MATHEMATICS ACHIEVEMENT: DO TEACHERS MAKE A DIFFERENCE?

By AHMAD FARID OSMAN, NOOR AZINA ISMAIL
Department of Applied Statistics
Faculty of Economics and Administration
University of Malaya, Malaysia

ABSTRACT

This paper examines the effects of gender of teachers, teachers' qualification, experience and training on mathematics achievement among eighth grade students in Malaysia using data from the Third International Mathematics and Science Study (TIMSS) 2003. Only gender of teachers has significant influence on student's achievement in mathematics.

INTRODUCTION

In the Eighth Malaysia Plan, covering the period of 2001 to 2005, the Government of Malaysia has allocated around 21 per cent of the total development allocation of the Plan for education and training programme (Economic Planning Unit Malaysia, 2001). This suggests the continued priority given by the Government to education and training. One of the measures taken is to attract quality teachers to serve especially in rural schools. This is carried out by giving incentives and benefits such as housing and increasing hardship allowance to these teachers.

However, do teachers matter? Hanushek (1986, 1989) concluded that there seems no strong relationship between school expenditures, where the main element consists of teacher salaries, class size, and student performance. On the other hand, many researchers (e.g Hegdes et al, 1994; Summers and Wolfe, 1977 and Monk, 1994) find that teachers' experience and qualification contribute to student performance. Hence, the objective of this study is to investigate whether teachers' experience, qualification and training do affect performance of eighth grade students in mathematics.

This paper analyzes data from the Third International Mathematics and Science Study (TIMSS) conducted in 2003 by the International Association for the Evaluation of Educational Achievement (IEA) which was carried out in more than 40 countries including Malaysia.

Description of the Data

The data were obtained from the responses of teachers who were teaching in the eighth grade at 150 different schools. The school samples were selected using a simple random sampling from all the secondary schools in Malaysia. For each school, a single classroom was selected at random and the mathematics teacher was asked to complete the questionnaire given.

The background of teachers was represented by gender, whereas the experience of teachers was represented by the number of years they have been teaching. On the other hand, main area of study and highest level of education attainment were representing the qualification of teachers. Lastly, the number of years of pre service training and having teaching license or certificate represent teachers' training.

Students' performance was represented by the average scores of students in a class and the average score for each student is the average of five plausible values generated by TIMSS. Out of 150 teachers, 72.5% of teachers were female and the remaining 27.5% were male. In terms of age, about 40% of the teachers were aged below 25 , 21.5% between 25 to 29 years, 45% between 30 to 39 years and 29.5% were 40 and above. Since age is likely to correlate with teaching experience, it was not included in the next analysis.

Years of teaching experience was divided into two categories: less than 5 years and 5 years and more. Many studies (e.g. Murnane and Phillips, 1998; Rivkin et al, 1998) suggest that students learn more from experienced teachers, those with at least five years of experience. In this

study, about three quarter of the teachers had more than 5 years of experience.

The highest level of education of teachers had three categories. More than 50 per cent of the teachers had tertiary education. The rest of them either had pre tertiary or post secondary education.

There were rising concerns that there were not enough qualified teachers teaching mathematics. Teachers trained in other areas were assigned to teach mathematics due to less number of mathematics teachers in schools. This phenomena can be seen here, where around 40 per cent of the teachers in this study were not trained in mathematics or mathematics education.

There were only around 7 per cent of teachers without pre service training and therefore this group was excluded in the next analysis. The pre service training has been divided into three categories: 1 year, 2 years and more than 3 years. Around 38 per cent of teachers had one year pre-service training, 25 per cent had 2 years of pre service training and the rest of them had 3 years or more.

More than 90 per cent teachers had teaching license and hence this variable was excluded in the next analysis, due to very less number of them without one.

Results

In order to find the significant mean score differences between categories of the variables above, at-test was used when there were only two categories, otherwise ANOVA was used.

It is a worldwide phenomenon that there are more female teachers as compared to their male counterparts. In year 2000, for example, around 62 per cent of teachers were females. The question is that, does gender of teachers affect students' performance? In this study, it does. The mean scores of the students taught by female teachers were higher than those thought by male teachers (Figure 1) and p value of the t-test was smaller than 0.01, indicating that there are differences in scores between students taught by male teachers and those taught by female teachers.

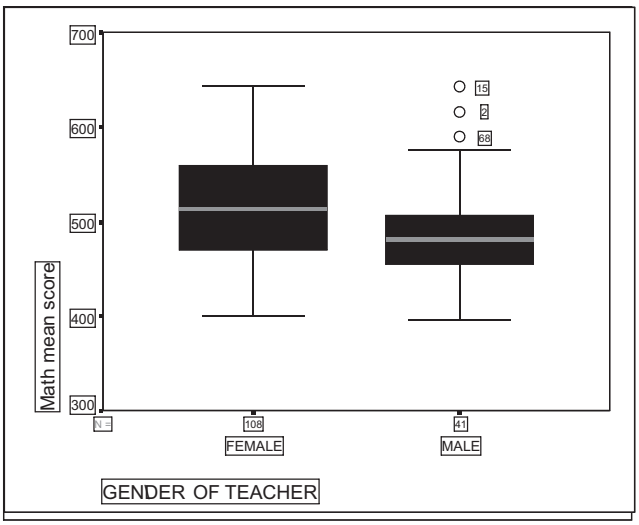

Figure 1: Student Scores According to Gender of the Teachers

From Table 1, we can conclude that none of teachers' experience, training and qualification had affected the mean scores of students.

Variables	Categories	%	Mean Scores	t/F Statistics (p-value)
Teaching experience	< 5 years	26.8	514.02	0.792 (0.430)
	≤ 5 years	73.2	505.81	
Highest Level of Formal Education completed	Postsecondary	27.5	496.65	1.169 (0.313)
	Pre-tertiary	18.8	512.84	
	Tertiary	53.3	512.14	
Pre Service Training	1 year	38.1	514.31	2.534 (0.083)
	2 years	25.2	508.75	
	3 and greater	36.7	491.18	
Main Area of study	Mathematics	65.1	508.98	0.287 (0.775)
	Other	34.9	506.21	

Table 1: Results of Comparing Mean Scores with Different Categories of Teaching Experience, Highest Level of Formal Education Completed, Pre Service Training and Main Area of Study

Conclusion

From the findings in this study, we can conclude that

students who were taught by female teachers scored higher in mathematics test conducted by TIMSS than those taught by male teachers. Teachers' experience, training and qualification, however, do not contribute to the increase in students' performance in mathematics. Nonetheless these findings do not suggest that financial allocations by the Government to train teachers are going to waste. The effects of these factors were not so obvious due to the fact that students in this study were taking national examination for that particular year. Schools normally place good teachers in classes where students take national examination.

Training, qualification and experience do not determine that the teachers would be good. However, it helps to develop teachers to improve their understanding of the materials and teaching approaches.

References

Economic Planning Unit Malaysia (2001). *Eighth Malaysia Plan, 2001 2005*. Kuala Lumpur: Percetakan Nasional Malaysia Berhad.

Hanushek E. A. (1986). The economics of schooling: production and efficiency in public schools. *Journal of Economic Literature*, 26, 1141 1177.

Hanushek E. A. (1989). The impact of differential expenditures on school performance. *Educational Research*, 18(4), 45 51.

Hedges L. V., Laine R. D. and Greenwald R. (1994). Does money matter? A meta-analysis of studies of the effects of differential school inputs on student outcomes. *Education Researcher*, 23(3), 5 14.

Monk D. H. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review*,13(2),125 145.

Murnane R. J. and Phillips B. P. (1981). Learning by doing, vintage and selection: three pieces of the puzzle relating teaching experience and teaching performance. *Economics of Education Review*, 1 (4), 453 465.

Rivkin S. G., Hanushek E. A. and Kain J. F. (1998). *Teacher, schools and academic achievement.* Working Papers. Cambridge: National Bureau of Economic Research.

Summers A. and Wolfe B. (1977). Do schools make a difference?*AmericanEconomicReview*,67,639652.

ABOUT THE AUTHOR

Noor Azina Ismail is Associate Professor at the Department of Applied Statistics, Faculty of Economics and Administration,University of Malaya. Her research interests lie in the field of mathematics education, health and applied statistics.