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Research Article

Evaluation of Student's Environment by DEA Models

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Abstract
The important question here is, is there real evaluation in educational advance? In other words, if a student has been successful in mathematics or has been unsuccessful in mathematics, is it possible to find the reasons behind his advance or, is it possible to find the reasons behind his advance or weakness? If we want to respond to this significant question, it should be said that factors of educational advance must be divided into5 main groups. 1-family, 2-teacher, 3- students 4-school and 5-manager of 3 schools It can then be said that a student's score does not just depend on a factor that people have imaged From this, it can be concluded that by using the DEA and SBM models, each student's efficiency must be researched and the factors of the student's strengths and weaknesses must be analyzed.

Keywords: Educational advance, Efficiency, Factors of advance, Environment, DEA.

1 Introduction

Picker and Berry (2000) claim, teachers must have the students focused on the process of solving and shouldn't only show the result because it is the easy way of mathematics yet what have been said, the requirement is making effort. Teachers can express the difficulties that they dealt with mathematics in their educational years to destroy the prejudice but it is not obligatory and it is optional if needed. Teaching vocation doesn't only circle around transmission of information. Researches on behavioral sciences show that students are exposed by attitudes, approaches and behaviors of teachers. Güven (2001) says that students generally concentrates on the way instructors approach to a topic and also the way teachers express their insights on them rather than the subject itself. Different teachers' styles in a way of features that differs from one another in terms of personality to attitudes and behaviors can have negative and positive impacts on students and thus, it makes it obligatory to behave more and more. Behaviors can have negative and positive impacts on students which in a way makes it obligatory to be more and more careful. Tatar (2010) says that because of what has been said, it is anticipated from the teachers to have positive effects on the students that all of their life is under the influence of the good relationship between them and academic victorious

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moments and success. Smith (2006), demonstrates that in a general sense, teachers evaluate to organize their teaching process and activate their programs for the future, and to observe student's learning and development by investigating their needs in learning. Based on to NCTM (2000), evaluation on the other side of the coin, is the process of finding proof about mathematical skills and abilities of students and also determining their will to mathematics in mathematics courses. Baykul (2000) and Yıldırım (1999) say that evaluation, means making a decision by a comparison between results of the measurement to a set of standards. Tan and Erdoğan (2004) say that measuring and evaluating show a loss and insufficient aspects of a teaching program, improves education and teaching process, provides information in the process of program development and provides guidance in this sense.

Experts, connoisseurs of sciences, education and mathematics believe that mathematics of educational advance of student's effective different reasons. They can be divided into 5 groups 1- family, 2-student, 3-teacher, 4- school, and 5-manager. This group will contain different items relating to family including the number of family members, parents' education, family income, parents' job and so on), 2- students including (students' interest in mathematics, the number of hours studying mathematics lessons, and students' self – confidence and so on), 3-teacher including (educational certificate of teacher records of the teacher in lessons, teachers' methods and so on), 4-school including (having workshops, computer class, instruction space and so on), 5- manager including (managers' behavior with students and their parents, managers' function and so on). In the past, it was previously believed that the score a student achieved was deserved. It was an indicator of her function, so according to the student's score, judgments were made regarding her level and appearance, it was this that was focused on but this procedure can be interpreted by another sort. First of all, when a student's score is in a low level. In this situation it can be concluded that the student had made a slight effort. But this situation does not only depend on the student effort, but on other factors as well, for example, 1-family, 2-student, 3- teacher, 4-school, 5- manager. This is because the effectual factor on the educational advance of a student is not just interest, self- confidence, etc. But the family factor can be effective on a student One example of this is the family's attention to the student's (education) studying, and they can also provide calm environmental situation and facilities for a student to study in. In addition, a teacher can be effective in the educational advance of a student. Another aspect in advance which can be mentioned is the teaching method that the teacher is using, the teacher's teaching record, interest in teaching, and a teacher's knowledge "schools" is which is another key factor in student's advance. It is possible that a school has supplied appropriate facilities or can prepare the kind of relationship between a student's necessities and their environment out of school Managers can be effective on educational advance. For instance, the manager's behavior with students and their parents, the record of management, and a manager's knowledge about the student's needs at school. To define the most effective influence on a student's advance factor, DEA and SMB software were used to recognize the strengths and weaknesses in this teaching method. This essay includes seven sections, Section 1. Introduction 2. Primary definition 3. Literature 4. Questions 5. Subjects and Tools of Research 6. Result 7. Conclusion.

2 Primary Definition

Since 1996 numerous studies have been done concerning the DEA. One of the main objectives is to measure the efficiency of a Decision Making Unit (DMU) by a scalar measure ranging between zeros (the worst) and one (the best). This scalar value is a measured linear programming model. Specifically, the Charnels-Cooper-Rhodes (CCR) model deals with the ratio of multiple inputs and outputs in an attempt to gauge the relative efficiency of the DMU concerned among all the DMUs. This fractional program is solved by transforming it into an equivalent linear program using the Cooper-Rhodes transformation. We will deal with n DMUs with the input and output matrices $X = (x_{ij}) \epsilon \mathbb{R}^{m \times n}$ and Y= $(y_{ij}) \epsilon\ \mathbb{R}^{s \times n}$, respectively. We assume that the data set is positive, i.e. X>0 and Y>0 The production possibility set P is defined as P=$\{(x,y) | x \geq X\lambda, y \leq Y\lambda\ ,\ \lambda \geq 0\}$ Where λ is a non-negative vector in $\mathbb{R}^n$ (we can impose some

constraints on λ, such as $\sum_{j=1}^{n} \lambda_j = 1$ (the BCC model), $if\ it\ is\ necessary\ to\ modif$y the production possibility set.). We consider an expression for describing a certain DMU (x_0, y_o) as

$x_{io} = \sum_{j=1}^{n} \lambda_j\ x_{ij} + {s_i}^-;\ \forall i$
$y_{ro} = \sum_{j=1}^{n} \lambda_j\ y_{rj} - {s_r}^+;\ \forall r$

$$\text{Minimize} \qquad \rho = \frac{1 - \left(1/m\right) \sum_{i=1}^{m} {s_i}^- / x_{i0}}{1 + \left(1/s\right) \sum_{r=1}^{s} {s_r}^+ / y_{r0}}$$

$$s,t. \qquad x_{io} = \sum_{j=1}^{n} \lambda_j\ x_{ij} + {s_i}^-;\ \forall i$$

$$y_{ro} = \sum_{j=1}^{n} \lambda_j\ y_{rj} - {s_r}^+;\ \forall r$$

$$\lambda \geq 0, \quad S^- \geq 0, \quad S^+ \geq 0.$$

The problem given above is a nonlinear programming. Then, $[SBM]$ becomes the following linear program in.S^-, S^+ and λ.

[LP]

$$\text{Minimize} \qquad \rho = t - \frac{1}{m} \sum_{i=1}^{m} {s_i}^- / x_{i0}$$

s.t.

$$\sum_{j=1}^{n} \lambda_j\ x_{ij} + \sum_{l=1}^{n} \mu_l \quad d_{il} + \ {s_r}^- = x_{i0} \quad \forall i$$

$$y_{ro} = \sum_{j=1}^{n} \lambda_j\ y_{rj} - {s_r}^+; \forall r$$

$$x_{io} - {s_i}^- \geq 0 \qquad \forall i$$
$$\lambda_j \geq 0 \qquad \forall j$$
$$\mu_j \geq 0 \qquad \forall l$$
$$ {s_i}^- \geq 0 \qquad \forall i$$
$$ {s_r}^+ \geq 0 \qquad \forall r$$

Definition 2.1. *(SBM-efficient): A DMU (x_0, y_0) is SBM –efficiency if $\rho^* = 1$. This condition is equivalent to s^{-*}=0 and s^{+*}=0, i.e., no input excesses and no output shortfalls in any optimal solution. For an SBM inefficient DMU (x_0, y_0), we have the expression:*

$$x_{io} = \sum_{j=1}^{n} {\lambda_j}^*\ x_{ij} + {s_i}^{-*}; \forall i$$
$$y_{ro} = \sum_{j=1}^{n} {\lambda_j}^*\ y_{rj} - {s_r}^{+*};\ \forall r$$

The DMU (x_0, y_0) can be improved and become efficient by deleting the input excess and augmenting the output shortfall as follows:

$$x_i \leftarrow x_{io} - {s_i}^{-*}, \ \forall i$$

$y_r \leftarrow y_{ro} + s_r{}^{+*}, \quad \forall r$

This operation is called the SBM –projection. Based on λ^*, we define the reference-set to (x_0, y_0) as follows:

Definition 2.2. *(Reference-set). The set of indices corresponding to positive $\lambda_j^* s$ is called the reference-set to (x_0, y_0).*

In the occurrence of multiple optimal solutions, the reference-set is not unique. We can choose any one of them for our purpose. Considering an optimal solution the corresponding reference-set R_0 is as follows

$R_0 = \{ j \mid \lambda_j^* > 0 \}$
Using R_0, we can express (x_0, y_0) by
$x_0 = \sum_{j \epsilon R_0} x_j \lambda_j{}^* + s^{-*}$,
$y_0 = \sum_{j \epsilon R_0} y_j \lambda_j{}^* - s^{+*}$.
The reference-set dependent values, ρ^* is not affected by values attributed to other DMUs not in the reference-set. In this sense, ρ^* proposed in this paper is different from other efficiency measures which incorporate statistic over the whole data set.

3 Literature

Evaluation is a methodological area that is related to, but different from more traditional social research. Evaluation uses many of the same methodologies which is used in traditional social research, yet because evaluation occurs in a political and organizational context, it requires group skills, administration ability, political agility, sensitivity to numerous stakeholders and other skills that social research in general does not count on as much. We introduce the notion of evaluation and some of the main terms and issues in the field. Many different types of evaluations exist depending on the aim being evaluated and the goal of the evaluation. Probably the most important basic distinction in evaluation types is what we know as formative and summative evaluation. Formative evaluations improve the aim and object that is being evaluated -- they help it by checking the delivery of the program or technology, the quality of its implementation, and also the assessment of the organizational context, personnel, procedures, inputs, etc. Summative evaluations, vice versa, examine the effects or outcomes of some objects and goals, i.e. summarizing it by describing what happens subsequent to delivery of the program or technology; assessing whether the goal and aim can be said make the outcome be produced; determining the overall effect of the causal factor beyond only the immediate target outcomes; and, estimating the relative costs linked with the aim and goal. Formative evaluation have several evaluation types: Need assessment shows to whom it needs the program, how big and good the need is, and what may work to meet the need. Evaluability assessment demonstrates if an evaluation is feasible and also how stakeholders can help shape its handiness. Structured conceptualization assists stakeholders to have a meaning of the program or technology, the target population, and the possible outcomes. Implementation evaluation controls the fidelity of the program or technology delivery. Process evaluation searches and examines the process of delivering the program or technology, including optional delivery procedures. Summative evaluation can also be divided to the following:

- Outcome evaluations examines whether the program or technology make demonstrable effects on particularly defined target outcomes.
- Impact evaluation covers more domains and tests the overall or net effects -- intended or unintended -- of the program or technology as one.
- Cost-effectiveness and cost-benefit analysis raise questions of efficiency by standardizing outcomes in regards of their dollar costs and values.

- Secondary analysis reinvestigates existing information to address brand new questions or use methods not previously used.
- Meta-analysis merges the outcome estimates from various studies to approach at an overall judgment with a brief attitudes on an evaluation question.

4 Questions

Q1. Do depend on students education advance just one's or it depends on the other factors?
Q2. Can be said that student's score depend on effort one's or it depend on the other factors as well for example family, teacher, school& manager?

5 Subjects and Tools of Research

First, 3 completely different high schools were chosen from an educational district: 1. Nikan High School, 2. Tahzib High School, 3.A private high school, then 3 grade 1 high school classes were selected from each school. The 3 schools were then given questionnaires regarding the factors of educational advance of students in mathematics lessons including 1. Type of family environment social aspect and amenities, and so on) 2. Factors related to student, this was called student's factors (student's interest, self-confidence, studying, concentration, stress and calmness) 3.effective factors on students learning (teacher), (teaching method used by the teacher, teacher's age, teaching record and interest) 4. Factors of school (school environment, facilities, workshops, and so on…) 5. Factor of manager (manager) (school management, manager's behavior with students and their parents and so on). These questionnaires were completed by the student's parents and then were collected. Weights were given to each of the questions by a skillful teacher and then each of the factors explained above were used as inputs and the scores of mathematics 1 were used as output

Input 1 = family's factor
Input 2= student's factors
Input 3= teacher's factors
Input 4= school's factors
Input 5= manager's factors

6 Result

Five effective factors on educational advance were considered as input and the students' scores were used as output. Efficiency of each of student was gained using the DEA and SBM models which have been shown in the table below. In this table there are 8 columns so in the first column the DMUs (the same students) from the second to fifth are inputs. The sixth one is output and the 8th is the efficiency of the students. The efficiency of each student was researched by the DEA and SBM models.

Table 1: Input, output and efficiency of students

N	INPUT 1	INPUT 2	INPUT 3	INPUT 4	INPUT 5	OUTPUT	Efficiency
1	161.75	96	157.1	23.44	50.65	20	0.76208
2	130.41	106	157.1	23.44	50.65	20	0.90935
3	140.9	100	157.1	23.44	50.65	20	0.86184
4	146.25	110	157.1	23.44	50.65	20	0.76801
5	163.84	91	157.1	23.44	50.65	20	0.77357
6	160.7	111	157.1	23.44	50.65	20	0.70700

7	127.64	105	157.1	23.44	50.65	20	0.93693
8	137.37	106	157.1	23.44	50.65	19	0.72886
9	154.3	88	157.1	23.44	50.65	18.5	0.68808
10	160.7	106	157.1	23.44	50.65	18.5	0.59605
11	157.45	96	157.1	23.44	50.65	18	0.59950
12	162.34	106	157.1	23.44	50.65	18	0.57145
13	134.55	108	157.1	23.44	50.65	18	0.64208
14	163.8	91	157.1	23.44	50.65	17.25	0.55893
15	140.99	81	157.1	23.44	50.65	16	0.57513
16	149.05	86	157.1	23.44	50.65	15.5	0.52391
17	149.35	90	157.1	23.44	50.65	16.5	0.55884
18	140.2	90	157.1	23.44	50.65	17.75	0.66835
19	153.94	103	157.1	23.44	50.65	17	0.54849
20	110.53	87	157.1	23.44	50.65	17	0.78485
21	155.64	81	157.1	23.44	50.65	14.5	0.47115
22	156.07	106	157.1	23.44	50.65	15.25	0.47471
23	142.79	85	157.1	23.44	50.65	15.5	0.54030
24	112.74	59	157.1	23.44	50.65	13	0.56975
25	163.8	103	157.1	23.44	50.65	8.75	0.24539
26	132.4	94	157.1	23.44	50.65	11	0.36471
27	149.25	90	157.1	23.44	50.65	8.5	0.25437
28	160.73	111	180.65	20.86	50.3	16.5	0.48189
29	154.78	81	180.65	20.86	50.3	20	0.75693
03	126.93	71	180.65	20.86	50.3	16	0.63791
31	152.14	93	180.65	20.86	50.3	17	0.54185
32	135.8	112	180.65	20.86	50.3	20	0.75601
33	158.55	89	180.65	20.86	50.3	8.5	0.23226
34	119.69	73	180.65	20.86	50.3	19.5	1.00000
35	137.4	104	180.65	20.86	50.3	17.5	0.57062
36	147.14	99	180.65	20.86	50.3	7.5	0.21486
37	134.19	81	180.65	20.86	50.3	17.5	0.66537
38	152.59	79	180.65	20.86	50.3	13	0.39235
39	157.49	72	180.65	20.86	50.3	15	0.48016
40	144.74	106	180.65	20.86	50.3	20	0.69745
41	165.14	110	180.65	20.86	50.3	20	0.60043
42	149.1	108	180.65	20.86	50.3	19.5	0.62684
43	155.45	89	180.65	20.86	50.3	19.5	0.67714
44	146.49	97	180.65	20.86	50.3	19.5	0.68095
45	162.89	81	180.65	20.86	50.3	20	0.72468
46	123.54	94	180.65	20.86	50.3	17	0.62399
47	171.1	91	180.65	20.86	50.3	14.5	0.40387

48	152.14	70	180.65	20.86	50.3	10	0.28044
49	171.8	84	180.65	20.86	50.3	19.5	0.63201
50	141.35	62	160	13.54	50	7.25	0.22276
51	166.05	95	160	13.54	50	17.75	0.56539
52	163.05	91	160	13.54	50	18.5	0.63062
53	152.45	52	160	13.54	50	5.75	0.16865
54	165.85	74	160	13.54	50	20	0.88933
55	134.05	95	160	13.54	50	19.25	0.84961
56	145.8	93	160	13.54	50	17.75	0.62324

Based on the defined classification each student can be replaced one group or each efficiency. Which is achieve earned from evaluation of internal that was considered as fallowing:

- Numbers from 1 to 27= Nikan high school
- Numbers from 28 to 49 =Tazib high school
- Numbers from from 50 to 56= private high school (Donyaieulom)
- [0.6, 1]=good
- [0.5, 0.6]=middle
- [0, 0.5]=weak

In the first group, which is named good, The students have high efficiency. The students who are in the second group, which is named middle, are those who lower efficiency comparing to the first group. Those who are near zero are considered inefficient, thus this group is weak in efficiency then they must try harder to earn the efficient of the group. In the third category, their numbers are more remarkable than the other's categories. meaning, students in this category have more desirable situation point of view students' factors, teachers' factors,….. but their efficiency are less. In the first category which is called good DMUs, 1, 2, 3, 4, 5, 6, 7are included and they and they have their own high efficiency. These students have been nominated as applicable students with high efficiency and also efficiency close to 1. DMU 34 is a good example. Her own efficiency is 1 and her score of mathematics is 19.5 but inputs 1 and 2 (student and family's factors) are less than DMUs1, 2, 3, 4, 5, 6, 7. Although these students were studying in Nikan school and the DMU student was in Tahzib school, the amount of input 3 (teacher's factor) was higher than that of Nikan school, whereas DMUs 1, 2, 3, 4,5, 6, 7 have of family and students are high for these students, the teacher's factor is low. So they can be placed in this group even though 34 DMU has input 1 and input 2 less than above the DMUs, but the teacher's factors in Tahzib school are higher than DMUs 1, 2, 3, 4, 5, 6, 7. DMU34 resulted in access to high efficiency. DMU 19, 46, 56, have efficiencies of 0.5484, 0.6239, 0.6232, respectively. Three students were chosen from different schools but their scores were the same with different efficiencies. DMU 19 had input 1 and input 2 more than DMU 46 and 56, whereas DMU 19 had less efficiency than 2 DMUs. This showed family and student's factors were more than the teacher's factor. Because this student had higher inputs she must have had more efficiency and an acceptable score, but this was not the case. DMUs of 25, 33, 53 are from 3 different high schools with less efficiencies, but in spite of students having good factors of family, they had very low student factors. This factor explains how students must enrich factors of students, for example, their hours of study must be increased,, in addition to interest in mathematics lessons, self- confidence, and concentration on lessons. DMU 47 is a student who has efficiency =0.4038, she has high family and manager and teacher's factors; therefore it was expected that this student would have a good efficiency score but this was not the case. This student had student's factors lower than the other factors. So she herself must enricher hours of studying, concentration and self-confidence. DMY28 had efficiency= 0.4818 and her score was 16.5. According to the inputs, this student had unacceptable efficiency,

meaning that she had high inputs but her score was not expected. Then it showed she had been careful enough in the mathematics lesson, but if she were more careful in solving mathematics problems she could get a higher score.

6.1. For the First Question

It was said that it depended on which of the factors, meaning, if one student received a low score each of the factors which introduced the weakness points of the students was analyzed.

6.2. For the Second Question

It could be dependent on the student and family because the family could not supply a calm environment and appropriate conditions or the student herself put no effort into studying; maybe there was a lack of self –confidence or even it may have depended on the teacher, who may have not had an appropriate method in teaching. It is also possible that the teacher was unable to create real motivation in the student or d the school environment or managers were ineffective on the educational advance of the student.

7 Conclusion

Efficiency of students was calculated by the SBM model. This efficiency was from 0 to 1 and if efficiency got close to zero, that student was inefficient. Efficiency of student depended on 5 factors, each of which included some items. Hence the student scores did not depend on just student's factors but on the other factors as well, for example family, students, teacher, manager and school. The strong and weak points of the students could be analyzed by efficiency which was gained from the results, inputs and output. It was said that it depended on which of the factors, meaning, if one student received a low score each of the factors which introduced the weakness points of the students was analyzed. It could be dependent on the student and family because the family could not supply a calm environment and appropriate conditions or the student herself put no effort into studying; maybe there was a lack of self –confidence or even it may have depended on the teacher, who may have not had an appropriate method in teaching. It is also possible that the teacher was unable to create real motivation in the student or d the school environment or managers were ineffective on the educational advance of the student. All of these factors are connected like a chain.

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