International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Volume-2, Special Issue 3 (July-Aug 2014), PP. 41-44

EFFECTS OF EDUCATIONAL INDICATORS ON STUDENTS' PERFORMANCE IN THE SULTANATE OF OMAN

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***Abstract*— This study attempts to investigate the effect of educational indicators and on the 12th grade students' performance in Sultanate of Oman. The data is collected from Data Resource System (DRS) at the department of statistics, and the Educational Evaluation System (EES). The multiple linear regression is performed to study the effects of the predetermined of educational indicators such as class size, school size, school type, student/teacher ratio, teacher/class ratio and student gender on the students' performance. The normality of the data is tested and the results suggest that generally the preliminary assumptions hold across factors. In other words, the analysis suggested that normality assumptions are not violated and hence, the data can be used for meaningful analysis. The results show that a number of significant relationships are obtained. More precisely, the study has found that gender is the most predictor of students' performance in Sultanate of Oman, followed by school size, class size, average number of teacher per class, school type and then average number of students per teacher.**

***key words*— multiple regression analysis, students' performance.**

I. INTRODUCTION

An educational indicator is defined as a qualitative or quantitative variable or factor that provides a simple and reliable means to reflect changes or to measure students' performance (OECD, 2002). Identification of educational indicators is very significant if not essential to remedy the problem of low academic performance and burn-out. According to Scheerens (1991), policymaking at the national level is a major source of application of indicators. With policymakers as well as consumers and stakeholders benefiting from the information obtained from the research of indicators, the view on the application of indicators should be broadened. In many countries, the range of educational data is considerably broad and has a wide perspective in terms of the process. However, school officers and policymakers should choose their key indicators through exploration, rigorous research, and understanding of the students' environment. Furthermore, knowledge and skills on the importance of the information provided are also highly significant because these would enable data tracing and usage of the valuable information obtained (Lashway, 2001).

Educational indicators are statistics that shed light on the performance of the educational system, including schools or institutes. An educational indicator provides adequate information about the characteristics of the educational system which can be used as a method in determining the effectiveness of schools, enhancing the performance of students, and implementing some rules and regulations.

In general, educational indicators play an active role in educational systems by focusing on final results, especially school performances and educational system assessments. Therefore, the importance of any indicator in the education arena is triggered by its role in enhancing the improvement of students' standard and education quality. The use of such indicators allows educational institutions to facilitate their own evaluation by identifying strengths and weaknesses and determining which improvement techniques are applicable (Levesque et al., 1998). In the context of Oman, identifying the educational indicators that affects students' performance would allow the policy makers and authority not only to solve the problem of low performance and provide panacea for academic problems but would also enhance the quality of education and give equal opportunity to every individual irrespective of its ideology and gender (Ministry of Education (2012) 'Statistical Year Book 2011/2012).

This paper hence attempts to investigate the impacts of class size, school size, school gender mix (school sex), student/teacher ratio, teacher/class ratio and student gender on the 12th grade students' performance in Oman. Considering that the 12th grade is the most essential grade in the education system because its corner stone for consequence levels, it is very essential to thoroughly examine the effect of these indicators on the students' academic performance. It is worth highlighting that the performance of students in this grade also reflects the quality of teaching, the methods as well as the education system as a whole.

For instance, despite the different research findings on the effects of class size on students' education performance and quality of educational outcomes, precise evidence to support the direct effect of average class size on students' performance remains lacking. Slavin (1989), in his empirical research, found that reducing the class size had a very small positive effect on students' performance, which demonstrated that having small classes would lead to a better quality of learning and teaching. Consistently, Leithwood and Jantzi (2007) discovered that students who traditionally struggle at school and have disadvantaged social and economic backgrounds are major benefactors of smaller schools compared with their counterparts from the middle and higher classes.

Furthermore, Leithwood and Jantzi (2009) found that 57 of the analyzed studies showed a negative correlation between school size and students' performance by using meta-analysis approach. Meanwhile, the study of Bradley and Taylor (1998) found a strong positive relationship between secondary school size and students' performance at schools in the UK. A similarly significant relationship was found between changes in students' performance and changes in school size over time (1992 to 1996). The study discovered that students performed better in schools where the number of pupils above 900 but fewer than 1500. In relation to gender, previous studies indicated that female students outperformed their male counterparts across many countries. Interestingly, Chang

(2008) found the average performances of female students at the lower level were better than those of male students and there were slight variations observed in terms of the grades. At the advanced level, male students however outperformed females and attained better scores. Similarly, in a research performed by the Statistical Department of Canada, using a multi-level model to analyze PISA dataset from a sample of more than 250,000 students (2009), the effect of gender on academic performances was examined. The finding suggested that female students outperformed their male counterparts in almost every country.

The study conducted in Arabic countries also showed that female students performed better than male students and this study were consistent with many previous studies. Studies across the Middle East countries indicated that females in Saudi Arabia, Palestine, Jordan, and Bahrain outperformed male students, whereas males outperformed females in Egypt and Morocco. No significant difference was found between males and females in both Syria and Lebanon (United Nations Development Programs, 2007).

Finally, the studies as in Kallai and Maniu (2004), Alexander and Fuller (2005) and Huebler (2008), found that student/teacher ratio has significant effect on students' performance and examination grades.

Therefore, due to these contradictory findings, this empirical study attempts to investigate the relationships between these predetermined variables and the results on the 12th grade students performances in Sultanate of Oman. Furthermore, the findings of this study will make recommendations on which factors can be considered in affecting to students' performance especially in Sultanate of Oman.

II. Data Collection

The data of this study was extracted from the Sultanate of Oman Ministry of Education. The Ministry of education has two main databases that dealing with and storing the students' information and data; they are the Data Resource System (DRS) under the department of statistics, and the Educational Evaluation System (EES) that used for the results of the 12th grade students (Ministry of Education 2012).

The data of this study was collected from these two databases. The analysis includes the results of all students of General diploma of the 12th grade examinations conducted in the past two years. There were 45,919 students in the 2010/2011 and 45,711 students in 2011/2012 respectively. The numbers of schools that had a 12th grade in these years were 421 and 427 schools respectively. In this case, the study includes all 12th grade students of the formal governmental education of Oman.

The total examination mark for any student in the 12th grade varies between 1 and 1000. That is because ten subjects are supposed to be taken by every student in grade 12 and the maximum mark for each subject is 100. The pass mark is 50 for all subjects.

The variables were calculated as follows:

-The student/teacher ratio: the total number of student in a given school divided by the total number of teachers of that school.

-The teacher/class ratio: the total number of teacher in a given school divided by the total number of classrooms of that school.

- The average class size: the total number of student in a given school divided by the total number of classrooms of that school.
- The school size: the total number of student in a given school.

In Oman, the school year is divided into two semesters. The student's performance is determined at the end of each semester by counting his or her marks using various assessment tools, and the performance is determined at the end of the school year by calculating the average mark obtained in both semesters (Ministry of Education 2012).

III. Methodology

This study employs a Multiple linear regression model based on the assumption that exist a linear relationship between the results of the 12th grade students and several variables of interest as discussed before. This model is then given by:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + U \quad (1)$$

where y is a Students' results of the 12th grade, x_1 is a class size, x_2 is a school size, x_3 is a teacher/ class ratio, x_4 is a school gender mix (school sex), x_5 is a student gender, x_6 is students/ teacher ratio, U is a random error and β_0 is a intercept. The $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are regression coefficients for the $k = 6$ independent variables. In Eq. 1, U (a random error) is assumed to be independent and identically distributed with mean 0 and variance σ^2.

This equation includes (k+1) information model in Eq. 1 that requires the use of matrices to estimate the regression. Upon these equations, model in Eq. 1 can be formulated in the form of matrices as follows:

$$\mathbf{Y} = \mathbf{XB} + \mathbf{U} \quad (2)$$

with

$$\mathbf{X} = \begin{bmatrix} 1 & x_{11} & x_{12} & \cdots & x_{16} \\ 1 & x_{21} & x_{22} & \cdots & x_{26} \\ . & . & . & \cdots & . \\ 1 & x_{n1} & x_{n2} & \cdots & x_{n6} \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} \beta_0 \\ \beta_1 \\ . \\ \beta_k \end{bmatrix}$$

$$\mathbf{U} = \begin{bmatrix} U_0 \\ U_1 \\ . \\ U_n \end{bmatrix} \qquad \mathbf{Y} = \begin{bmatrix} y_1 \\ y_2 \\ . \\ y_n \end{bmatrix}$$

and n is the number of observation.

Hypotheses test on the parameter estimates of the multiple regression analysis allows us to choose among alternative theories or hypotheses in sorting out correlations between variables that are plainly spurious from those that reflect valid relationships. The utilization of multiple regression analysis in this study is to examine the relative importance of each indicator and its contribution to overall significance of the study.

IV. Results

Table I summarizes the descriptive statistics (means, standard deviations, median, skweness and kurtosis) of the variables and correlation among these variables is presented in Table II. A number of significant relationships are obtained. Regarding the means of the variables, the analysis illustrates that the mean of students' performance was 656.75 with SD of 80.31. This indicates that majority of students passed their

examination since 500 is the lowest pass score. Moreover, SD shows the means of scores are not extremely deviated from mean score.

TABLE I. SUMMARY STATS

Variable	Mean	SD	Median	Skewness	Kurtosis	No of students
Total examination marks	656.75	80.32	667.00	-.99	1.85	91526
Average class size	28.60	5.46	30.00	5.46	-1.21	91526
School size	704.73	262.78	750.00	-.30	-.74	91526
School Type	1.07	.26	1.00	3.37	9.32	91526
Average number of teachers	2.71	.640	2.500	3.19	12.98	91526
Student gender	1.50	.50	1.00	-.01	-.200	91526
Average number of students per teachers	11.41	2.19	12.00	-.99	1.85	91526

Furthermore, the mean of class size was 28.60 with SD of 5.46. The findings show that majority of secondary school classes have roughly 29 students in class. However, by considering standard deviation, the number of students in the classes might up to 34. Moreover, the mean of school size is 704.73 with standard deviation (SD) 262.78. This result indicates that the average number of students in Omani is 705 but considering the standard deviation the number of students in a school can be up to 968 students.

Meanwhile, means of school type and gender and their standard deviations are 1.07, (SD = .255) and 1.50 (SD = .50) respectively. These means are not surprising since there are only two types of gender (male and female) and school type (single school and coeducation). Additionally, the analysis shows that means of average teacher per class and students per teachers are 2.705 (SD is .64), and 11.41 (SD is 2.19), respectively. The findings suggest that at least 3 teachers per class while at least 11 students per teacher and maximum 14 students per teacher. On the other hand, the analysis of the data find that median of students' performance to be 667.00, median of class size is 30, median of school size is 750 and median of school type is 1.00. Furthermore, the median for average number of teacher per class is 2.50, and student per teacher is 12 while as expected the median for gender is 1.00.

The analysis of normality of the data across the indicators suggests that the assumption of normality generally hold without major violation. The analysis indicates that except a few cases, the skewness and kurtosis are inline within acceptable values. Moreover, the analysis of correlation among the variable show different magnitude relationships among variables, but there is strong and positive relationship between gender and students' performance based on the correlation analysis.

TABLE II. CORRELATIONS AMONG THE VARIABLES

Variables	TEM	ACS	S. Size	S. Type	ANT	Gender
TEM						
ACS	-.180					
S. Size	-.139	.599				
S. Type	.193	-.472	-.339			
ANT	.001	-.075	-.227	.402		
Gender	.753	.047	.186	.186	.125	
ANST	-.125	.622	-.547	-.547	-.601	-.028

Note: TEM= Total Examination Marks, ACS = Average Class Size, S. Size = School Size, S. Type = School Type, ANT = Average Number of Teacher Per Class, Student Gender, ANST = Average Number of Students Per Teachers.

The analysis of the correlation coefficient also indicates that the variables are moderately correlated with each other that show the degree of association among the variables. It is worth mentioning that correlation is estimating the strength of linear association between variables.

As highlighted previously in multiple regression equations, the partial coefficient for each variable signifies how much the value of a dependent variable changes when the value of the particular independent variable increases by one unit when other independent variables are kept constant.

TABLE III. COEFFICIENT TABLE

	B	SE	Beta	t	Sig
Constant	590.464	2.228	-.143	265.050	.001
Average Class Size	-2.108	.045	-.143	-47.362	.001
School Size	-.065	.001	-.212	-69.465	.001
School Type	-5.297	.793	-.017	-6.677	.001
Teacher /Class Ratio	-14.675	.372	-.117	-39.460	.001
Student gender	128.704	.328	.801	392.572	.001
Students / Teacher Ratio	2.132	.158	.058	13.475	.001

Table IV shows that the set of the predictors accounted for 81% of the total variance explained by the model and the remainder percentage 19% are due to random errors. The adjusted coefficient of determination (adjusted R2) was .65, with estimated standard error of 47.670. This indicates that the model is appropriate and there are relationships between the criterion and predictors.

Most importantly, the overall model based on ANOVAb table was statistically significant, F (6, 91519) = 28046.479, MSE = 2272.442 p=. 001), inferred from this that the form, suitable to represent the linear relationship between the putative dependent variable and the explanatory variables.

Moreover, further analysis of the predictive power of the individual predictors found all predictors to be significantly correlated with students' performance (criterion) but with different magnitudes and directions.

For example, gender was found to be the major predictor of students' performance: (ß = .801, p=. 001). This finding suggests that gender play a significant role in the students' acquisition and their performance. Moreover, school size is the second predictor, which is found to be negatively and statistically correlated with students' performance. This simply means that when school size is large, the students' performance tends to decrease: (ß = -.212p=. 001 which accounts for almost 26% of the variance of the model.

The analysis also has found that average class size provide significant impact on students' performance. It is suggested that class size negatively and statistically correlated with students' performance: (ß = -.143p=. 001. This denotes that the more the numbers of students increase in the class; the lower would be the students' performance. The finding might be partially because teacher would not be able to pay attention to all needy students individually which would automatically lead to poor performance.

Furthermore, the study has found that the average number of the teacher per class has negative and statistical relationship with students' performance. According to the finding, whenever the number of teacher per class increases, the students' performance would reduce, (ß = -.117, p=. 001). Additionally, the analysis also indicates that number of students per teachers also have a significant impact on students' performance (ß =.058, p=. 001). Finally, it is found that school type (single sex or coeducational) is statistically correlated with students' performance (ß =.017, p=. 001).

TABLE IV. MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.801	.648	.648	47.670

TABLE V. ANOVAB

Model	Sum of Square	df	Mean Square	F	Sig
Regression	382403988.066	6	63733998.011	28046.479	.001
Residual	207971624.755	91519	2272.442		
Total	590375612.822	91525			

The investigation of the normal probability plots (refer to Fig. 1) suggests that observed value for each score is plotted against the expected value from normal distribution, which indicated that expect minor deviations, the normal distribution hold but not perfect as Fig.1.

Fig. 1. Normal P-P Plot of Regression of Total examination marks.

V. CONCLUSION

This paper investigates the effects of predetermined educational indicators such as class size, school size, school type, average number of teacher per class, gender and average number of students per teacher on one hand and students' performance on the other hand.

Although, the analyses of distribution assumptions indicate that the data deviates a little bit from normal distribution, this deviation is not extreme to affect the quality of data. The result indicates that assumption of normality generally holds across indicators, hence, the data can be used to conduct a meaningful research.

Moreover, the multiple regression analysis suggests that predictors collectively affect the criterion. More precisely, it is found that educational indicators have enormous impact of students' performance. Interestingly, the study discovers that gender is the most important predictor of students' performance, followed by school size, class size, average number of teacher per class, school type and then average number of students per teacher.

This finding in consistent with previous studies that suggested that gender plays an important role learning, creatively and students' performance (Chang, 2008; United Nations Development Programs, 2007). In conclusion, the study has shown that the student gender indicator is the most influential factor on the final results, despite the fact that the government of the Sultanate of Oman provides education equally to male and female. On the other hand, further analysis need to be carried out to further study the effects of gender on students' performance and consequently impede the gap between male and female students.

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