

CHAPTER SEVEN

CONCLUSION

7.1 Main Findings

In this study we view mathematics and science within the context of joint production. The joint production function was estimated using canonical correlation analysis. Evidence was found that the overall relationship is significant. Estimates of the marginal products, marginal elasticities, marginal rates of substitution and marginal rates of output transformation were calculated for each output. These estimates indicate that there are trade-offs differ for rural and urban schools.

The canonical correlation analysis reveals that Malaysian secondary schools are more productive in the teaching and learning process of science than mathematics nationally. Comparing the performance between two educational outputs, this analysis suggests that average achievement in mathematics is higher than science at urban schools. Oppositely, rural schools perform higher in science than mathematics. In Malaysia, it is sensible as the urban students are well exposed to the urban-business environment as compared to the rural students who are traditionally village folks.

The much publicized finding was that a large amount of the variation performance among students was attributable to differences in variation in family background. Our results provide empirical verification that the family background variables such as the educational aids and education's level of parents do make a difference in Malaysian educational system.

There have been many public statements suggest that the intuitively plausible approach of increasing the amount of time spent in school in order to boost achievement is naïve and simplistic. There is a host of contextual factors which cloud the relationship between the amount of time devoted to school and the level of academic excellence. Notwithstanding, our results analyze that the instructional hour variable is an effective and important variable to offset the disadvantage in low level of out-of-school study time in rural areas. However, it has less significance on determining the school performance in urban schools. To conclude, instructional hour variable is of relevance and should be adopted where applicable in secondary schools, particularly in the rural areas.

The negative coefficient of per pupil non-teaching expenditure suggests that there is inverse relationship between input and output for both school locations. In other words, this result reveals that wisely use in non-teaching expenditure would result in better academic achievement. Comparisons were made to urban-rural difference; we found that the absolute values of parameter estimates for per pupil non-teaching expenditure variable are higher in rural schools. Obviously, rural area which associated with poor home educational resources depends heavily on the school inputs to increase performance academically.

Not surprisingly, there is a negative correlation between pupil teacher ratio and the joint educational outputs. It shows that the increasing pupil teacher ratio, which caused unfavorable classroom environment, will have a negative impact on students' performance. Comparison was made that the relationship of educational outputs to pupil teacher ratio has been found to be strongly negatively correlated in rural schools than in urban schools. This implies that the students' academic achievement in rural areas can be improved by reducing the class size.

In Malaysian educational production functions, the percentage of teachers at the school for five or more years appears to have the minimum explanatory power. This result is inconsistent research conducted by Darling-Hammond (2000) where the benefits of experience level off after five years.

7.2 Policy Implications

There are several policy implications can be drawn from these highlights. For policy planning, those variables that are labeled significant “determinants” should be considered as possible, but not certain, inputs to academic achievement as measured by achievement scores. This uncertainty is due to achievement scores do not measure all aspects of cognitive achievement, nor they measure any dimensions of students’ affective development like co-operation, responsibility or leadership. Nevertheless, results should encourage policy planners to undertake pilot projects, for example reducing pupil teacher ratio, initiating out-of-school study time and improving the socioeconomic characteristics of communities of the poorer sectors of our society.

From the above finding, decreasing pupil teacher ratio can be very effective in improving student achievement in rural schools. Another way to improve the student achievement is by increasing the time allocated to instruction. This can be done by lengthening the school days and/or school year or reallocating instruction time. The Canonical Correlation Analysis provides support for the announcement of a RM200 million tuition voucher scheme to help primary school-children from poor families in rural schools and certain poor urban schools to obtain extra lessons in four subjects.

However, instruction can be made more effective in many ways. An effective instruction will reduce the time needed for learning through increase teachers' skill and capabilities to diagnose students' prior learning and to sequence the instructional tasks. Teacher training institutions need to put more emphasis on developing such skills. In addition, time needed for learning can be reduced by enhancing student study skills. If students can learn effective way to organize their out-of-school study time, to use the reference resources and library, the total time needed to master school learning tasks is lessened. It is recommended that parents pay greater attention at home to ensure better home educational resources.

7.3 *Limitations of the Study*

Generalization from the results obtained from this study, were subjected to the following limitations.

- The selected sample represents a relatively small percent of the secondary schools in Malaysia. Thus, the research may not be able to capture the picture of the whole population.
- The sample sizes used by this study are relatively not sufficient for analyzing data at rural-urban level. This caused an extreme caution in our interpretations.
- If this assumption production is technically efficient is not valid, the parameter estimates of canonical correlation analysis may be biased (Ruggiero, 1996).
- The model chosen for this study is extremely simplified. For example, we ignore a number of possible reallocations of school resources within different grade in the school.

Despite the mentioned limitation, it is hoped that this study had given some insight about the contribution of instructional hours of the academic achievement in rural and urban areas. This can help on designing our educational policy, particularly the tuition voucher scheme.

7.4 Future research

There are two recommendations for future research. Firstly, it will be interesting to expand the analysis on testing the technical efficiency for Malaysian educational production functions using canonical correlation analysis, which is suggested by the Ruggiero (1996). Secondly, include the prior academic achievement as an explanatory variable to form a value-added model.