

Influences on Academic Achievement of Primary School Pupils in Cambodia

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Abstract

Employing education production function approach, this article investigates the influences of school and pupil background factors on academic achievement of primary school pupils in Cambodia. Based on achievement data of 1,080 Grade 6 pupils from one rural and one semi-urban area, the study reveals that school and teacher quality exerts a considerable effect on pupils' performance. Teachers' experience and teacher guides are positively correlated with academic achievement, while instructional time loss is significantly associated with poor performance. In light of these results, policies to boost academic achievement of primary school pupils in Cambodia are discussed.

Abstrak

Dengan menerapkan pendekatan fungsi produksi pendidikan (*education production function*), artikel ini meneliti pengaruh sekolah dan faktor latar belakang siswa terhadap pencapaian prestasi akademik para siswa sekolah dasar di Kamboja. Berdasarkan data pencapaian prestasi dari 1,080 siswa kelas enam di salah satu kawasan pedesaan dan satu kawasan semi-perkotaan, penelitian ini menunjukkan bahwa kualitas sekolah dan pengajar memberikan pengaruh yang sangat menentukan pada kinerja siswa. Pengalaman pengajar dan bimbingan dari pengajar sangat berpengaruh positif terhadap prestasi akademik para siswa, sementara hilangnya waktu pengajaran terkait secara signifikan dengan rendahnya prestasi siswa. Terkait dengan hasil penelitian ini, kebijakan untuk meningkatkan prestasi akademik siswa sekolah dasar di Kamboja akan dibahas lebih lanjut.

Key Words: School Quality, Academic Achievement, Education Production Function, Comparative Education, Cambodia

Introduction

After more than two decades of expansion, enrollment in primary education in post-war Cambodia started to decline gradually in 2003 as the result of the decrease in the primary-school-age population. In 2010, Cambodian primary schools were accommodating 2,191,192 pupils which equals to 20 percent drop in total enrollment in the last eight years (Ministry of Education Youth and Sports [MoEYS] 2003, 2011). Along with the declining enrollment, Cambodia has made a great stride in improving educational access and equity.

In 2010, the net enrollment rate in primary education reached 95.2 percent and the growth in enrollment showed a negligible difference across gender and regions (MoEYS 2011). There has also been a steady progress in the primary school completion. From 1999 to 2006, the primary school completion rate doubled to

reach 87 percent, and the percentage of repeaters in primary schools was nearly half reduced from 25 percent to 13 percent (World Bank 2008). These trends suggest a positive overall performance of Cambodian education system.

However, although there has been improvement in the percentage of pupils who persisted in school up to Grade 6 (the last grade of primary education), the survival rate remained as low as 61.2 percent in 2010, meaning that almost 40 percent of the pupils dropped out of school before completing the primary cycle. School dropout is a common problem of education system in developing countries, where poverty and family demand for child labor are high. However, school quality which is measured by its ability to produce pupils' learning has been shown to be related to dropout decision of primary school pupils (Lockheed and Verspoor 1991; Harbinson and Hanushek 1992; Hanushek et al. 2008). For instance, Eric Hanushek and his colleagues (2008) showed that with a pupil's own ability and achievement held constant, the pupil is much less likely to remain in school if attending low-quality school rather than high-quality school. Following this relationship, it is possible to argue that, with 40 percent of the pupils dropping

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out by the end of Grade 6, the school quality at primary education level in Cambodia is remarkably low. A study of nationally representative sample showed that roughly two-thirds of Grade 3 pupils are classified as 'non-proficient' on assessment tests, as compared to only one quarter of Grade 6 pupils (Marshall et al. 2009). This finding suggests that pupils' learning improves as they move to higher grades. However, the present author argues that the improved learning is in part the results of changes in pupil cohort rather than fundamental changes in school quality. That is, the higher achievement of Grade 6 pupils is observed because poorly-performing pupils have dropped out before they reach that grade level, leaving in the system only those with relatively high achievement. Learning, not just being in school, is what the pupils and their parents take into consideration when they make decisions to invest in schooling. Even though pupils are promoted to higher grades, they will continue to drop out of schools if they perceive their schooling does not lead to improved learning.

The discussion so far highlighted two important points which motivate the current study. First, decreasing school age population reduces pressure on the government to expand educational access and, therefore, more attention and resources should be directed to the improvement of educational quality or pupils' learning. Second, there is a hypothesis that improved learning will lead to a better progression through grades, reducing educational wastage on repetition and dropouts. The purpose of this study is to investigate into factors which improve learning achievement of primary school pupils in Cambodia. The study intends to answer the following two specific questions:

1. How much is the variance in academic achievement explained by home- and school-related factors?
2. What factors are associated with a higher academic achievement?

By answering these questions, the study hopes to contribute to the thin literature in Cambodian context for the discussion on educational quality which emphasizes academic achievement. The author also seeks to inform policymakers on how to use educational resources to raise pupil performance in a more effective way.

Theoretical Framework

Factors influencing learning have long been extensively studied and debated by scholars from various disciplines. Educators have paid particular attention to this issue since the thought-provoking findings of the Coleman Report, which claimed that schools did little to affect academic achievement, while family and social

forces accounted for much of the variation in a child's learning (Coleman et al. 1966). This surprising conclusion has drawn so much attention and curiosity towards the determinants of pupil performance in both developing and industrialized countries. Although studies investigating the influences on pupil achievement may take a variety of approaches, the most prolific research tradition is the so-called education production function (EPF) paradigm, or the input-output model. In the United States alone, nearly 400 studies of this kind were published in books and scholarly journals by 1994 (Hanushek 1997), while a synthesis of research which looked into the same issues in developing countries identified over 100 studies over the same period (Fuller and Clark 1994).

The underlying model guiding the analyses of these studies is the assumption that the output of educational process (i.e., the achievement of individual pupils) is related directly to a series of inputs to education including those of families, peers, and schools (Hanushek 1989). This area of research is distinguished from many others because the results of analyses enter quite directly into the policy process by identifying school-related factors which tend to boost learning achievement (Hanushek 2010). The arguments of EPF studies center on two major themes: the controversy of home and school and the relative importance among school inputs.

The Controversy of Home and School

The most discussed question in the EPF studies is whether home or school is most important to academic achievement rather than the more policy-oriented ones of which school inputs are of most relevance to pupil learning. In sharp contrast to research findings in the United States (e.g., Coleman et al. 1966), Stephen Heyneman and William Loxley (1983), using achievement data sets from 13 industrialized and 16 developing countries, found that, in low-income countries, overall proportion of variance in pupil achievement was largely associated with school resources as compared to family background characteristics (as cited in Huang 2010). For instance, they found that in India 90 percent of achievement variance was due to teachers and schools. Reviews of studies conducted in developing countries also reaffirmed this finding (Fuller 1987; Lockheed and Hanushek 1988; Fuller and Clark 1994). However, Abby R. Riddell (1997), reviewing more recent studies which employed multilevel regression analyses, found that changing the levels of school resources accounted for an average of only 46 percent in the variation of primary school pupils' achievement. In line with this result, a study of 13 countries in Latin America found that school resources explained 43.5 percent and 54.3 percent of achievement variances in language and

Math respectively (Willms and Somers 2001). In a recent study, Baker et al. (2002), using data from the Third International Study of Mathematics and Science (TIMSS) and a method comparable to those of Heyneman and Loxley (1983), found that family background variables were much more significant predictors of pupils' achievement than were school resources variables regardless of national income. Although the debate on the importance of home and school into learning achievement might continue tirelessly, one conclusion can be made of almost half a century of EFP research: the effects of home as well as school on learning achievement are not uniform across societies. Generally, the effect of school is considerably larger in developing countries as compared to developed countries.

The Relative Importance among School Inputs

Although a comprehensive review of research in developing countries identified 30 indicators of school inputs, which were classified into five categories: school spending, specific material inputs, teacher attributes, classroom pedagogy and organization, and school management (Fuller and Clark 1994), most of EPF studies have paid attention to a relatively fewer number of variables, which are readily available from school surveys. For example, Ralph W. Harbinson and Eric A. Hanushek (1992) looked into 96 studies in developing countries by focusing their attention on the effects of six educational inputs on pupil performance. The inputs were pupil-teacher ratio, teacher's education, teacher's experience, teacher's salary, expenditure per pupil, and facilities. The study found that, except for teacher's education and facilities, there was little evidence that the measured inputs had significant impact on learning achievement (Harbinson and Hanushek 1992). Facilities here referred to quality buildings and libraries. A different review of research by Bruce Fuller (1987), as summarized by Fuller and Heyneman (1989), showed that school inputs which effectively boost pupil performance were textbooks and instructional materials, length of instructional programs, school library activities, years of teacher training, and school feeding program, while the least effective ones included reducing class size, science laboratories, teacher salaries, and grade repetition. Other studies in developing countries (Lockheed and Verspoor 1991; Velez et al. 1993) came to similar conclusions.

Methods

Data and Sample

The data used in this paper was derived from a survey which covered 32 randomly-selected primary schools in one rural district and one semi-urban district in Cambodia. One Grade 6 class of each school was selected and all the pupils of that class were tested in Math and Khmer language (national language). The pupils also attended a session in which they answered a questionnaire which contained questions about themselves and their families. In total, 1080 Grade 6 pupils participated in the survey. Information on various school inputs was provided by the principals of the 32 schools based on the School Questionnaire developed by the researcher. The information on school inputs provided by the principals was merged with pupils' test scores and information derived from the Pupil Questionnaire. Each pupil was assigned the values of inputs of the school he or she attended.

Variables

Academic achievement: Because there was no standard test available in Cambodia, achievement test in Math and Khmer language was developed by the researcher with the help of some teachers in the research sites. After reviewing the course of study, Grade 6 syllabus, pupil textbooks, and teacher guides, the researcher met with several teachers to discuss test items, formats and difficulty. The test was piloted and finally administered to sixth grade pupils in the sample schools. The finalized test version consisted of ten items (five from each subject). The tests intended to assess pupils' learning achievement on Math and Khmer language which they had studied earlier in the semester. Test results yielded a mean score of 51.59 with a range of 0 to 100 and an acceptable reliability estimate (Cronbach's Alpha = .76).

Pupil characteristics: Pupil characteristics included in the study were gender, age, and after-school time use. As shown earlier, Cambodia has achieved in closing the gender gap in primary school enrollment. However, there are reasons to suspect that academic achievement is not evenly distributed across gender. Even though national data consistently show that girls' promotion rates are higher than those of boys, signaling better performance in favor of girls, previous studies (Marshall et al. 2009, 2012) showed that girls' achievement are significantly lower than that of boys in both Khmer language and Math. Age of the pupils deserves attention because in Cambodia, like other developing countries, the prevalence of late school entry and repetition may result in pupils with a wide range of ages studying at the same grade level.

Unlike the previous EPF research, the current study employed included a measure on after-school time use. School hours in Cambodia are short because children attend school only half a day and there are hardly any extracurricular activities provided at school. Children spend a great deal of time outside schools and how they spend it will also determine their success in school. Studies have found that more time on tutoring and homework was associated with better grades, while time spent on work, including household chores, and leisure activities is related to poor performance at school (Smith 1990; Cooper et al. 1999).

Family characteristics: Frequently used family background variables were included in the analyses: family size represented by number of siblings, parental education, and books at home. However, a new proxy for socioeconomic status (SES) was used: pupils' *pocket money*. The commonly used measures of SES are parental education, occupation, and income. Yet, such measures have been shown to be only weakly correlated with academic achievement (White 1982; Sirin 2005). Giving children daily pocket money is a very common practice in Cambodia. A survey conducted in Cambodia in 2004 showed that in many households pocket money was the largest single expenditure on schooling (Bray and Seng 2005). Pocket money means a lot to Cambodian school children. With pocket money, they buy snacks and meals, which are sold in the school compound, and pay for tutoring and sometimes informal fee charged by their teachers. Pocket money is also a symbol of status as children from rich families tend to come to school with more money in their pockets. A preliminary correlation analysis showed a significant relationship between the pocket money and test scores ($r = .206, p < .001$), suggesting that pocket money is a good predictor of academic achievement. A final and less often used variable included was *home teaching* as a measure of family social capital. Although the presence of human capital such as parental education is believed to strongly affect a child's intellectual development, it is argued that if human capital is not complemented by social capital as embodied in family relations, it is irrelevant to the child's educational growth (Coleman 1988). Home teaching was used in the current study to capture the scholarly relationship within the family and was operationalized as the frequency at which the pupils are taught at home by their parents or older siblings, which also includes homework help.

School characteristics: School-related variables employed here consisted of four indicators of material resources (textbooks, teacher guides, books in library, and class size), two indicators of teacher quality (teachers' education and experience) and an indicator of the length of instructional program (instructional time loss). Availability of basic instructional materials such as textbooks and school libraries has been consistently shown to have a strong effect on pupils' performance in developing countries, where such

resources are relatively scarce compared to industrialized nations (Lockheed and Verspoor 1991; Fuller and Clark 1994; Hanushek 1995, 2003). Teacher education and experience comprised the measures of teacher quality. The current study used the school percentage of teachers with at least 12 years of general schooling to denote teacher education and the school percentage of teachers with ten years of teaching to denote teacher experience. These were aggregate variables denoting teacher quality of the whole school rather than variables indicating only the quality of teachers whose pupils took part in the survey. At the final year of primary education, pupils' learning is an accumulated product of a number of teachers to whom they have been exposed while they are in school, and not merely that of their Grade 6 teachers. Previous studies showed mixed results of the effects of teacher education and experience on pupil performance (Fuller 1987; Harbinson and Hanushek 1992).

Instructional time loss was employed to measure the availability of time for instruction. Research from a variety of countries has shown that the amount of time available for teaching and learning is consistently related to how much children learn while they are in school (Lockheed and Verspoor 1991). However, in developing countries, it has been found that significant amount of time is lost due to informal school closures, teacher absenteeism, delays, early departures, and poor use of classroom time (Abadzi 2009). Table 1 provides descriptive statistics for all variables used in this study.

Analytic Strategy

The trend for data analysis in school effectiveness or EPF research has been the use of multilevel modeling, also called hierarchical linear modeling (HLM). The design of the current study, however, prevented it from employing such advanced regression method. For example, the study has a sample of only 32 schools, which is not sufficient to produce an unbiased estimates of second-level (i.e., school level) variables, which require at least 50 cases for accurate estimation (Maas and Hox 2002). Instead, the study employs the conventional Ordinary Least Squares (OLS) regression, which was used by James Coleman and his colleagues (1966), Heyneman and Loxley (1983), and David P. Baker and his colleagues (2002). Although there have been criticisms over the use of OLS regression for nonrandom nested data of pupils in schools, Baker and his colleagues (2002) expressed skepticism over the claim that the use of multilevel modeling would uncover larger school effects in industrialized nations than was reported by the previous OLS estimates.

In this study, the OLS regression analyses were conducted through three stages using SPSS/PAWS 18. At the first stage, only variables comprising pupil characteristics were entered. The

second stage added family background variables. Finally, the third stage incorporated all variables including school characteristics.

Table 1. Definitions of Variables, Means, and Standard Deviations

Variables	Definition/Measurement	Mean	SD
Academic Achievement	Scores on achievement tests on Math and Khmer language with a range of 0 to 100	51.59	25.30
<i>Individual Characteristics</i>			
Gender	Gender of the pupil (0=Male; 1=Female)	.52	.50
Age	Age of the pupil in years	13.11	1.16
Work	Time spent on work including housework (1 = no time; 2 = less than 1 hour; 3 = 1 to 2 hours; 4 = 3 to 4 hours; 5 = 5 or more hours)	3.27	.97
Tutoring	Time spent on private tutoring (1 = no time; 2 = less than 1 hour; 3 = 1 to 2 hours; 4 = 3 to 4 hours; 5 = 5 or more hours)	2.15	1.15
Homework	Time spent on homework (1 = no time; 2 = less than 1 hour; 3 = 1 to 2 hours; 4 = 3 to 4 hours; 5 = 5 or more hours)	2.52	.61
Leisure	Time spent on TV, play, or talk with friends (1 = no time; 2 = less than 1 hour; 3 = 1 to 2 hours; 4 = 3 to 4 hours; 5 = 5 or more hours)	2.43	.58
<i>Family Characteristics</i>			
Siblings	Number of siblings with at least one parent in common	3.99	1.76
Parental education	Highest level of education of either the mother or the father (1 = none; 2 = primary school not completed; 3 = primary school completed; 4 = junior high school; 5 = high school or higher education)	3.28	1.20
Books at home	Number of books at home (1 = none; 2 = 1–5 books; 3 = 6–10 books; 4 = 11–20 books; 5 = 21–50 books; 6 = 51 or more books)	3.18	1.69
Home teaching	Frequency of being taught at home by family members (1 = never; ...; 5 = everyday)	3.20	1.42
Pocket money	Amount of pocket money received from parents per day (Unit = Riels) (1 = none; 2 = 100 to 400; 3 = 500 to 900; 4 = 1,000 to 1,900; 5 = 2,000 to 4,900; 6 = 5,000 or more)	3.49	.93
<i>School Characteristics</i>			
Textbooks	Proportion of pupils who have textbooks for Math and Khmer language (1 = none; ...; 5 = all the pupils have)	3.93	.56
Teacher guides	Proportion of Teachers who have guidebooks for Math and Khmer language (1 = None; ...; 5 = all the teachers have)	3.49	1.24
Teachers' education	Percentage of teachers with secondary education or higher	37.65	22.64
Teacher experience	Percentage of teacher with more than 10 years of experience	66.87	23.367
Class size	Average number of pupils per class	44.91	4.80
Time loss	Percentage of instructional time lost in a year (1 = 0%; 2 = less than 5%; 3 = 5–9%; 4 = 10–19%; 5 = 20% or more)	2.32	.86
Library books	Number of books in library (0 = no library or books; 1 = less than 500 books; 2 = 500 or more books)	1.08	.83

Results

Table 2 shows the main results of the OLS regression analyses of the effects on academic achievement. Model 1 showed that age had a highly negative relationship with academic achievement, indicating that younger pupils outperformed their older counterparts of the same grade. Time spent on tutoring had the strongest effect ($\beta = .163, p < .001$) on learning among other individual characteristics. Expectedly, time spent on leisure activities such as watching TV, play, or talk with friends was negatively correlated to academic achievement although the strength of the relationship was weak ($\beta = .097, p < .01$).

Model 2 showed that home teaching and pocket money were significant determinants of academic achievement. Of particular interest, pocket money was highly significant and had the largest magnitude of effect on achievement ($\beta = .144, p < .001$).

Model 3 predicted the relative influences of all factors on academic achievement. It was evident that when school variables were added to the regression analyses, there was a slight change in the magnitude of the effect of individual characteristics but a notable reduction in a significance level and the strength of the relationship between family factors and academic achievement. For instance, pocket money, which was found to be the most influential factor to affect achievement in Model 2, was no longer a significant predictor when school inputs were accounted for in Model 3 and its effect was only minimal ($\beta = .061, p > .05$). This suggests that school inputs played an important role in mediating the social inequality of educational achievement.

Model 3 showed that the significant variables with notable effects on academic achievement included age, tutoring, teacher guides, teacher experience, and time loss. Age of the pupils and schooling time loss perceived by the principals were negatively correlated to test scores, while time spent on tutoring, teacher guides and experience tended to have positive effects on achievement.

Table 2 also provides the values of variance (*R*-squared) in academic achievement explained by different regression models. The bottom row of Table 2 shows that all variables measured by this study accounted for 19.8 percent of the variation in academic achievement (Model 3), meaning that a large part of achievement variance remained unexplained. This is understandable since achievement is also a product of many other factors not counted here. Within this 19.8 percent of explained variance, 12.9 percent was accounted for by the home factors (i.e., pupil and family characteristics as shown in Model 2) and 6.9 percent was uniquely attributed to school inputs (the difference between *R*-squared in Model 3 and *R*-squared in Model 2). To put it another way, as a percentage of the total explained variance, family and school ac-

counted for 65.2 [(12.9/19.8)X100] percent and 34.8 [(6.9/19.8) X100] percent, respectively, of the variation in academic achievement.

Table 2. Standardized Regression Coefficients with Academic Achievement as Outcome Variable

	Model 1	Model 2	Model 3
<i>Individual Characteristics</i>			
Gender	.063	.054	.049
Age	-.149***	-.132***	-.137***
Work	-.025	-.053	-.027
Tutoring	.163***	.136***	.124***
Homework	.021	.042	.016
Leisure	-.097**	-.078**	-.045
<i>Family Characteristics</i>			
Siblings		-.062	-.061
Parental education		.039	.001
Books at home		-.021	-.054
Home teaching		.066*	.031
Pocket money		.144***	.061
<i>School Inputs</i>			
Textbooks			-.024
Teacher guides			.124***
Teacher education			.080*
Teacher experience			.254***
Class size			.002
Time loss			-.132***
Library books			.029
<i>R-Squared</i>	.078	.129	.189

* $p < .05$, ** $p < .01$, *** $p < .001$.

Discussion and Conclusion

This study employed education production function to investigate the effect of pupil-, family-, and school-related factors on pupil learning. Based on OLS regression analyses, the study found a considerable effect of school resources. Holding pupils' backgrounds constant, school accounted for about 35 percent of the variation in achievement scores. This is a relatively low effect as compared to that documented by the seminal work of Heyneman and Loxley (1983). However, this finding of school effect is on par with recent reviews of research in developing countries (Riddell 1997; Scheerens 2001; Willms and Somers 2001) and does indicate a greater school effect on academic achievement than that found in studies in industrialized countries. The finding provides more support for policies aimed at improving school resources to raise pupils' academic achievement. The remainder of this paper will discuss school-specific factors that significantly contributed to

student learning and that are more amendable to policymakers than pupil background characteristics.

The first significant predictor of academic achievement is teacher experience. The result showed that, holding other factors in control, the higher the percentage of experienced teachers a school had, the higher the pupils in that school performed in achievement test. Compared to the other predictors, teacher experience had the highest magnitude of effect on academic achievement, suggesting that one of the best ways to improve pupil learning is to make use of teacher experience. A further analysis of the survey data showed that schools with higher teacher experience tended to concentrate in urban and high-SES areas. This uneven concentration of teacher experience can be explained by two reasons. First, urban schools generally have been longer in existence and so have their teachers. Some of the schools in rural areas have just been constructed during the great expansion period of the last decade and most of the teachers were newly recruited. Second, it is a product of rural-to-urban migration of teachers who start their teaching in rural areas and later move into urban zones, where the advantage to earn additional income from private tutoring or doing a second job is higher than the special benefits provided by the government for teaching in underserved areas. The current teacher deployment system allowed teachers to change their initial postings after a few years of teaching. Teachers, except those who lived in the localities, tended to move to a more affluent or urban area after this initial stage of their careers, exacerbating the achievement gap in pupils' learning.

Currently, the government depends on local area recruitment for the supply of teachers to disadvantaged areas. Though this policy is able to deploy teachers with strong ties to schools in their own communities and will remain there longer, there is usually a shortage of potential teacher trainees from those areas and they are recruited based on affirmative measures. These measures include, for example, the government set quotas and the lower entry requirements to teacher training college for the candidates from disadvantaged areas. Of course, this initiative will somehow improve the education in underserved areas; but, the achievement gap between rural and urban areas is likely to persist. This study suggests that policy to improve pupils' achievement should consider not only the recruitment of local teachers but also the reassignment of experienced teachers to rural schools.

Availability of teacher guides was the second significant predictor of academic achievement. Although there are numerous studies on availability of textbooks and other resources, teacher guides are the least explored school input. The current study also included availability of textbooks in the regression, but it was not significantly related to achievement. Probably, availability of textbooks was no longer a problem in Cambodian primary schools as

most of the pupils could access to the textbooks (see Table 1). However, some teachers were still teaching without teacher guides, let alone other teaching resources. Teaching in Cambodia relied a great deal on textbooks and teachers rarely introduced extra materials into their classrooms. Also, teachers had to follow the child-centered approach, which was introduced in 1996. Nevertheless, the teachers have not been adequately trained to apply this pedagogy to their own classrooms. Therefore, it is not surprising that teacher guides were helpful textbook companions for teachers. They are guidelines as well as reference which teachers can consult when they have difficulty in their daily teaching. An examination of the Grade 6 Math teacher guide by the researcher revealed that the teacher guide was well integrated with pupil textbooks, providing teachers with necessary knowledge of the lessons before embarking on teaching them. Each chapter of the teacher guide, which is in line with that of the textbook, informed teachers of the following seven components: (a) chapter objectives; (b) important concepts and principles; (c) key terms; (d) teaching materials needed; (e) time needed; (f) instruction for teaching, which also included answers for problems in the textbook; and (g) suggestions for assessing pupil learning (MoEYS 2001). Surely, these are prerequisites for teaching, the ignorance of which would doom a teacher to failure in his or her teaching endeavors. The significant effect of teacher guides as found by this study is an important evidence of this relationship and it implied the needs to improve the resource bank through which teachers can learn and improve their teaching skills. Only doing that can teachers, who were poorly educated themselves and who rarely receive any technical support in their profession, develop themselves to the need of the new pedagogy. Providing teacher guides to every teacher is one of the effective means to improve pupil performance.

A final important factor which was found to constrain academic achievement was instructional time loss. Pupils of schools which reported higher percentage of instructional time loss had lower test scores than those in schools with better time management. This study employed just a gross measure of instructional time by asking principals to roughly estimate the proportion of schooling time lost due to unscheduled school closures, teacher absenteeism, and bad weather. The principal reported that, on average, less than five per cent of annual educational time was lost due to the above reasons. However, this result should be treated as a low limit estimate of school time loss due to the principals' bias. During school visits to conduct the survey for this study, the researcher observed that wastage of instructional time was more prevalent. Schools tended to start late and there usually was a long break between classes. Two teachers were absent on the day of survey even they had an appointment with the researcher. There were two cases where the whole school was closed to make way for the teachers to attend

the wedding of a colleague's relative. In a more systematic observation, the researcher asked two teachers to record their classroom teaching with an audio recorder by themselves without the presence of the researcher. In the examination of 20 recorded classes (ten from each teacher), the researcher counted the time between the beginning of the session, which was denoted by the announcement of class commencement made by the teacher and the end of the session, which was denoted by the announcement of break time or class dismissal. The researcher found that the classes lasted for an average of 28 minutes, which was much shorter than the official forty-minute class period. This shows a 30 percent loss of classroom time. However, this result, which relies on only two cases, should be treated with a caution. The Cambodia Education Sector Support Program (CESSP) survey conducted on a representative sample of schools reported that school closures due to public holidays and other reasons and teacher absenteeism accounted for the loss of 9 percent and 5 percent of annual instructional time respectively (Benveniste et al. 2008). Based on these evidences, it can be concluded that the actual instructional time which is available for pupil to engage in learning tasks is less than 60 percent of the official 190 school days per year. Although this is a tremendous loss of schooling time, it is not unique to Cambodia. Studies in other developing countries found a reduction of a roughly 30-50 percent of instructional time as intended by the official curriculum (Benavot and Gad 2004; Abazi 2009). Yet, these results should be considered as lower bound estimates because the measures used in these studies including the current study often fail to take into account pupils' time-on/off-task.

The seriousness of instructional time loss and the significant effect it has on pupil learning as shown in this section deserves special attention from policymakers. Although the loss incurred by natural phenomena such as torrential rain fall and flood is inevitable, a great deal of time for learning can be saved by good management. A strong monitoring system of instructional time should be introduced and incentives should be made to encourage schools that have outstanding practices in maximizing instructional time for their pupils.

In conclusion, this study detected a considerable overall effect of school inputs on academic achievement and identified three important aspects of school resources that were significantly correlated to student achievement: teacher experience, teacher guides and instructional time. Students performed better in schools with more experienced teachers, higher availability of teacher guides and longer annual instructional time than in schools with less of these resources. More explanations were provided pertaining to why these resources are important in Cambodian context. In light of the evidence, the study suggested that interventions to boost student learning should target on teacher redeployment system

which takes into account teaching experience, an improvement of teachers' resource bank (e.g., ensuring that every teacher has guidebooks), and a better management of instructional time.

References

- Abadzi, Helen. 2009. "Instructional Time Loss in Developing Countries: Concepts, Measurement, and Implications." *The World Bank Research Observer* 24 (2): 267-290.
- Baker, David P., Brian Goesling, and Gerald K. Letendre. 2002. "Socioeconomic Status, School Quality, and National Economic Development: A Cross-National Analysis of the "Heyneman-Loxley Effect" on Mathematics and Science Achievement." *Comparative Education Review* 46 (3): 291-312.
- Benavot, Aaron, and Limor Gad. 2004. "Actual Instructional Time in African Primary Schools: Factors That Reduce School Quality in Developing Countries." *Prospects* 34 (3): 291-311.
- Benveniste, Luis, Jeffery Marshall, and M. Caridad Araujo. 2008. *Teaching in Cambodia*. Phnom Penh, Cambodia: The World Bank.
- Bray, Mark, and Bunly Seng. 2005. *Balancing the Books: Household Financing of Basic Education in Cambodia*. Washington DC and Hong Kong: The World Bank; Comparative Education Research Centre, University of Hong Kong.
- Coleman, James S. 1988. "Social Capital in the Creation of Human Capital." *The American Journal of Sociology* 94: S95-S120.
- Coleman, James S., Ernest Campbell, Carol Hobson, James McParland, Alexander Mood, Frederic Weinfeld, and Robert York. 1966. *Equality of Educational Opportunity*. Washington, DC: U.S. Government Printing Office.
- Cooper, Harris, Jeffrey Valentine, Barbara Nye, and James Lindsay. 1999. "Relationships between Five After-school Activities and Academic Achievement." *Journal of Educational Psychology* 91 (2): 369-378.
- Fuller, Bruce. 1987. "What School Factors Raise Achievement in the Third World?" *Review of Educational Research* 57: 255-292.
- Fuller, Bruce, and Prema Clarke. 1994. "Raising School Effects While Ignoring Local Culture? Local Conditions and the Influence of Classroom Tools, Rules, and Pedagogy." *Review of Educational Research* 64: 119-157.
- Fuller, Bruce, and Stephen P. Heyneman. 1989. "Third World School Quality: Current Collapse, Future Potential." *Educational Researcher* 18: 12-19.
- Hanushek, Eric A. 1989. "The Impact of Differential Expenditure on School Performance." *Educational Researcher* 18: 45-65.
- Hanushek, Eric A. 1995. "Interpreting Recent Research on Schooling in Developing Countries." *The World Bank Research Observer* 10 (2): 227-246.
- Hanushek, Eric A. 1997. "Assessing the Effects of School Resources on Student Performance: An Update." *Education Evaluation and Policy Analysis* 19: 141-164.

- Hanushek, Eric A. 2003. "The Failure of Input-Based Schooling Policies." *The Economic Journal* 113 (485): F64-F98.
- Hanushek, Eric A. 2010. "Education Production Functions: Developed Country Evidence." In *International Encyclopedia of Education*, Vol. 2, ed. P. Peterson, E. Baker, and B. McGaw (pp. 407-411). Oxford, UK: Elsevier.
- Hanushek, Eric A., Vitor Lavy, and Kohtaro Hitomi. 2008. "Do Students Care about School Quality? Determinants of Dropout Behavior in Developing Countries." *Journal of Human Capital* 2 (1): 69-105.
- Harbison, Ralph W., and Eric A. Hanushek. 1992. *Educational Performance of the Poor: Lessons from Rural Northeast Brazil*. New York: Oxford University Press.
- Heyneman, Stephen, and William Loxley. 1982. "Influences on Academic Achievement across High and Low Income Countries: A Re-analysis of IEA Data." *Sociology of Education* 55: 13-21.
- Huang, Francis L. 2010. "The Role of Socioeconomic Status and School Quality in the Philippines: Revisiting the Heyneman-Loxley Effect." *International Journal of Educational Development* 30: 288-296.
- Lockheed, Marlaine E., and Eric A. Hanushek. 1988. "Improving Educational Efficiency in Developing Countries: What Do We Know?" *Compare* 18 (1): 21-38.
- Lockheed, Marlaine E., and Adriaan M. Verspoor. 1991. *Improving Primary Education in Developing Countries*. New York: Oxford University Press.
- Maas, Cora J. M., and Joop J. Hox. 2005. "Sufficient Sample Sizes for Multilevel Modeling." *Methodology* 13: 86-92.
- Marshall, Jeffery H., Ung Chinna, Puth Nessay, ung Ngo Huk, Va Savoeun, Souer Tenon and Meung Veasha. 2009. "Student Achievement and Education Policy in a Period of Rapid Expansion: Assessment Data Evidence from Cambodia." *International Review of Education* 55 (4): 393-413.
- Marshall, Jeffery and others. 2012. "Student Achievement and Education System Performance in a Developing Country." *Educational Assessment, Evaluation and Accountability* 24 (2): 113-134.
- Ministry of Education, Youth, and Sports (MoEYS). 2001. *Sievphov kru: Kaenitvitya thnak ti 6* [Teacher Guide: Mathematics for Grade 6]. Phnom Penh, Cambodia: MoEYS.
- MoEYS. 2003. *Education Statistics and Indicators 2002/2003*. Phnom Penh, Cambodia: MoEYS.
- MoEYS. 2011. *Education Statistics and Indicators 2010/2011*. Phnom Penh, Cambodia: MoEYS.
- Riddell, Abby R. 1997. "Assessing Designs for School Effectiveness Research and School Improvement in Developing Countries." *Comparative Education Review* 41: 178-204.
- Scheerens, Jaap. 2001. "Monitoring School Effectiveness in Developing Countries." *School Effectiveness and School Improvement* 12 (4): 359-384.
- Sirin, Selcuk R. 2005. "Socioeconomic Status and Academic Achievement: A Meta-analytic Review of Research." *Review of Educational Research* 75: 417-453.
- Smith, Thomas E. 1990. "Time and Academic Achievement." *Journal of Youth and Adolescence* 19 (6): 539-558.
- Velez, Eduardo, Ernesto Schiefelbein, and Jorge Valenzuela. April, 1993. *Factors Affecting Achievement in Primary Education*, HROWP Working Paper 2. Washington, DC: World Bank, Department of Human Resources Development and Operations Policy.
- Willms, J. Douglas, and Marie-Andree Somers. 2001. "Family, Classroom, and School Effects on Children's Educational Outcomes in Latin America." *School Effectiveness and School Improvement* 12 (4): 409-445.
- White, Karl. 1982. "The Relation between Socioeconomic Status and Academic Achievement." *Psychological Bulletin* 91: 461-481.
- World Bank. 2008. *The Road to 2015: Reaching the Education Goals*, Annual Report. Washington, DC: The World Bank, The Education for All – Fast Track Initiative Secretariat.