between grades, that is, the promotion, repetition and drop-out rates,
3. The percentage of an age cohort which has access to school and at which age,
4. The percentage of a school cohort which concludes each grade and graduates,
5. What the students know and are able to do at each or some grades,
6. The available resources to finance the system and how it is being spent.

Klein (l.c) conducted his study using indicators (i) – (iv) through the transition rates and its derived measures. To give some idea on (v), Klein (2011) himself studied the PISA and some other standardized test scores and concluded that standardized tests fail to measure the differential effects on scores to variation in input ingredients.

Kamat (1968) gave a mathematical formulation of markovian type to estimate wastage due to dropout and leakage. A detailed study of dropout situation of Bangladesh (the then East Pakistan) was performed by the planning department in 1968-69. Alamgir (1973) studied dropout as a part of a model for planning the manpower educational system of Bangladesh. He considered dropout as a function of the recurring expenditure by the Government. He also evaluated shadow prices of persons with different level of education. Nuruzzaman (1977) computed the parameters of the schools system in Bangladesh using a model of markavion type with fixed transition ratio. An Asian model of education due to UNESCO was tried partially by Patwrri (1977) for Bangladesh to predict enrolments and teacher requirement for various level of education. Mian (1979) made a case study of enrolment trends and pattern for Bangladesh at primary level. He also studied dropouts by sex from socio-economic points in view followed by average time required to pass the primary level of five years duration along with the cohort proportion passing the primary level as indicators of efficiency of primary school system. Nath (2006) studied the internal efficiency of secondary education in Bangladesh as the ratio of expected pupil years to complete the cycle by the graduates to the total pupil years actually spent to produce those graduates expressed in percentage. Quader, Saleh and others (1979) studied capacity utilization as measure of efficiency in primary education sector of Bangladesh.

## 4 Efficiency in the Present Study

The fifth indicator of Ruben Klein (l.c) is not studied elsewhere at length. From statistical points in view, efficiency is a measure of performance variability. The standardized test scores used by American and British system fail to measure this variability. Efficiency of a system, unlike an estimator or a test statistic, is a complex thing and difficult to define. It depends on many factors like working manpower, management, machines, materials, environment, etc.

In a school system, students are the materials, teachers are working manpower, school authorities, that is, Govt. officials and local managing committee who supervise the school activities is the management, training of teachers inclusive of educational equipments may be considered as machineries, school buildings, furniture, local atmosphere, co-operation of guardians etc. may be included in the school environment. All these together are responsible for the output, that is, performance of students in their school final examination.

At the very first outlook, school final results are considered as the output of schools and a measure of school efficiency. Assuming the students to be uniform, variability in individual results may be considered as random effect of school system. Aggregation

of variability of all schools of one stream may be considered as the stream variation and aggregate variation of all the streams accounts for total variation in the system.

## 5 A Measure of Efficiency for Education system

Efficiency of a system is a measure of closeness of its ideal (maximum) and actual performance (Murray and Frenk, l.c). The measure should be such that inter unit comparison within the group and inter group comparison within the overall system are possible. Again, efficiency by a system may very over time and should have room for comparison over time.

Ideal performance is always unique while actual performance is a variable overtime, space and individuals measured in terms of average score ($\mu$) in the school system along with a measure of dispersion about the average.

Generally, we use standard deviation ($\sigma$)as a measure of dispersion and dispersion per unit mean is termed as coefficient of dispersion (C.D).

Thus, the absolute efficiency of school system, sub-system or individual schools may be defined as

$$E = \ 1 - C.D = 1 - \ \frac{\sigma}{\mu} = \ \frac{\mu - \sigma}{\mu}.$$

Where $\mu$ and $\sigma$ are the mean score and standard deviation of scores respectively for the whole system, sub-system or individual schools as the case may be.

Replacing $\mu$ and $\sigma$ by their sample estimates $\overline{y}$ and $s$ we may write estimated efficiency of our Primary education system in term of examination scores based on terminal competencies as

$$\hat{E} = \ \frac{\overline{y} - s}{\overline{y}}$$

$\Longrightarrow 100\hat{E} = 100 - C.V$ (Coefficient of variation).

$100\hat{E}$ being the percent efficiency of the systems.

For the stream $i$ , $\hat{E}_i = \frac{\overline{y}_i - s_i}{\overline{y}_i}$ and for $jth$ schools in the $ith$ stream, it is $\hat{E}_{ij} = \ \frac{\overline{y}_{ij} - s_{ij}}{\overline{y}_{ij}}$

Relative Efficiency of sub-system r with respect to sub- system s is defined as

$$(RE)_{rs} = \ \frac{E_r}{E_s} \ ; r, \ s = 1, \ 2, \ 3.$$

In a similar manner, relative efficiency of school $l$ with respect to school $m$ of sub-system $(strem)_i$ may be defined as

$$(RE)_{lm:i} = \frac{E_{li}}{E_{mi}} \ ; i = 1, 2, 3; l, m = 1, 2, \ \ldots\ldots\ldots n_i$$

## 6 Data source

Data for this study is collected from Moheshpur Upazilla, Jhenaidah district of Bangladesh under the supervision of the department of statistics, Rajshahi University in connection with a doctoral research - 'Demand for Universal Primary Education in Bangladesh' during October, 2012. A two stage stratified PPS sampling design is used to select the target students for school final examination. Selected students are tested with set questionnaires of multiple choice (MC) covering their curriculum and terminal competencies. Two separate tests are conducted with an interval of one month, one under existing multi-channel system and the other under proposed uniform and universal system. The test scores so obtained are the raw materials of this study.

The following three major streams of education is running at the primary level of Bangladesh:

1. General stream – the left out of British system # 151.
2. Ebtedayee Madrassa stream – the left out of Darse-Nizami system # 24.
3. Kindergarten stream – local version of Anglo-Missionaries system # 38.

Second stratum is comparatively smaller than the first stratum. We had no monetary support to cover all the schools under study. So, we have consider one institution from the smallest stratum and proportional number from the other two stratum, in total (6+1+2) = 9 institution. Number of students of each institution in class V within each stratum is considered as weight for PPS sampling to select individual institutions from each stratum.

General stream has 50 terminal competencies in the curriculum. It is 47 for Ebtedayee Madrassa stream and 72 for Kindergarten stream. 28 terminal competencies are common in the three streams. In total, there are 76 independent terminal competencies for the three streams. 76-28 = 48 terminal competencies are varying among the three different streams. Out of these 48 different terminal competencies, 30 are selected on choice of 523 pre-selected respondents on a mixed sampling design from among the guardians, teachers, social leaders and educational administrators checking reliability and validity of the selected items. Newly selected 30 terminal competencies in addition to the common 28, in total (28+30) = 58 terminal competencies formed the basis of the proposed uniform and universal model for primary education in Bangladesh. Results of the findings on the basis of section 5 using data generated by section 6 are displayed in table 1 and 2.

**Table 1.** Efficiency of Primary Education by schools under existing (E) and proposed uniform and universal model (U)

| Streams (1) | Schools (2) | Students (3) | Mean score (4) | | Std. Deviation (5) | | Estimated Efficiency (6) | | Relative Efficiency of U with respect to E (7) |
|---|---|---|---|---|---|---|---|---|---|
| | | | E | U | E | U | E | U | |
| General | 1 | 74 | 72.50 | 82.64 | 9.228 | 9.080 | 0.873 | 0.890 | 1.0194 |
| | 2 | 27 | 75.37 | 83.74 | 8.376 | 8.996 | 0.889 | 0.893 | 1.0045 |
| | 3 | 45 | 72.18 | 83.09 | 8.734 | 8.142 | 0.879 | 0.902 | 1.0261 |
| | 4 | 31 | 73.06 | 83.22 | 8.652 | 6.930 | 0.882 | 0.917 | 1.0396 |
| | 5 | 19 | 70.89 | 80.39 | 10.440 | 10.067 | 0.852 | 0.875 | 1.0269 |
| | 6 | 47 | 74.02 | 86.80 | 8.427 | 6.492 | 0.886 | 0.925 | 1.0440 |
| Ebtedayee Madrassa | 1 | 58 | 65.98 | 78.45 | 9.731 | 9.256 | 0.852 | 0.882 | 1.0352 |
| Kindergarten | 1 | 22 | 75.73 | 86.18 | 9.473 | 7.037 | 0.875 | 0.918 | 1.0490 |
| | 2 | 18 | 66.72 | 81.57 | 9.749 | 10.455 | 0.854 | 0.872 | 1.0211 |

**Table 2.** Efficiency of primary education by Streams under existing (E) and proposed uniform and universal model (U)

| Sl (1) | Streams (2) | Students (3) | Mean score (4) | | Standard deviation (5) | | Estimated Efficiency (6) | | Relative Efficiency of U with respect to E (7) |
|---|---|---|---|---|---|---|---|---|---|
| | | | E | U | E | U | E | U | |
| 1 | General | 243 | 73.00 | 83.55 | 8.909 | 8.382 | 0.878 | 0.899 | 1.0239 |
| 2 | Ebtedayee Madrassa | 58 | 65.98 | 78.45 | 9.731 | 9.256 | 0.853 | 0.882 | 1.0339 |
| 3 | Kindergarten | 40 | 71.67 | 84.11 | 10.504 | 8.927 | 0.854 | 0.894 | 1.0468 |
| 4 | Total | 341 | 71.65 | 82.75 | 9.581 | 8.795 | 0.867 | 0.894 | 1.0311 |

## 7 Discussions

Results of the study are displayed in tables 1 and 2. Descriptive statistics of scores for individual schools under existing multi-channel system and proposed uniform and universal system in the study area are given in column (4) and (5) of table 1. These statistics aided the calculation of absolute and relative efficiency of each school separately, for each stream and for the total systems. Column (6) and (7) of table 1 give

the efficiency calculations, absolute and relative of the systems under consideration for each school separately. Table 2 gives the efficiency calculation, absolute and relative of the systems by streams and for the total.

An examination of tables show that mean scores increased considerably under the proposed uniform and universal system in comparison to the existing multi-channel system but standard deviation of scores remaining more or less the same for each and every schools, each stream and the total system. This implies that student achievement under uniform and universal system is higher than the existing multi-channel system but institutional effect on student achievement remains the same so that gain in efficiency is not noticeable in spite of marked increase in the mean scores. In the existing system, efficiency is observed to be 86.7 percent for the total with stream variation of 85.3 percent for Ebtedayee Madrassa, 85.4 percent for Kindergarten and 87.8 percent for the general stream. The corresponding figures under proposed uniform and universal system are 89.4, 88.2, 89.4 and 89.9 percent respectively. Unless standard deviation of scores decreases in the same ratio as the mean score increases, benefit from the uniform and universal system will not be satisfactory.

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