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ABSTRACT

Low levels of student achievement and school quality persist in developing countries. This document reviews the importance of school quality in increasing literacy and influencing economic growth in developing nations. Improvements are discussed in terms of: (1) school quality and economic development; (2) defining school quality; (3) improving school quality; and (4) increasing school efficiency. Evidence suggests that low school quality accounts for low literacy levels and achievement among children in developing nations and that little progress has occurred in improving school quality in the poorest countries since 1970. Definitions of school quality should focus on characteristics that influence student achievement and on efforts that encourage more efficient management and effective local school staff. Little research has been conducted about the influence of teaching practices and classroom organization on achievement levels, but access to textbooks and writing materials and teacher quality consistently influence student achievement. Methods for studying the efficiency and cost-effectiveness of management practices in terms of increased school quality are reviewed, and investments that can be reduced without causing detrimental effects are identified. Tables and a 94-item bibliography are included. (Author/JHP)

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Raising School Quality in Developing Countries

What Investments Boost Learning?

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Abstract

Low levels of student achievement and school quality persist in developing countries. The importance of school quality -- in raising literacy and influencing economic development -- is reviewed in this paper. Some of the lessons learned in how best to improve the quality and efficiency of schools are discussed within four areas.

School quality and development. Considerable evidence now exists that low school quality accounts for low levels of literacy and achievement among Third World children. If the effects of a child's preschool and socioeconomic background are held constant, school quality makes a substantial difference in his or her achievement. The economic returns from improvements in school quality are comparable to those from school expansion. However, little progress has been made to improve school quality among the poorest developing nations since 1970. In some countries, even the limited quality that has been achieved over the years is being eroded.

Defining school quality. School quality is often indicated by levels of student achievement or by school characteristics which are unrelated to student performance. Instead, the definition of school quality -- as well as government investment strategies -- should focus on (a) school characteristics which influence student achievement, and (b) efforts which encourage more efficient management of material inputs by local school staff.

Improving school quality. Textbooks, writing materials, and teacher quality have been shown in empirical studies to consistently influence student achievement. Considerable savings can be realized by reducing expenditure in other elements of schools which are not related to achievement, such as number of pupils per class, laboratories in the classroom, and paper credentials and salary levels of teachers. Very little research has been conducted on the influence of teaching practices and classroom organization on achievement levels of Third World students. These management practices may raise literacy and academic achievement more than new investments in material inputs. This area should be explored in the future.

Increasing school efficiency. Very little thinking has been done on the relative cost-effectiveness (or internal efficiency) of alternative school inputs and management practices in raising achievement. In this paper, those school characteristics which are not related to higher student achievement and for which investment can be reduced without any detrimental effect are identified. But of those characteristics which consistently do influence performance, little is known about their magnitude and their relative costs. Methods for studying the efficiency of various inputs are reviewed in this paper.

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Contents

Summary

"A year of schooling is not just a year of schooling. It can be anything from a delight to a torment depending on the imagination and devotion, as well as the cognitive skills, of the teacher. It can be anything from an experience of growth and mastery to a stunting and confining time [Note 1.1]"

Considerable evidence now demonstrates that the quality of a child's school influences his or her academic achievement in developing countries. This differs from the situation within industrialized nations where the effect of school quality is eclipsed by the child's family background. However, the quality of schools remains low in many developing countries. This paper examines aspects of this problem and reviews what is known about how to improve the quality and efficiency of schools.

First, little progress has been made in improving the level of school quality in the poorest developing countries since 1970. Expenditure per pupil can be used as one general indicator of school quality. For low-income countries, the average level of per pupil expenditure has declined from (constant 1980 U.S.) $109 in 1970 to $75 in 1980. In contrast, middle-income nations have increased per pupil expenditure from $127 to $195 during this period. Low-income countries also remain below middle-income countries and far below industrialized countries in the percent of children who complete primary school.

Recent research reviewed in this paper shows that rates of return to investments in improving school quality are comparable to returns from expanding school systems. Therefore, the limited progress of many countries in improving school quality and efficiency may significantly constrain the potential contribution of educational investment to development.

Second, analysis of the problem requires a clear definition of "school quality." Often school quality is inferred from the achievement level of the students (that is, quality of output). This fails to control for the influence of the child's family background and the ongoing demand for his or her labor. However, policy and investment decisions continue to be founded upon this imprecise definition. Quality is better defined as the school's specific impact on the student's learning after accounting for contextual factors. The school's influence is a function of (a) the concentration of material inputs expended by the school per pupil, and (b) the efficiency with which these inputs are managed by the teacher and the headmaster.

Third, this paper addresses the question of which specific material inputs are related to student achievement by reviewing 72 studies on this

issue conducted in developing countries over the past 15 years. In general, the review finds that those material inputs directly linked to the instructional process consistently influence pupil achievement. For instance, of the 22 studies of the influence of textbooks, 14 have found a significant effect on achievement. Fifteen of 18 studies of school libraries (and intensity of utilization) found that they contribute to student achievement. Of 31 analyses of teacher training, 21 found that the length of training influences pupil achievement. All studies reviewed empirically tested multivariate models and controlled on the independent influence of pupils' family background.

Fourth, this paper addresses the question of what school inputs most efficiently raise achievement. We do know that some costly inputs are not consistently related to achievement. For instance, 9 of 13 studies have found that teachers' salary levels are not related to pupils' achievement. Sixteen of 21 empirical studies have found that pupils enrolled in classrooms with fewer students do not achieve at higher levels than those in larger classrooms. Such disconfirmation of any relationship between an input and actual achievement suggests where cost-savings can be generated without detrimental effects on pupil performance.

Very little research has occurred in three important areas. Among those inputs that do significantly influence achievement, we know little about the relative magnitude of their effects. For instance, only a few empirical studies have compared the size of the achievement effect from textbooks versus the effect from improving inservice training for teachers. In addition, little information has been collected on the costs of alternative school inputs. To determine the relative efficiency of two investment strategies, one needs to know both the relative magnitude and the costs of the alternative policies. Very little empirical data exist in either area.

Finally, very little is known about how the social management of inputs influences pupil achievement. For example, researchers in industrialized countries have found strong effects from the length of classroom time spent on actual instruction, from the use of different ways of encouraging active student participation during class, from the use of praise and encouragement by the teacher, and from strong leadership by headmasters. But these social practices have received very little attention among researchers and policymakers in developing countries.

Chapter 1
The Issue: A Costly Neglect of School Quality?

Introduction

The education sector's contribution to national development has been widely recognized in the Third World since World War II. Government policymakers and development groups have emphasized the importance of increasing the **quantity** of education -- that is building more schools, hiring more teachers, and enrolling more children. However, the **quality** of teaching and learning in a number of schools remains low in many developing countries. Several events have increased public concern over school quality.

First, the issue of quality has been eclipsed by the post-war desire in many developing countries to simply build national systems of education. Until primary enrollment rates reached reasonably high levels, improvement of quality was not viewed as an immediate problem. Nations which successfully have expanded primary schooling are now faced with a tradeoff between improving quality of primary instruction or further expanding secondary and tertiary schools.

Second, the recent decline in the level of investment capital available to the Third World has raised the issue of efficiency: How can schools increase literacy and academic achievement more efficiently? When school systems expand rapidly, policymakers and local school staff spend less time thinking about which elements of schools more efficiently boost student achievement. But the slowing of growth in resources and enrollment rates provides an opportunity to focus attention on improving the effectiveness of schools. This is not to say that improving school quality is less costly than continuing the expansion of schools. Recent research does, however, separate those elements of school organizations which are consistently related to higher student achievement from those factors which are not. Shifting resources from school expansion to the improvement of school quality could raise efficiency at no additional cost to the education sector.

Third, our knowledge of student achievement in the Third World and the influence of school quality has grown substantially in recent years. As attention of policymakers and researchers turns from school expansion to school improvement, the problem of inadequate quality becomes more stark. Four aspects of the school quality problem have been highlighted in recent research:

o Literacy and academic achievement of children in developing countries remain far below the performance of students in industrialized countries at the same grade level.

o Low levels of student achievement and poor school quality are hampering economic development. Initial evidence demonstrates higher economic returns to school investments when school quality and/or student achievement are relatively high. These "economic effects" of school quality are independent of school quantity (that is, they are independent of either the individual's length of schooling or the nation's aggregate enrollment rate).

o The absence of a clear priority in investment policy between improving the quality of primary schooling versus expanding secondary and tertiary schooling may be very costly. The evidence is clear that rates of return to primary schooling are higher than returns to secondary and higher education in most Third World countries. Improving the quality of primary schools may spur economic development more sharply than expanding higher levels of schooling.

o Initial evidence reveals that school quality has declined in many of the poorest nations since 1970. In addition, the gap in relative levels of school quality between developing and industrialized countries has widened over the past 15 years.

Each aspect of the school quality problem is discussed below.

Issue 1: Low Student Achievement, Low School Quality

Only 10 percent of Third World students, aged 14, are literate in their native language. This is a major finding of one cross-national study of school achievement. Mean exam scores in reading, math, and science were 50 percent lower in developing countries than in industralized nations. In reading, for instance, the mean comprehension score (in the student's native language) was 26 for all countries surveyed. The mean reading score, however, for Chile was only 14; for Iran, 8; and for India, 5. Only four developing countries (Chile, India, Thailand, and Iran) were included in this study, but the findings may accurately represent low levels of student achievement in many other Third World nations. For example, in Sierra Leone only 15 percent of all Grade 2 students are able to achieve scores in math that are expected of them at that grade.

Alternative measures of student performance show equally discouraging student performance in the Third World. In Bangladesh, only one-fourth of all children complete the fourth grade. In Peru, 37 percent of all children repeat the first grade. In Chile, Thailand, Iran, and India the number of children in Grade 4 was one-half the size of those enrolled in Grade 1 [Note 1.2].

Student performance varies within developing countries. In Egypt, rural primary school students perform one grade level below urban children. Reading scores among low achieving schools in Botswana average one-third of the level of achievement by pupils in high performing schools. Similarly, in Kenya, rural school performance on the national exam is one-third below the mean performance of urban schools. In Brazil, the urban youth, age 12-15 , on average complete four years of schooling; but rural youth spend just one to

one-half years in school. Each day, 15 percent of all urban Peruvian students and 30 percent of rural children reportedly are absent from school [1.3].

The costs of frequent repetition and high dropout rates are enormous. In Haiti, due to high repetition rates, 20 student-years of attendance occur for each rural pupil who graduates from primary school. [Five pupils each attending school for two years equals 10 student-years of attendance.] In contrast, graduates in urban private schools spend on average seven years for a six-year course. [1.4].

Table 1 provides data on pupils completing primary school for developing and industrialized nations. For instance, among 23 low-income countries (GNP per capita less than US$405) only 60 percent of all children complete primary school. The completion rate rises to 75 percent among middle-income developing nations (GNP per capita of $840 for lower middle-income and $2,490 for upper middle-income nations). Virtually all children of industrialized nations (GNP per capita averaging $11,070) finish primary school. Student performance in sub-Saharan Africa remains acutely low by any standard. [For example, adult literacy is below 20 percent in Chad and Mali.]

Table 1
Student Performance: Primary School Completion Rates

	% Pupils Completing Primary School	Number of Countries Reporting
Development Status		
Low-income countries	60%	23
Middle-income countries	75%	49
Industrialized countries	93%	6
Developing Countries By Region		
Sub-Sahara Africa	65%	30
East Asia	84%	11
South Asia	66%	4
Latin America	65%	19

Source: UNFSCO (1983a)

Documenting low levels of student achievement in developing countries is a straightforward task. Explaining the causes of low performance is more difficult. A nation's wealth is related to students' average achievement levels in at least two ways [1.5]. First, infants and young children in more affluent countries experience a higher material quality of life, especially in terms of nutrition, physical health, and cognitive stimulation. Therefore, children in wealthier nations enter the primary school with stronger physical

and intellectual competencies. Second, the demand for children's labor is lower in industrialized nations. These societies, in fact, often bar children from taking up jobs. In contrast, many children in developing countries are required to work in agriculture (or take up urban jobs) for a good part of each day and especially during planting and harvest seasons.

Social studies from the Third World find that the pupil's social background does make a difference in shaping student achievement. However, the influence is considerably less in developing countries than in industrialized nations [1.6]. The quality of the child's school also determines student achievement. The school's specific influence is strongest among poorer countries and among lower income students within developing nations. At times, school quality has more influence on school achievement than does social class. Interestingly, school quality is a stronger (and family background a weaker) determinant of achievement in mathematics or science curriculum areas which are not linked to indigenous language or knowledge [1.7].

In short, schools can also influence human capital formation. But unfortunately school quality is very low in many developing countries. Signs of low quality are abundant. In Malawi, for instance, only one in eight children attending school has a seat; just one in 88 students is provided a writing desk. In Togo the ratio of pupils to teachers is 55/1; it is 51/1 in Cameroon. Prior to a large development program, schools in the Philippines had one textbook for every 10 pupils. Shortages of books and basic reading materials are common. Sierra Leone spends US$0.68 per student on instructional materials; Bolivia allocates $0.80 for textbooks and classroom supplies [1.8].

School quality varies across nations, particularly in basic material resources available per student. Table 2 (Column A) shows central government expenditures per pupil for developing and industrialized countries for 1980. Low-income nations spend just US$ 59 per student, middle income countries spend US$195 and industrialized nations spend $2,297 per pupil. The pattern of resources allocated per pupil for (non-salary) instructional materials (Column B) is similar: low-income countries spend on average $1.69 per pupil while industrialized nations spend $92.32. The total expenditure per student and expenditure on instructional materials are two indicators of school quality related to student achievement (see Chapter 3). Expenditure data have not been adjusted for differences in purchasing power because of the lack of indices available for individual developing countries. However, based on existing purchasing power information, the differences in quality levels would be compressed modestly if complete purchasing-power adjustments could be made [1.9].

Table 2
School Quality Indicators for Primary School Level, 1980
(Number of Countries Reporting)

Nation Groups	(a) Total Recurrent Expenditures Per Pupil (1980 US $)	(b) Expenditures on Instructional Materials Per Pupil (1980 US $)	(c) Pupil/Teacher Ratio
Development Status			
Low-income Countries	$ 59 (21)	$ 1.69 (34)	44 (34)
Middle-income countries	$ 195 (42)	$ 6.14 (32)	32 (59)
Industrialized countries	$2,297 (19)	$92.32 (16)	18 (18)
Developing Countries Only by Region			
Sub-Sahara Africa	$ 92 (24)	$ 2.49 (16)	43 (36)
Middle East & North Africa	$ 221 (5)	$ 3.28 (4)	30 (10)
East Asia & Pacific	$ 210 (6)	$ 2.06 (6)	31 (12)
South Asia	$ 17 (6)	$ 1.26 (4)	40 (9)
Latin America & Caribbean	$ 209 (19)	$ 8.99 (15)	30 (24)

Sources: Unesco ..781, 1983a, 1983b)

Variation in school quality is also apparent across geographical regions among developing countries. South Asia for instance spent a total of just $17 per student and an additional $1.26 per pupil for instructional materials in 1980 (see Table 2). On the other hand, Latin America allocated $209 per student and an additional $8.99 on instructional materials.

The ratio of pupils per teacher represents a third measure of quality. The pupil/teacher ratio is 44/1 in low-income nations, 32/1 in middle-income countries and 18/1 in industrialized states (Column C). The highest pupil/teacher ratios are reported in sub-Saharan Africa (43/1) and South Asia (40/1).

School quality also varies within developing nations. In Honduras, for instance, about one-third of all rural teachers work in a one-room schoolhouse with 60 children. In Tanzania the pupil/teacher ratio averages from 60/1 in rural regions and 31/1 in urban regions. In northeastern Brazil, one-third of all teachers have four years of schooling or less, and 75 percent do not meet minimum national qualifications. In El Salvador, 55 percent of all rural students have no books available in their schools.

Better cross-national measures of school quality would be useful. Expenditures per pupil as a general indicator fails to capture variation in the use of resources, particularly administrative costs, teacher salaries, and instructional materials. The pupil/teacher ratio reported by UNESCO does not take into account multiple shifts of classes. It simply reports the national ratio of enrollments to teachers. The benchmark may reflect average class size; but class size is not always related to achievement levels. More work is needed in developing cross-national indicators of school quality.

Issue 2: Constraining the Economic Return to School Investments

High economic costs result from low school quality. Available evidence suggests that variations in school quality are related to economic gains both in terms of individual income and national economic development. Importantly, the economic effects of investments made to improve school quality are independent of expansion in school enrollment. Not surprisingly, how much a child learns significantly influences future earnings. Therefore, unless a priority is placed on improving quality, the economic benefits of simply expanding schools will be limited.

Two types of research have been conducted on the economic benefits of school quality. First, the influence of school quality on the individual's subsequent occupational success is examined. The evidence is now clear that children who attend schools of varying quality acquire differing amounts of knowledge. This variation among individuals may influence the level of job obtained by the individual and subsequent personal earnings. In Chile, for example, the careers of 1,205 Chilean youths were tracked from school to their first jobs. All the youths surveyed had completed primary school in 1970. Their family background and the quality of school attended both helped to explain the level of their first occupation. School quality was measured by several indicators, including teachers' educational level, textbook availability, and the quality of school facilities [1.10].

Several studies in industrialized nations have found that school quality (measured in terms of expenditures per pupil) significantly affects earnings

of school graduates. Early work on estimating economic returns to education used global measures of school quantity, such as the length of school attendance. Family background also affects the amount of schooling and, therefore, subsequent earnings of the child. Yet this more recent work reveals larger income effects for schooling when discriminating between varying levels of quality within industrialized nations.

School quality may also influence the earnings of individuals in the Third World. For instance, in a recent study of 6,171 Brazilian males, aged 15 to 35, the quality of school attended (determined by the mean educational level of teachers) was found to influence subsequent earnings more strongly than the length of schooling completed. The quality of schools varied considerably. Teachers on average had attained less than nine years of schooling. Their level of schooling varied widely; two-thirds of the teachers had received between five and twelve years of formal education. The Brazil study suggests that the economic return to school quantity may be over-stated unless one takes into account the differences in school quality across regions and individual schools. For example, the social rate of return on increased investment to improve school quality exceeded the yield associated with increasing the number of years of school attendance (even after accounting for the additional cost of educating teachers for a longer period of time). In addition, the rate of return on improving quality also exceeded the ten percent standard commonly used in judging the desirability of investment strategies [1.11].

Whether governments can actually benefit from such high returns is another question. School quality differences are often determined by economic and institutional structures. For example, many developing nations have not addressed inequities in school quality between urban and rural areas. One recent study found that children of white-collar workers benefit nearly six times as much from school expenditures (including support of school quantity and quality) as do children of farmers. In some developing countries, particularly in francophone Africa, the distribution of educational benefits between urban and rural areas is ten to one. Additional benefits in school quality may further benefit only urban students unless institutionally entrenched inequities are reduced [1.12].

Economic returns to school quality were also examined in a recent study of actual school achievement of 205 workers in Kenya and 179 workers in Tanzania. All individuals were employed in the modern economic sector. The study disaggregated the length of schooling of workers from their scholastic achievement. Achievement was measured by a standard exam in literacy and numeracy. Examination results do not directly measure school quality. Some degree of literacy can also be acquired outside of formal schooling. But actual achievement levels reflect, in large part, the quality of the school and its capacity to raise literacy, independent of the child's length of attendance. Individual income effects from the length of schooling and from the acquisition of a school degree were found to be small. But returns on the worker's level of literacy and numeracy were substantial among both manual and white-collar workers. A rough test of ability was also used to control for

the effects of cognitive skills developed prior to school entry (which explained little variation in subsequent earnings) [1.13].

A related study examined the influence of educational attainment and school quality on farmers' productivity among 683 households in Nepal. This study used actual measures of productivity rather than assume that wage levels can be used as a valid proxy for a worker's productivity. Agricultural productivity was not sensitive to variation in the length of schooling for farmers who remained in school between one and six years. However, farmers with seven or more years of schooling were significantly more productive than those with lower levels of school attainment, after controlling for the influence of physical production inputs (land and capital). This suggests the presence of a threshold level of achievement or school retention which is related to subsequent productivity gains. In Nepal, variation in farmers' numeric skills was not related to overall productivity, but they were related to output of wheat, a recently introduced crop. In short, school quality was shown to yield competitive economic benefits. These benefits were independent of and at least comparable to returns from school expansion [1.14].

The second type of research assesses the impact of school quality on a nation's total economic output. Advocates of this method avoid the use of individual income as a proxy for productivity since actual levels of production are assessed. At the individual level, a close correlation often is observed between the worker's level of schooling and his or her wage rate -- even when a national economy experiences no growth in productivity. By looking at aggregate economic output and production inputs (including levels of investment in school expansion and school quality) the weaknesses of using individual-level data are avoided. In addition, returns to education may also vary with changes in labor demand over time. By looking at the relationship between school investments and economic growth over historical periods, the risk of inferring long-term relationships from data collected at one point in time is minimized.

Much of the research conducted at the national level has examined the influence of school quantity (national expenditures, average school attainment, or length of schooling for different occupational groups) on gains in economic output. However, one study from Mexico found that school quality (in terms of expenditures per pupil and primary student persistence rates) and rising literacy were positively related to rising economic output. These effects were observed over a 50 year period, controlling for the influence of material factors of production. The influence of literacy, a general measure of school achievement, was strongest in the urban manufacturing sector [1.15].

Issue 3: Policy Tradeoff Between School Expansion and School Quality

The potential benefits of continued school expansion may be seriously limited unless schools of low quality are upgraded. Two studies have examined the tradeoff between quality and quantity. The first study on Brazil found a higher social rate of return for marginal improvements in quality than for

increasing pupils' average length of school attendance. The individual's length of schooling and the quality of school attended both shaped eventual personal income. But the findings suggested that the productivity of young workers would increase more from improving school quality than from expanding enrollment or from increasing the average length of attendance. To illustrate, assume (1) that school places were provided to only one-half of the pupils actually enrolled, and (2) that the resources thus saved were redirected to improve the quality of education. Results from the Brazil study show that aggregate income would increase 18 percent if resources were allocated to this scheme [1.16].

In a second study, the causes of wide variation in school quality found among developing countries were examined. Two indicators of school quality were used -- per pupil expenditures and the ratio of pupils to teachers. Countries with higher primary school enrollment rates were found to have higher quality schools. However, if differences in national wealth were taken into consideration, these countries actually had lower school quality in terms of expenditures per pupil. Over the 1970-1980 period, expenditures per pupil declined in those countries that had the highest growth in enrollment rates. The concentration of resources per student simply failed to keep pace with the rising number of students. These findings did not hold when using the pupil/teacher ratio as a measure of quality. This evidence points to a discrete tradeoff between school expansion and improvement of school quality [1.17].

This tradeoff becomes more significant in light of the fact that in some regions the social rate of return for primary schooling is twice that for higher education (see Table 3). Rates of return are also lower for secondary schools compared to primary schooling. Further, social rates of return are inversely related to national wealth -- that is, returns to schooling are the highest in lower-income countries. This is due largely to acute shortages of literate and skilled workers in poorer nations. Given these diminishing rates of return (a) from the quantity of secondary and tertiary schooling and (b) from school expansion, in general, among middle-income developing countries more emphasis can be placed on improving the quality of education. This may yield returns that are comparable to the yield on school investments during early periods of school expansion.

Table 3:
Social Rates of Return to Education
(Length of Attendance)

Region or Development Status	Level of Schooling		
	Primary	Secondary	Tertiary
Low-income countries			
Africa	28%	17%	13%
Asia	27	15	13
Latin America	26	18	16
Middle-income Countries	13	10	8
Industrialized Countries	--	11	9

Source: Psacharopoulos (1985)

More research is necessary to determine the economic benefits of school quality and to specify the conditions necessary for higher returns. The preliminary results of existing research suggest that the quality of schooling and the amount of learning by students significantly contribute to their improved productivity and income growth. Education's contribution to economic development has usually been seen in terms of school quantity. But, in short, recent research has shown that school quality exerts at least a comparable influence [1.18].

Issue 4: Eroding School Quality?

Since World War II, Third World governments and development agencies have emphasized school expansion, not improvement of school quality. This policy has had dramatic results: In 1950, just 37 percent of all children of primary school age were enrolled in primary school in developing countries. The proportion increased to 58 percent by 1970 and is estimated at 72 percent for 1985. Secondary enrollment rates similarly rose from 5 to 43 percent between 1950-1985. This level of school expansion is even more impressive when one considers the fact that the number of school-going children has been increasing at about three percent annually over this period [1.19].

Yet little is known of the long term effects on school quality resulting from such high rates of expansion. Recent evidence suggests that resources available to the education sector have leveled off even as school expansion has continued. Therefore, expenditures per student may have diminished and the quality of education has declined. During the 1970's, for instance, government expenditures in developing countries fell from 21 to 18 percent of GNP while the average share of government budgets allocated to education slipped from 16 to 11 percent [1.20]. On the other hand,it is possible that

nations experiencing economic growth may have been able to increase per pupil expenditures even while enrollments were expanding.

Recent data on school quality show that among low-income nations, expenditures per pupil dropped from (constant 1980 US) $109 to $75 over the 1970's while per pupil expenditures in middle-income developing nations increased from $127 in 1970 to $195 in 1980 (see Table 4). Industrialized countries almost doubled their support per student during this period.

Table 4

School Quality Trends for Developing & Industrialized Nations, 1970-1980
(Number of Countries Reporting)

School Quality Indicator	Low-income Countries	Middle-income Countries	Industrialized Countries
Primary School Expenditures Per Pupil (Constant 1980 US$)			
1970	$109	$127	$1,205
1980	$ 75	$195	$2,343
(n)	(11)	(33)	(17)
Pupil/Teacher Ratio			
1970	44	36	23
1980	45	31	19
(n)	(33)	(57)	(18)

Similar trends are evident in the ratio of pupils per teacher. Low-income countries showed no real change in the ratio over the 1970-1980 period, while in middle-income and industrialized countries the ratio declined significantly.

One might argue that unit costs of education should go down as enrollments expand due to economies of scale. However, experience in middle-income developing countries shows that enrollment rates and expenditures per pupil can be raised simultaneously. The latter are positively related to higher student achievement levels. Therefore, it might be unwise to expect economies of scale. In some instances, unit costs could lower school quality, pupil achievement, and subsequent economic returns to educational investments.

Chapter 2
Defining School Quality

Introduction

The term "school quality" is often associated with the student's level of academic performance. If student achievement levels are low -- manifest in a school's low test scores, high dropout and repetition rates -- the school allegedly is of low quality. But academic performance of children can stem from factors other than the character of the school itself. A clearer definition of "school quality" is required. School quality can be defined as: (a) the level of material inputs allocated to schools on a per-student basis, and (b) the level of efficiency with which fixed amounts of material inputs are organized and managed to raise student achievement.

In addition to sharpening the definition of school quality, this chapter reviews research regarding the influence of school quality on student achievement. The influence of the school versus out-of-school factors in shaping literacy and academic achievement continues to be debated. In both industrialized and developing countries, the child's family background and the community influence scholastic achievement. Yet the evidence is now clear that school quality significantly influences student achievement in the Third World.

A Value-Added Definition of School Quality

The low levels of literacy and school achievement in many Third World countries should not be attributed entirely to the school. The model in Table 5 identifies school-related and other factors that operate as the child grows.

Prior to entering school (Time 1), material conditions shape the child's health and nutritional status, which in turn shape cognitive capacities (Box 1). Parental and community beliefs regarding literacy and education, exercised early in the child's life, influence later school achievement. Parenting practices also help shape the child's cognitive skills. Certain forms of interaction between parent and child are related to higher intellectual development and school achievement later in the child's life. This has been observed particularly among parents who frequently ask their child questions, allow the child to solve problems with some degree of independence, and encourage early reading [2.1].

Once the child enters school (Time 2), the quality of school may influence his or her level of literacy and academic skills. The quality of school refers to the character of the instructional process experienced by each student and the school's efficacy in developing cognitive proficiencies.

Table 5
Factors Influencing Student Achievement

Child Flow:	Time 1 Pre-school	Time 2 In-school	Time 3 Leaving school	Time 4 Post-school
		2. SCHOOL QUALITY - Material inputs - Teacher Quality - Teaching practices and classroom organization - School management and structure		
	1. PRESCHOOL DEVELOPMENT - Health and nutrition - Cognitive growth - Parents' literacy and endorsement of schooling		4. SCHOOL OUTCOMES - Literacy level and academic achievement - Social skills	5. POST SCHOOL OUTCOMES - Job attainment and earnings - Social quality of life
		3. SOCIAL / ECONOMIC CONTEXT - Demand for child's labor - Opportunity costs of attending school		

Factors external to the school influence the child's eventual level of academic achievement (Box 3). In many developing countries the demand for the child's labor and earnings, particularly among rural and poor urban families, may determine school attendance. Opportunity costs of entering and continuing through school also vary. This factor may operate independently of the family's wealth. For instance, in Mexico, Brazil, and Egypt children of more productive rural families attend school less, due to higher opportunity costs [2.2]. Immediate material and health conditions are other factors that can influence eventual school achievement.

School quality is defined here as (a) the level of material inputs allocated per pupil (resource concentration), and (b) the level of efficiency with which fixed amounts of material inputs are organized and managed to raise pupil achievement.

This definition reduces the imprecision evident in casual uses of the term "school quality." First, the concentration of material resources per student indicates a fundamental shift in policy from how many children are being served, to what is the quality of instruction for each child? Second, the definition emphasizes the difference made by the school (or the value-added) in increasing the child's literacy and academic skills, independent of preschool background and the ongoing demand for the child's labor. School quality cannot be measured simply by the level of student achievement. Factors outside the school organization also need to be taken into account. A low-quality school may, for example, graduate relatively high-achieving students -- especially if it serves children from more affluent families. And a high-quality school may raise the literacy of poor rural children even if their scholastic achievement is below that of urban children.

Third, all characteristics and inputs of schools are not related to student performance. For instance, the existence of classroom laboratories cannot be used to measure school quality because laboratories are not empirically related to higher pupil performance. Similarly, marginal decreases in average class size do not necessarily improve pupil performance, though schools with smaller classes are generally perceived as being of higher quality (Chapter 3). Unless the elements of school quality enhance student achievement, greater investment in those school inputs will be ineffective.

Fourth, the definition emphasizes that a school's quality of education is not determined by the sum of various material inputs (per pupil). The level of material inputs per pupil (including textbooks, desks, and writing materials) undoubtedly influences student achievement. The length of the instructional program (per day and over the school year) also depends upon the level of material sources. And empirically, a school's level of total expenditures per pupil is a consistent predictor of student achievement, after students' backgrounds are taken into account.

But, by looking only at the level of material inputs, one ignores the question of whether these resources are efficiently managed. Therefore, a school's level of quality is also determined by management of the school and the classroom. Three non-material inputs are important determinants of school quality:

(a) **Teacher quality.** This includes schooling, social background, verbal proficiency, and motivation of teachers.

(b) **Teacher behavior in classroom.** The efficient use of instructional time, the level or performance standards and expectations set for students, the extent to which teachers evaluate students' performance, and teachers' ability to motivate students to learn also are important inputs.

(c) **Organization of the school.** This includes the headmaster's management capability, a feeling of camaraderie among teachers, norms of achievement set by the headmaster, and the school's legitimacy in the community.

Simply increasing the level of material inputs does not guarantee that these management and social elements of quality will improve. (More details appear in Chapter 3)

Fifth, the definition of school quality distinguishes between school quality and internal efficiency. Schools which expend more resources per student are of higher quality in that they are more likely to graduate higher achieving students. Developing countries that shift scarce resources from expanding schools to spending more per pupil will improve school quality by concentrating funds on fewer children. In each case, schools will be better able to invest in those material inputs which will boost pupil achievement (for instance, texdtbooks or teacher training). However, this does not necessarily mean that they will be more efficient. Improving school quality or effectiveness is only a first step toward raising efficiency, requiring investment in those inputs and organizational practices that boost achievement. The second step requires identifying what school inputs and practices yield the greatest gains in achievement at the lowest cost [2.3].

Because of variation across regions and schools, issues concerning curriculum content are not addressed in this paper. Material inputs and the social organization of schooling are neither culture-free nor neutral in their effects on children. For instance, schools and classrooms in China and Japan often are structured to encourage cooperation and interdependence among students. In contrast, schools in Western cultures generally emphasize individual competition and discourage interdependent forms of learning and working. Yet I assume that under any type of formal socialization -- within families, apprenticeships, work settings, or schools -- improvements in educational quality require attention to material inputs and social organization. On the other hand, the content of curruciulum more likely will be tailored to meet the priorities of a specific society.

The Internal Effectiveness of Schools

In industrialized nations, studies have consistently shown that schools have little effect in determining academic performance or eventual economic success, once the student's preschool development and community background are

taken into account. These findings initially came from the Coleman Report in the U.S. and the Plowden Report in the U.K. over 15 years ago.

These reports have increased skepticism over the wisdom of increasing school investments in developing countries. For instance, in 1975 a World Bank paper (Alexander & Simmons) addressed the issue of whether schools influence academic achievement, reviewing research from Western Europe, the U.S., and initial studies from the Third World. Based on the research at that time, the authors concluded that schools made little difference in raising literacy and academic skills after accounting for the family background of children and their community context. However, the subsequent decade of research within the Third World yielded considerable evidence that school quality makes a substantial difference. And the impact of school quality relative to external factors appears to be greatest among the poorest developing countries.

The social class background of children, as one study of Sri Lankan secondary schools found, has a high correlation with their performance. Evidence from India, Peru, and Malaysia suggests that this correlation is higher for students' achievement in reading than for math and science. One review of 33 studies of school achievement determinants found that the student's family background was significant in 73 percent of the cases. This evidence suggests that preschool development and community context make a significant difference in shaping achievement, although the magnitude of this impact was not addressed. [2.4].

In an analysis of 16 developing and 13 industrialized nations, Heyneman and Loxley found that school quality is a stronger determinant of achievement within developing countries (Table 6). Among all 29 nations included in the study, a strong negative correlation was apparent between the nation's wealth and the amount of variance in achievement explained by school quality. This study offers evidence that school quality substantially shapes achievement after controlling for the effects of the student's background. The observed influence of school quality across diverse countries minimizes concern over some distortions which may result from the occasional correspondence between school quality and student background within a particular nation.

Table 6
Relative Influence of School Quality and Student Background

Country	GNP Per Capita US$ 1971	Variance in Achievement Student Background	Explained by: School Quality
India	$110	3%	27%
Uganda	130	6	5
Botswana	160	6	14
Bolivia	190	11	24
Thailand	210	6	25
Egypt	220	6	14
Paraguay	480	23	16
Netherlands	2,620	22	11
Australia	2,870	17	7
French Belgium	2,960	14	16
Flemish Belgium	2,960	12	16
Germany	3,210	17	14
Sweden	4,240	18	7
United States	5,160	21	13

Source: Heyneman & Loxley (1983)

Chapter 3

What School Characteristics Boost Achievement?

Introduction

The general influence of school quality on student achievement is now firmly established for most Third World settings. However, much less is known about which specific elements of school quality are effective in shaping achievement. The first generation of research on school quality was concerned with determining whether the school organization made a difference. Therefore, the aggregate influence of various elements of school quality was investigated. Delineating which specific school factors boost pupil performance is a different task. In addition, shifting investments from school expansion to improving school quality and effectiveness is conceptually simple. But fine tuning investment policy to target resources on the most efficacious ingredients of schools is a more complex endeavor.

First, those elements of school quality which are effective in raising student achievement must be separated from those that are unrelated to pupil performance. Second, the magnitude of influence exerted by efficacious elements of school quality must be estimated. Third, the relative cost-effectiveness of significant school factors must be examined, accounting for the differing magnitude of effects and varying costs among different school factors. Whether policymakers and local school managers can move through each analytic step in detail is not clear. However, this simple stream of questions can certainly be pursued by many decision-makers.

This chapter focuses on the first step: Identifying those elements of school quality which consistently boost pupil achievement and isolating the other set of school characteristics which make no difference. Research on this question has blossomed in the Third World over the past 15 years. I review the findings of 72 empirical studies. Little knowledge exists on the relative magnitude of effects from different school factors. And even less evidence is available on the relative costs of alternative school inputs and practices. Chapter 4 reports on what little research has been conducted in this area.

Lessons from Industrialized Countries?

School quality research in developing countries remains largely reactive to the policy question initially asked two decades ago within industrialized

countries: Do schools make a difference in shaping the academic achievement and occupational success of young people? The focus is on the aggregate influence of school quality on achievement, after empirically controlling on the child's family background and community context. Only recently has research shifted from looking at whether school quality makes a difference to identifying which elements of quality consistently influence student achievement.

Typically, investigations study the general correspondence between student achievement levels and various school factors (for instance, class size, expenditures per pupil, and teacher qualifications) based on large scale school surveys. It is not unusual for such production-function studies to look at the independent influence of 15-30 elements of school quality on student achievement. The review of this empirical work which follows does report on specific school factors which do or do not consistently shape achievement. But this is really a secondary purpose of this line of research. Only the most recent work carefully assesses the relative impact of specific elements of school quality.

The school quality field is bounded by a second lasting effect of early research on school effects within industrialized nations. The production-function metaphor continues to be relied upon to represent the schooling process. That is, the school organization is seen as a firm which receives material inputs and transforms these resources into the production of educated children. Following my review of Third World research, I examine the utility of applying a material production model to the largely social process of teaching and learning.

Overview / What Elements of School Quality Influence Achievement?

School quality studies vary widely on what particular school quality elements are examined. All investigations included in this review, however, do control on the student's social class and economic background in some manner. Each study also employ some means of testing for the statistical significance of any observed effect. Only statistically significant effects of school quality elements are reported in this review ($p<.05$ for beta coefficients, production-function elasticities, or f-values within experimental analysis-of-variance designs). Finally, this review builds on previous research summaries [3.1].

Table 7 summarizes the findings from all studies reviewed. Column 1 indicates the specific elements of school quality which have been investigated. Column 2 reports the expected direction of correlation between the specific quality factor and pupil performance. Column 3 reports the number of statistical observations made between the particular school factor and achievement. For instance, among all studies reviewed, 11 analyses were conducted on whether the factor, expenditures per pupil, was related to achievement. Each study examined a subset of school quality elements. On the other hand, an individual study may include analyses with the same quality factor for different pupil subgroups. Continuing with the example, Column 4

Table 7
Influence of School Quality Elements on Student Achievement

(1) School Quality Indicator	(2) Expected Direction of Relationship	(3) Total Number of Analyses	(4) Number of Analyses Confirming Effect	(5) Number of Analyses Reporting No or Negative Effect	(6) Confirmation Rate
School Expenditures					
1. Expenditures per pupil	+	11	6	5	54%
2. Total school expenditures	+	5	2	3	40%
Specific Material Inputs					
3. Class size	-	21	5	16	24%
4. School size	+	9	4	5	44%
5. Instructional materials					
Texts and reading materials	+	22	14	8	64%
Desks	+	3	3	0	100%
6. Instructional media (radio)	+	3	3	0	100%
7. School building quality	+	2	2	0	100%
8. Library size and activity	+	18	15	3	83%
9. Science laboratories	+	11	4	7	36%
10. Nutrition and feeding programs	+	5	5	0	100%
Teacher Quality					
11. Teacher's length of schooling					
Total years of teacher's schooling	+	25	11	14	44%
Years of tertiary & teacher training	+	30	21	9	70%
12. Inservice teacher training	+	5	4	1	80%
13. Teacher's length of experience	+	23	10	13	43%
14. Teacher's verbal proficiency	+	2	2	0	100%
15. Teacher's salary level	+	13	4	9	31%
16. Teacher's social class background	+	10	7	3	70%
17. School's percent of full-time teachers	+	2	1	1	50%
18. Teacher's punctuality & (low) absenteeism	+	2	0	2	0%
Teaching Practices / Classroom Organization					
19. Length of instructional program	+	13	11	2	85%
20. Homework frequency	+	7	5	0	71%
21. Active learning by students	+	2	0	2	0%
22. Teacher's expectations pupil performance	+	3	3	0	100%
23. Teacher's time spent on class preparation	+	5	4	1	80%
School Management					
24. Quality of principal	+	7	4	3	57%
25. Multiple shifts of classes each day	-	3	1	2	33%
26. Student boarding	+	4	3	1	75%
27. Student repetition of grade	+	5	1	4	20%

then reports that in seven of the 11 analyses a (statistically) significant relationship was found (again, always controlling for the effects of the student's background).

Table 7 is useful in illustrating what elements of school quality have been most often studied. Both material inputs and teacher quality (proxies) have received the most attention from researchers. Despite increasing research on the influence of teaching practices and school management within industrialized countries, these areas have received very little attention in the Third World.

In addition, Table 7 differentiates those elements of quality which are not consistently related to student achievement from those factors which more frequently appear to exert an influence on performance. Elements of school quality which are significantly related to achievement in at least one-half of the analyses are assumed to hold a "consistent" influence. This definition is somewhat arbitrary. Yet this rule of thumb is based on the fact that most of the studies reviewed included more than 10 elements of quality in multivariate models. Therefore, even when an element is related to achievement it will not appear to be statistically related if it covaries with another indicator of school quality.

Given this body of evidence, school factors which influence pupil achievement can be distinguished from those which do not.

Set 1 Quality elements not consistently related to achievement:

1. Class size	(no effect in 16 of 21 analyses)
2. Laboratories	(no effect in 7 of 11 analyses)
3. Individual teacher salary levels	(no effect in 9 of 13 analyses)

Set 2 Quality elements consistently related to achievement:

4. Expenditures per pupil	(effect in 6 of 11 analyses)
5. Instructional materials	(effect in 17 of 25 analyses)
6. School library activity	(effect in 15 of 18 analyses)
7. Teacher training (tertiary level)	(effect in 21 of 30 analyses)
8. Length of instructional program	(effect in 11 of 13 analyses)
9. Teacher's social class	(effect in 7 of 10 analyses)

Patterns of influence are mixed for several other elements of school quality. For instance, the teacher's total length of schooling (including years in primary and secondary school) influenced achievement in 10 of 24 studies. Whether this is a "consistent pattern" is difficult to infer. Other school factors show promise, particularly frequency of homework, use of instructional radio, and inservice teacher training. But an insufficient number of studies have been completed from which to generalize.

Interpretation of these general patterns must be couched within the features of specific studies. The following discussion details research within each area of school quality. The review will also highlight findings on the magnitude of reported achievement effects from specific elements of school quality. However, this area is problematic. Any one factor's level of influence on achievement depends upon many aspects of the research design. Empirical models and data sets vary enourmously in (a) the number of factors included in each multivariate model, (b) the level of observed variance for specific elements of quality, (c) the amount of measurement error for indicators of quality, (d) the degree of colinearity among quality variables, and (e) the level of instruction studied. It is difficult for researchers to employ even roughly consistent designs and impossible to hold constant scope conditions within which findings would apply. And again, the researcher's central concern is with the aggregate question -- does school quality makes a difference. This diverts attention from the critical issue of what is the magnitude of observed effects from different school factors.

I turn next to reviewing findings within each of the primary areas of school quality. A table summarizing the literature accompanies each discussion below. Citations have been kept to a minimum in the text, since the tables contain reference information.

Overall School Expenditures

Table 8 summarizes existing empirical studies that have examined the influence of expenditures per pupil and total school expenditures on student performance. Each expenditure measure is a global indicator of quality. Per pupil expenditures more directly indicate the concentration of school resources on each student enrolled in school (Indicator 1). The bulk of resources go to teacher and school staff salaries. Therefore, this global measure does not indicate teacher quality nor specify the level of resources allocated to books, instructional materials, or other inputs more directly linked to the instructional process. Different analyses look at various areas of achievement (Column 4). Any reported effect (Column 5) is statistically significant ($p<.05$). Some findings are limited to certain conditions (specified in Column 6). Finally, the studies reviewed utilize various analytic methods (see Column 7 and notes at the foot of Table 8).

Mentioned above, a majority of studies have found a positive relationship between school expenditures per pupil and achievement. The influence of this school quality element is strong in some analyses. For example, in the Colombian study of academic achievement (4,233 secondary school graduates), the influence of per pupil expenditures was exceeded only by the youth's verbal ability (comparing t-statistics among 24 student background and school factors tested). The influence of this factor was less strong only slightly for achievement within the commercial curriculum. This same study found more moderate, but significant, achievement effects in Tanzania (2,803 secondary graduates).

Table 8
Efficacy of School Quality Elements:
School Expenditures*

(1) School Quality Indicator	(2) Hypothesis	(3) Country (School Level)	(4) Achievement or Economic Outcome Measured	(5) Direction of Effect +	0	-	(6) Setting	(7) Study (Method)
1. School expenditures per pupil	Higher expenditures will provide higher quality teachers and learning resources, leading to higher achievement	Argentina (Primary)	Science achievement	+				Heyneman & Loxley (MR)
		Kenya (Primary)	National exam		0			Thias & Carnoy (PF)
		(Secondary)		+				
		Malaysia (Secondary)	Comprehensive exam		0			Beebout (MR)
		Mexico (Primary)	Agricultural & manufacturing output	+				Fuller et al. (PF)
			Science		0			Heyneman & Loxley
		Colombia (Secondary)	Academic & vocational	+				Psacharopoulos & Loxley (MR)
		Tanzania	Vocational knowledge	+			For 2 of 3 tracks	
			Language		0			
		Bolivia (Primary)	Science	+			Urban schools	Morales & Pinellsiles (MR)
					0		Rural schools	
2. Total school expenditures	Overall expenditures reflect higher quality, leading to higher student achievement	Chile	Science	+				Heyneman & Loxley
		Brazil			0			
		Paraguay			0			
		Colombia			0			
		Mexico		+				

* Column headings: Column 3 indicates both the country within which the research was conducted and the school level of students studied (primary or secondary grades). The school level last specified applies to the current country, reading down the column, unless a new school level is indicated.

Column 5 reports a positive or negative effect only when the study found a statistically significant influence of the particular school quality input ($p < .05$). When a "0" is indicated in Column 5, this means that no significant effect was found for this school quality input. The direction of the effect reported relates to the direction indicated in the stated hypothesis (Column 2).

Column 6 specifies a specific condition underwhich the findings hold. If know scope condition is specified, the effect was found for the entire sample of students being investigated.

Column 7 mentions the type of empirical analysis utilized by the researcher(s). The following symbols were used: MR = multiple regressions with reporting of beta coefficients; PF = a log-linear production function with a report of elasticities; CG = an experimental or comparison (control) group study was conducted; CO = correlation coefficients were reported; bivariate correlations reported only when no relationship was found.

The magnitude of the achievement effect from per pupil expenditures was thoroughly examined within an early study of primary and secondary school students in Kenya. No significant effect was found at the primary school level. At the secondary level, per pupil expenditures did influence achievement. The researchers then estimated the magnitude of this effect. Second, they identified the strength of relationship between higher national test scores (indicator of achievement) and future earnings. The authors found that raising national exam scores among sampled secondary students by five percent would require a 50 percent boost in expenditures per pupil. Yet the rate of return to this investment in terms of increased income would be significant (six percent) -- but only for low achieving students. For relatively high achieving students, income benefits gained from higher achievement were entirely offset by the cost of raising achievement.

A growing amount of research within industrialized countries suggests that per pupil expenditures -- as a concrete indicator of school quality -- is related to individual income of graduates. This claim has not been extensively tested in developing countries. Four analyses have found no achievement effects from higher per pupil expenditures, including well designed studies in Malaysia and Tanzania. In addition, one might argue that schools must reach a threshold size before achievement is significantly influenced (Indicator 2). Yet in terms of total expenditures, just one in four analyses discovered a statistically significant effect.

Specific Material Inputs

The second set of school quality elements includes discrete material inputs which operate more closely to the instructional processs (Table 9). First, Third World findings on possible achievement effects from smaller class size are quite similar to research within industrialized nations (Indicator 1). Within normal ranges, the presence of fewer students per classroom has no consistent affect on achievement. No effect from smaller class size has been found in 11 of 21 analyses. In five additional studies, students working within larger classes actually performed at higher levels. We should be quick to point out that "normal ranges" are often exceeded in the poorest developing countries, given that the mean national ratio of pupils to each teacher equals 44 within the poorest nations (as reported in Chapter 1). Note that due to double shifts, this is not an exact measure of class size. In addition, achievement effects for specific ranges of class size have not been investigated in the Third World.

Yet given this existing evidence, substantial reductions in class size would be necessary to raise achievement. In contrast, increases in class size would free up significant resources while not diminishing overall student achievement. Just one study has found that smaller classes at the primary level are significantly related to higher achievement. This report comes from an analysis of science achievement among 837 urban students in Colombia. The bulk of studies simply reports no effect for class size.

Table 9
Efficacy of School Quality Elements:
Specific Material Inputs

(1) School Quality Indicator	(2) Hypothesis	(3) Country (School Level)	(4) Achievement or Economic Outcome Measured	(5) Direction of Effect +	0	-	(6) Setting	(7) Study (Method)
1. Class size	Fewer students per teacher will improve the quality of interaction and raise achievement	Botswana (Primary)	Science			-		Heyneman & Loxley
		Thailand	Reading & science			-		Loxley (MR)
		India			0			
		Chile			0			Cooper & Keeves (MR)
		(Secondary)			0			Schiefelbein & Farrell
						-	Poorer schools	(1973)
		Iran			0			Thorndike (MR)
			Reading & math	+				Ryan (MR)
		Egypt (Primary)	Literacy & numeracy		0			Hartley & Swanson (MR)
		Kenya	National exam		0			Thias & Carnoy (MR)
		Malaysia (Secondary)	Comprehensive exam	+				Beebout (MR)
		(Primary)			0			Haron (MR)
		Puerto Rico (Primary/sec.)	Reading	+				Carnoy (MR)
		Tanzania	Language	+				Psacharopoulos & Loxley
			Vocational knowledge		0			
		Indonesia (Secondary)	Letters & arts exam		0			Seebiring & Livingstone (MR)
		Bolivia	Science			-	Urban schools	Morales & Pinellsiles
		(Primary)	Reading		0		Urban schools	
		Argentina			0			Echart et al. (MR)
		Colombia	Science	+			Urban schools	Arriagada (1981, MR)

2. School size	When a threshold school size is reached, higher quality resources will be available, raising achievement	Chile (Primary)	Reading & science	+				Comber & Keeves
		Thailand		+				
		Iran		+				
		Kenya (Primary)	Cambridge exam			-		Thias & Carnoy
		(Secondary)		+				
		Malaysia (Primary)	Comprehensive exam		0	-		Beebout Karon
		Congo	Language & math			-		Youdi (MR)
		Bolivia (Secondary)	Reading & science		0			Morales & Pinellsiles
3. Instructional materials	Greater availability of of texts and reading materials will raise the quality of learning activities, increasing achievement	Uganda (Primary)	Comprehensive exam	+			(Actual counts)	Heyneman & Jamison (MR)
		(Secondary)		+				Heyneman (MR)
		Egypt	Science	+			(Student/teacher reports of adequacy)	Heyneman & Loxley
		El Salvador		+				
		Paraguay		+				
		Bolivia		+				
		Mexico		+				
		Peru			0			
		Brazil			0			
			Comprehensive exam	+			Student owns text	Wolff (MR)
		Colombia	Reading & math		0			
		Argentina			0			
		India	Reading & science	+			Science texts	Comber & Keeves
		Chile	Language & math	+				Schiefelbein & Farrell (1973)
		Nicaragua	Math	+				Jamison et al. (CG)
		Philippines	Science	+				Heyneman et al. (CG)
		Indonesia (Secondary)	Arts & science		0			Seabiring & Livingstone
		Thailand (Primary)	Comprehensive exam		0			Fuller & Chantavanish
		Malaysia		+			Rural schools	Haron
					0		Urban schools	
		Ghana (Secondary)	Reading comprehension	+				Smart (CG)
		Malaysia	Language skills		0			Beebout

	Provision of desks will increase opportunity to read and write, raising achievement	Egypt (Primary)	Science	+			Heyneman & Loxley
		El Salvador		+			
		Peru	Reading	+			Arriagada (1983; MV)
4. Instructional media	Radio and other instructional media efficiently raises student achievement	Nicaragua (Primary)	Math	+			Jamison et al. (MR)
			Student promotion	+			Jamison (MR)
		Philippines	Language, math & science	+			Heyneman et al.
5. Physical facilities	Better facilities provide more motivating conditions for learning	Uganda (Primary)	National exam	+		Composite of facility quality	Heyneman & Jamison
		Peru (Primary)	Reading & science	+		Electric lights	Arriagada (1983)
6. Library activity	The presence and active use of a school library will boost reading achievement	Argentina (Primary)	Science	+			Heyneman & Loxley
		Brazil		+			
					0		Costa (MR)
		Mexico		+			Heyneman & Loxley
		Bolivia		+			
		Paraguay		+			
		El Salvador		+			
		Botswana		+			
		Peru		+			Arriagada (1983)
		Chile (Primary/sec.)		+			Thorndike
		Iran		+			
		Thailand		+			
		India		+			
		Malaysia (Secondary)	Comprehensive exam	+			Beebout
		(Primary)		+		Volumes in libraries	Haron
					0	In-class libraries	
		Indonesia (Secondary)	Arts & science		0		Seabiring & Livingstone
		Botswana (Secondary)	Reading & math	+			Loxley

7. Laboratories	The presence and instructional time spent in laboratories will raise science achievement	India (Primary)	Science	+			Heyneman & Loxley
		Thailand		+			
		Iran		+			
		Brazil		+			
		Chile			0		
		Peru			0		
		Paraguay			0		
		Mexico			0		
		Colombia			0		
		Argentina			0		
		Bolivia			0		
8. School feeding programs	Malnutrition will lower student achievement	Guatemala (Primary & sec.)	Verbal skill & enrollment	+			Balderston et al. (MR)
		Egypt (Primary)	Reading & math	+		Occurence of illness	Hartley & Swanson
		Chile		+			Schiefelbein & Farrell (1970)
		Thailand		+			Fuller & Chantavanich
		Uganda	Comprehensive exam	+			Heyneman & Jamison

Two studies have examined the magnitude of the class size effect (or lack thereof). First, the Malaysia study of 89 secondary schools found a significant effect of smaller class size and pupil achievement in language learning (in Malay). The researcher then estimated the marginal (achievement) product associated with spending one additional dollar to lower class size. Raising student achievement by just one percent (on standardized exams) would cost an additional $50 per student if allocated to help lower class size. In contrast, this same increment in higher student achievement could be accomplished at one-third the cost if resources were allocated to teacher training. Cost data used for these estimates are admittedly rough. But this method for comparing the cost-effectiveness of alternative elements of school quality is instructive.

A second study examined the relative magnitude of achievement effects resulting from the introduction of textbooks, from establishment of radio instruction (in Nicaragua), and from lowering class size. Various experimental studies provided an estimate of how strongly each factor influenced achievement (in terms of standard deviation gains between control and treatment groups). The researcher then estimated the cost of attaining the same gain in achievement from each element of school quality. To obtain the achievment benefit gained from raising the availability of textbooks at a constant increment of cost, schools must lower average class size from 40 to 10 pupils per teacher! This method of equating the costs for alternative inputs against a standard gain in achievement yields a clear picture of the relative efficiency of alternative interventions. The efficiency of introducing radio instruction was even higher than boosting the availability of books in the Nicaraguan case. The main point remains: In most situations lowering class size with the intent of raising achievement is not an efficient strategy [3.2].

The positive impact of instructional materials -- especially those directly related to reading and writing -- is consistent across several studies. The availability and use of textbooks (measured, for instance, in terms of the number of textbooks available per student) have been looked at in 22 analyses (Indicator 3). Significant effects were observed in 14. Early research in the 1970's relied on IEA survey instruments which asked students and teachers about simple availability of textbooks in classrooms [3.3]. This factor was significant in many Latin American countries which employed these measures. Actual counts of textbooks in Uganda also revealed a significant influence on pupil achievement.

This research generally indicates a moderate influence of textbooks and instructional materials on achievement. In Uganda, for instance, textbook availability strongly influenced achievement in English, dwarfing the effects of the child's social class (based on 1,907 students in 61 primary schools). However, averaging across curriculum areas, the influence of textbooks was smaller than social class, preschool competence, pupil health, and the teacher's verbal (English) proficiency (comparing t-statistics). In Malaysia and Chile, textbook availability was related to higher achievement. But the correlation between these two variables was less than .20, prior to controlling for the effects of student background or other school quality

elements. Textbooks did not explain more than four percent of the variation in achievement among all students sampled within each country.

The influence of textbooks appears to be stronger within rural schools and among students from lower income families. In rural Brazil, for instance, students with parents who had received no schooling were almost three times as likely to pass primary school if they had used two or more books (67 percent graduating), compared to students in this same group who had no textbooks in school (only 24 percent graduating). Among students with parents who had completed primary school, 73 of all pupils with at least two books passed primary school, versus 61 percent of those with no books (total sample equalled 1,006 primary school students). Similarly, the study of 6,056 Malaysian youth found that the availability of books in school was more strongly related to achievement among lower income children from Chinese and Indian ethnic groups.

Clearer evidence on the magnitude of textbooks' effect comes from more recent studies which have employed experimental research designs -- thereby holding constant student background and other school factors. For instance, a controlled experiment in the Philippines provided textbooks to 2,295 first and second grade pupils within 52 schools. A control group of similar schools was also selected. Books were then introduced at ratios of 2 pupils per book and 1 pupil per book in alternate classrooms. Achievement gains resulting from the intervention were substantial. In first grade science, performance was .51 of a standard deviation higher within the experimental classrooms, .30 higher in mathematics, and .32 higher in Pilipino. The .51 change (in units of the standard deviation) indicates that the mean score achieved by 50 percent of all students was obtained by 69 percent of those students in the treatment group. This improvement is twice the impact of what would be gained by lowering class size from 40 to 10 students (using Philippines textbook data, U.S. class size data).

The influence of the textbook program on achievement was greater for children with parents who had received less schooling. The correlation between the child's social class and science achievement was modest for all students. Yet this association was not at all evident for pupils receiving textbooks. Nor did the child's social class influence gains in achievement scores. Interestingly from an efficiency viewpoint, the concentration of textbooks (2:1 versus 1:1 pupil to book ratio) made no difference on levels of pupil achievement. The magnitude of effect on Pilipino and mathematics was more modest.

Less robust, yet significant effects of textbooks were found in an experimental program in Nicaragua. Forty-eight first-grade classrooms within rural and urban schools participated in the program, including 1,098 children. These classrooms were split into three groups: those receiving textbooks, those receiving radio instruction, and those serving as control classrooms (findings for radio instruction reviewed below). The interventions were applied at the beginning of the school year. Post-tests were given at the end of the same academic year. Pupils who received textbooks scored four percent higher on the mathematics post-test (one-third of a standard

deviation). The researchers note that Nicaraguan teachers were less schooled than teachers in the Philippines. The latter also had more experience with textbooks either as students themselves or during their teacher training.

A variety of measures have been used in survey studies to determine the presence and use of textbooks. The initial IEA research asked individual students to simply report whether a textbook was "available" to children to help in their studies (used in India, Iran, and Chile). Other studies have asked students whether and how many textbooks are owned (in Chile and Brazil). This indicator is more relevant in Latin America where texts are often sold by private booksellers to parents and students. In the Uganda study, the researcher actually counted how many textbooks were available and used within each classroom setting. No research has been found on how often and within what context students read textbooks. We do not know whether texts are read in class, at home, alone, or with other students. The impact of textbooks may be understated if measurement error is high. Distilling out disturbance caused by factors related to how and with what frequency books are read may sharpen our understanding of how strongly texts actually influence achievement. In addition, some uniformity in measures used by researchers would aid future comparisons of findings across studies.

Desks in classrooms represent an additional input within the instructional material category. All three analyses examining the effect of this concrete element of school quality have found significant achievement effects. For instance, a recent study of 324 sixth-grade students in Peru discovered that the percent of children with classroom desks was more strongly related to reading achievement than was the influence of social class background (comparing t-statistics). Surprisingly little research has examined the effects of simple teaching practices, such as the child's opportunity to read and write inside the classroom (as well as outside the school).

As with textbooks, the availability of a desk is easily measured and observed achievement effects are important. But we know little about how children's classroom time is structured, particularly how the material desk fits into opportunities to read and write. In some instances the desk may hold more utility as a symbol of constructing a "modern school." Whether teachers structure lessons to encourage the actual use of desks is a separate issue. Encouragement of students to write may be more important than reading from the standpoint of motivation. Writing is a productive form of literacy. Rather than passively reading material, writing involves the active creation of ideas and the organization of information. But we have little understanding of how instructional materials can better encourage writing activity.

The radio is another instructional device which has received considerable attention from researchers (Indicator 4). Initial production of curriculum and classroom lessons is difficult and costly. Yet following the initial investment, delivery of radio instruction via simple receivers can be efficient in terms of per pupil costs. The Nicaragua textbook program outlined above also included a radio instruction project. The radio component

was more effective than textbooks in raising achievement. Participating first-grade students received mathematics instruction over a radio for 20-30 minutes within their classrooms. Post-broadcast lessons were given by the teacher, and worksheets were provided to students for practicing curriculum the material. At the end of the first grade, participating students scored 17 percent higher on the post-test compared to control-group pupils. This gain exceeded one standard deviation on the post-test [3.4].

A school library is another instructional resource which may significantly influence pupil achievement (Indicator 6). Significant student performance effects have been found in 15 of 18 analyses. The most consistent findings come from Latin America where multiple measures of school library utilization were used. Building on the early instruments from the Coleman and IEA projects, a survey of school quality was conducted in seven Latin American countries in 1975. The number of books on loan from a school library was significantly related to student achievement levels within Argentina, Mexico, and Brazil. At the individual level of analysis, students who reported that they used the library more frequently performed at higher levels (as always, controlling for pupils' family background). Other research indicates that the simple presence of a school library is related to the school's average achievement level in El Salvador, Botswana, and Uganda.

These findings come from one major analysis of the influence of school quality on science achievement (by Heyneman & Loxley). Within this work, a minimum criterion of statistical significance was utilized ($p<.05$) to determine whether the school library measure held a significant effect after controlling for family background factors. The efficacy of the library variables is confirmed by earlier findings from the IEA study within Thailand, Iran, Chile, and India. Yet neither project analyzed the magnitude of this consistent effect of the presence of a school library and utilization rates. The study of Malaysian primary schools (6,056 students) did find significant effects of school library size (number of volumes) and academic achievement. However, the bivariate correlation between the two was small. And within multivariate analyses, the achievement effect of library size was significant yet much less strong than the social class control variables and the availability of textbooks. In Botswana, a study of 869 standard seven students found statistically significant achievement effects for how often the library was used (based on report by individual students) and the number of new volumes purchased by the library (school report). The strength of this relationship was comparable to the significant influence of social class background, appearing for both reading and mathematics achievement.

The early IEA survey included questions which asked schools about the use of classroom laboratories in the teaching of science (Indicator 7). This particular material input remains controversial. Governments and development agencies have invested sizable resources in building school laboratories and in financing the purchase of laboratory equipment. Whether this investment is paying off in higher levels of achievement remains an unanswered question. The early IEA survey asked schools about the presence and utilization of classroom laboratories. These measures were rather consistently related to higher achievement in three of the four developing countries included in the

study: India, Thailand, and Iran. Two indicators of laboratory use -- number of students in laboratory classes and time spent in laboratory classrooms -- were related to achievement. However the subsequent Latin American survey used these same items and found no significant relationship with pupil performance [3.5]. I found no analyses which examine the effectiveness of laboratories relative to other elements of school quality. Nor do the earlier IEA findings mean that laboratories are cost-effective. The high cost of building, equipping, and maintaining school laboratories may outweigh any modest gains in achievement.

School feeding programs have received slight attention from researchers (Indicator 8). More is known about the effects of poor health, malnutrition, and hunger on children's school achievement than on the ameliorative effects of school feeding efforts. The effects of poor health can be dramatic. In a recent study of 3,699 primary school students and dropouts in Egypt, health status was one of the strongest predictors of academic achievement. For instance, children who had suffered from a serious illness in the preceding year scored 20 percent lower on the literacy test and 10 percent lower on the numeracy exam. Children who had a major physical disability or suffered from malnutrition also achieved at significantly lower levels.

An earlier study in 61 Ugandan primary schools provided similar results. Multiple measures were used, asking children whether they had suffered from malnutrition, how often they had chills or a fever, how often they had stayed in a clinic overnight, and whether they had seen blood in their stools. Among the 1,907 surveyed, 75 percent reported having suffered from Malaria; 37 percent answered that they had stayed overnight in a clinic or hospital; 12 percent had seen blood in their stools; 5 percent claimed they had been treated for malnutrition. This latter 5 percent of children performed a quarter of a standard deviation below all other students on an achievement test. Controlling for family background and other school quality elements, pupil health (overall index) contributed significantly to academic achievement. Similar findings also are reported from studies in Chile, Thailand, and a longitudinal investigation in Guatemala. The Guatemala research included study of 512 children from four rural villages. Longitudinal achievement effects for diet were found after controlling for earlier levels of health and nutritional intake. Yet very little empirical evidence substantiates the effects of child nutrition programs on eventual academic performance.

Teacher Quality

At this point, only material inputs to the schooling process have been discussed. But how are material resources managed by the teacher in designing learning activities? One way to approach this question is to look at the quality of teachers. Since most school quality research has relied on large scale surveys, easily measured proxies for teacher quality have been used most often. For instance, many studies have asked about teachers' qualifications in terms of their total length of schooling or their amount of postsecondary teacher training. Whether and how these proxies are related to the teacher's

proficiency in organizing instruction and in motivating children remains very cloudy.

Yet even rough measures of teacher quality are related to higher levels of student achievement (Table 10). Findings are mixed on the effect of the length of primary and secondary schooling completed by teachers (Indicator 1). This factor has been studied in 25 analyses across many countries. A significant relationship was found in 11 of these studies. The strength of this relationship is moderate in a few of these analyses. The IEA survey of literature achievement in Chile included 103 schools and 1,311 students. A moderate correlation between teachers' school attainment and pupil performance was observed (r=.34); the significance of this factor remained when the factor was analyzed, controlling for student background and other school quality elements. An early study of school quality in Puerto Rico found that teachers' schooling level was most strongly related to achievement of primary school students and among pupils from lower-income families. No significant relationship was found for secondary school students [3.6].

Teacher schooling effects have been negligible in several other studies. For example, a study of over 27,000 Thai primary school students found a statistically significant, yet small association (r=.11). This low level of magnitude is troubling from a policy viewpoint. Allocating additional resources to increase teacher candidates' total length of schooling may be an inefficient strategy for raising pupil achievement. One analysis based on IEA data for Chile and India found that moving the average length of teachers' schooling to the 75th percentile (of the range of teacher schooling previously found in these countries) would boost pupils' reading scores by 10 percent. But the cost of such an improvement would be extraordinary [3.7].

In contrast, achievement effects are more consistent for teachers' length of tertiary schooling and for the number of teacher training courses. The early IEA survey included items on both of these areas; identical measures were used in the subsequent Latin America survey. As seen in Table 10, either the original IEA research group or the later analysis by Heyneman and Loxley found significant effects from at least one of these factors in 11 countries. Independent work in 10 other countries has revealed significant effects. In total, 21 of 30 studies have found a significant association between teachers' level of general university or specific teacher training and the later achievement of their students.

The magnitude of this relationship at times is moderate. One study of 89 secondary schools in west Malaysia (7,674 pupils) found a notable correlation between length of teacher training and student achievement (r=.27). This factor retained its significance when entered into a multivariate model which controlled for the effects of pupils' family background and other elements of school quality. This research also discovered an achievement effect for the interaction of teacher training and the length of teaching experience. Similarly, the IEA study found a modest bivariate correlation for science achievement among 3,153 students from 124 schools in India (r=.23). In addition, the level of teachers' credentials was the strongest predictor of student achievement within a sample of 463 primary school graduates in Uganda when tested against several other elements of school quality.

Table 10
Efficacy of School Quality Elements:
Teacher Quality

(1) School Quality Indicator	(2) Hypothesis	(3) Country (School Level)	(4) Achievement or Economic Outcome Measured	(5) Direction of Effect +	0	-	(6) Setting	(7) Study (Method)
1. Pre-service teacher training	The teacher's years of primary and secondary schooling will raise their verbal skills, boosting student achievement	India (Primary)	Science	+				Heyneman & Loxley
		Uganda		+				
		Bolivia		+				
		Brazil (Secondary)			0			Morales & Pinellsiles
		Chile		+				Husen (MR)
		Paraguay (Primary)			0			Heyneman & Loxley
		Mexico			0			
		Peru			0			
		Colombia			0			
		Argentina			0			
		Thailand	Language & math		0			Fuller & Chantavanich (MR)
		Botswana	Reading		0			Husen (CO)
			Reading & math	+				Loxley
		Mexico	Language & math		0			Izquierdo & Guzman (CO)
		42 LDC's	Drop-out rates		0			Levy (MR)
								(Cross-national design)
	The teacher's years of post-secondary instruction and teacher training will boost teaching skills, leading to higher student achievement	Botswana (Primary)	Science	+				Heyneman & Loxley
		India	Reading & science	+			Reading teachers	Comber & Keeves
		Chile		+			Reading teachers	
		Thailand		+			Science teachers	
		Iran		+			Science teachers	
		Egypt	Reading & math	+				
			Literacy	+				Hartley & Swanson
			Numeracy		0			
		Mexico (Primary)	Science	+				Heyneman & Loxley
		(Secondary)		+				Klees (MR)

	Argentina		+			Heyneman & Loxley
	(Primary)	Reading & math		0		Echart et al. (MR)
	(Secondary)		+			
	Peru	Science	+			Heyneman & Loxley
	(Primary)					
	Bolivia		+			
	Paraguay		+			
	(Primary)	Reading & math	+			Riveiola & Carvalho (MR)
	(Secondary)			0		
	Brazil		+			Costa (MR)
		Science		0		Heyneman & Loxley
	Colombia			0		
			+			Arriagada (1981; MV)
	Thailand	Language & math	+			Fuller & Chantavanich
	Malaysia	Reading			-	Ellson (CB)
		Comprehensive exam	+		Rural schools	Moran
				0	Urban schools	
	Uganda	National exam		0		Heyneman (1976; MR)
				0		Somerset (CO)
				0		Silvey (CO)
	Sierra Leone			0		Windham (CO)
	Ghana		+			Bibby & Peil (MR)
	(Secondary)					
	Indonesia	Arts & letters	+			Sembiring &
		Science		0		Livingstone
The teacher's total years of formal schooling will raise verbal skills and teaching effectiveness, raising student achievement	Puerto Rico	Reading	+			Carnoy
	(Primary)					
	Iran	Language & math		0		Ryan
	Malaysia	Comprehensive exam	+			Beebout
	(Secondary)					
	Congo	Language & math	+			Youdi
	Kenya	National exam		0		Thias & Carnoy
	Chile	Language & math		0		Schiefelbein & Farrell (1973)
	Tanzania	Academic & vocational		0	For 3 of 4 tracks	Psacharopoulos & Loxley
	Brazil	Individual income	+			Behrman & Birdsall (PF)
	(Primary/sec.)					
	Uganda	Comprehensive exam		0		Silvey (MR)
	(Secondary)			0		Somerset (MR.
	Sierra Leone			0		Windham (CO)
	(Primary)					

	More highly schooled teachers will boost parents' demand for more schooling, and raise academic achievement	Brazil (Primary)	Students' mean years of school completed	+			Behrman & Birdsall
2. Inservice teacher training	Upgrading the skills of current teaching staff will raise the quality of instruction, leading to higher student achievement	Egypt (Primary)	Literacy & numeracy	+			Hartley & Swanson
		Indonesia	Arts & science	+			Sembiring & Livingstone
			Language	+			Nasoetion et al. (MR)
		Botswana	Reading & math		0		Loxley
				+			Husen
3. Teacher's length of experience	Teachers with longer tenure develop stronger instructional skills, raising student achievement	El Salvador (Primary)	Science	+			Heyneman & Loxley
		Iran		+			
		India		+		Reading teachers	
		Chile		+		Reading teachers	
		Uganda (Primary)	National exam		0		Heyneman (1976)
		Chile (Secondary)	Language & math		0		Schiefelbein & Farrell (1973)
		Egypt (Primary)	Literacy & numeracy		0		Hartley & Swanson
		Puerto Rico (Primary)	Reading	+			Carnoy
		Puerto Rico (Secondary)			0		
		Kenya	National exam	+			Thias & Carnoy
		Malaysia (Primary)	Comprehensive exam	+			Beebout
					0		Haron
		Tunisia (Secondary)	Grade point average			-	Carnoy & Thias
		Congo	Language & math		0		Vundi
		Colombia	Reading & science	+			Arriagada (1981)
		Mexico	Language & math			-	Klees
		Indonesia	Arts & science		0		Sembiring & Livingstone
		Bolivia (Primary)	Reading		0		Morales & Pinellsiles
		Paraguay			0		Rivarola & Corvalan
		Brazil		+			Costa
		Argentina (Primary & sec.)			0		Echart et al.

		Botswana (Primary)	Reading & math	+	0		Years teaching Age	Loxley
4. Teacher's verbal proficiency	Teachers with greater verbal skills increase the quality of student and teacher interactions, increasing achievement	Uganda (Primary)	National exam	+				Heyneman & Jamison (MR)
		Iran		+			Rural schools	Ryan
5. Teacher's salary	Higher paid teachers possess higher language and instructional skills, raising student achievement	Peru (Primary)	Science	+				Heyneman & Loxley
		Bolivia		+				
		Brazil			0			
		Paraguay			0			
		Mexico			0			
		Argentina			0			
		Kenya	National exam	+				Thias & Carnoy
		Colombia			0			Heyneman & Loxley
		Colombia (Secondary)	Academic & vocational knowledge			-		Psacharopoulos & Loxley
		Tanzania	Language		0			
			Vocational knowledge			-	For 2 of 3 tracks	
		Bolivia	Reading & science	+			Urban schools	Morales & Pinellsiles
					0		Rural schools	
6. Teacher's social class	Teachers with more highly educated parents will possess greater language proficiency and increase achievement	Argentina (Primary)	Science	+				Heyneman & Loxley
		Peru		+				
		Bolivia		+				
		Paraguay		+				
		Brazil		+				
		Mexico			0			
		Colombia			0			
		Chile	Verbal & math	+				Farrell & Schiefelbein
		Iran		+				Ryan
		Uganda	National exam		0			Heyneman (1976)
7. Teacher's absenteeism and punctuality	Teachers displaying greater puntuality are more highly motivated and effective	Thailand (Primary)	Language & math		0			Fuller & Chantavanich
		Mexico			0			Izquierdo & Guzman
8. Full-time versus part-time teachers	Full-time teachers will possess more motivation and teaching effectiveness	Indonesia (Secondary)	Arts & letters	+				Sembiring & Livingstone
			Science		0			

Very little evidence exists on the effectiveness of inservice teacher training programs (Indicator 2). This scarcity of knowledge is in stark contrast to the increasing level of resources invested in upgrading the skills of incumbent teachers. For instance, in the last decade two-thirds of the World Bank's education projects have included inservice teacher training components. Only four studies have examined the influence of such efforts. The strongest effect was found in a survey of 124 Indonesian secondary schools. Half the teaching staff in the arts stream had attended inservice training courses. For science teachers, participation was even higher. This factor was the second strongest predictor of pupil achievement (bivariate correlations equalling .46 for arts and .35 for science). Within multivariate models, controlling for students' family background and many other quality elements, the frequency of inservice training remained as a moderate predictor of student achievement. This factor was far stronger than the influence of pupils' family background [3.8].

Significant findings are reported in an earlier study from 40 fifth-grade Indonesian classrooms. The experimental design compared classroom groups which differed on the number of available textbooks and on the level of inservice teacher training. The training "treatment" occurred independent of the introduction of textbooks. The former factor was significantly related to pupil achievement although the magnitude of the effect was weak, indicated in both the bivariate relationship (r=.15) and within a multivariate model. Inservice teacher training also was found to hold a significant association with achievement in Botswana and Egypt. Much more research is needed in this area, especially as governments and development agencies invest a growing amount of resources in trying to upgrade teachers' skills. The research to date finds that such initiatives do influence subsequent pupil achievement. But even less is known about what types of inservice programs are more effective and more efficient.

Only a few studies have examined how a teacher's skills relate to pupil achievement. Proxies such as the teacher's level of schooling or inservice training assume that additional competencies are obtained which subsequently increase pupils' achievement levels. More direct assessment of actual skills which are clearly related to the teacher's effectiveness is very rare. The school quality literature from industrialized countries, for instance, emphasizes the strength of teachers' verbal competence in boosting pupil performance (summarized in the annex). Work in the Third World is beginning to examine these types of teacher attributes. For instance, the previously mentioned study of 1,907 primary school students in Uganda found consistent and strong achievement effects from teachers' English proficiency on achievement in both language and mathematics achievement (Indicator 4). This factor influenced pupil performance more strongly than did students' social class background, preschool ability, and two other school factors included in the model (comparing t-statistics). Teachers' achievement level (on a secondary school-leaving exam) was correlated with their pupils' performance in a study of 797 second grade students in Iran. The bivariate association was weak for the student sample overall (r=.14). However, within a multivariate analysis of students from rural and/or poor backgrounds, teachers' achievement level more stongly influenced their pupils' subsequent achievement.

The teacher's social class has been studied as a proxy for verbal and cognitive attributes which may influence achievement (Indicator 6). The argument is simply that teachers coming from more highly schooled families will be more effective teachers. For example, teachers' own verbal proficiency may enrich the quality of verbal interaction and cognitive stimulation experienced by their students. Teachers' social class is significantly associated with pupil achievement in 7 of 10 analyses. Seven of these analyses come from one study. The Latin American school quality survey included a single measure of social class background: level of schooling attained by the teacher's father. This factor was consistently related to the performance of teachers' own pupils in Peru, Bolivia, Paraguay, Argentina, and Brazil. In addition, the Chilean study of 3,530 grade 8 students found a significant, yet small, effect between teachers' social class and pupil achievement. The study of Iranian second grade students mentioned above found a modest correlation between an index measuring the quality of teachers' secondary schools and their pupils' subsequent performance (r=.19). This factor remained influential when included in a multivariate model.

Two alleged indictors of teacher quality hold little consistent influence in boosting achievement. Teacher experience did appear to make a significant difference in the early IEA survey, at least for reading teachers in Chile, India, and Iran (Indicator 3) [3.9]. However, research since the IEA study yields more skeptical findings. A recent study of 869 students from 37 primary schools in Botswana found that the influence of teachers' experience rivalled the influence of father's occupation (used as a background control variable). Interestingly, a second study from Malaysia found that the length of teachers' experience was associated with pupil achievement, but only among teachers receiving more preservice training courses. Nevertheless, 13 of 23 studies which have looked at teacher experience have found no significant achievement effect.

Similarly, teacher salary levels in general are not related to pupil performance (Indicator 5). Two recent analyses from Tanzania (2,803 secondary students) and Colombia (4,233 secondary students) found that higher achieving vocational students actually were taught by lower paid teachers. The negative influence of teacher salaries in Colombia was strong, exceeding the achievement effect of students' social class background and other elements of school quality. In contrast, an early school quality study of 115 secondary schools in Kenya found a significant effect for higher teacher salaries (with just three other quality elements in the model). As mentioned above, the researchers estimated the magnitude of this relationship, then determined the link between higher pupil achievement and future earnings. Both relationships were stronger for graduates from lower-income families. They estimated that additional investment in raising teacher salaries would yield a seven percent annual rate of return to graduates from poor families [3.10]. However, the rate of return was less than one percent for graduates of average social class background, despite the statistical significance of the association between teacher salary and pupil achievement.

Overall, only 4 of 13 analyses have found an association between teacher salary levels and pupil achievement. The cost implications of increasing

teacher salaries and paying higher wages to teachers with longer tenure are enormous. Given the limited achievement effect of salary level and experience, budget savings could be generated in this area and redirected to more promising elements of school quality. No detrimental effect on student achievement would likely occur.

Teaching Practices and Classroom Organization

Despite the burgeoning literature within industrialized countries on how teachers manage instructional resources and organize their classrooms, very little work has occurred within developing countries. Table 11 summarizing the findings of studies which have been completed. The length of instruction stands out as a consist predictor of student achievement (Indicator 1). This element of school quality suffers from inconsistent definition and the use of varied measures. Measures range from the number of days in the school year to how many hours science is studied during the school week. Yet in general, the length of instruction was significantly related to achievement in 11 of 13 analyses.

The length of instruction offered by schools is bounded, in part, by available material resources. Yet in many settings, the length of the school day, time spent on particular curriculum areas, and the efficient use of instructional time within classrooms is more strongly determined by management practices than by material parameters. Classrooms vary enormously in the amount of time actually spent on instructional tasks rather than keeping order, checking each student's homework, or arranging lessons. More efficient use of classroom time is strongly related to pupil performance within industrialized nations. Considerable progress on this potential source of school efficiency could be made -- by sharpening classroom management and teaching skills -- within existing levels of material inputs.

In Brazil, the study of primary school achievement introduced above (1,006 pupils) included a question for teachers on the length of their school day. This simple measure was significantly related to achievement in rural but not urban schools. The influence of this indicator was modest, though similar to the magnitude of pupils' family background. Research in Colombian primary schools (826 sixth grade pupils) found that the hours of class offered per year predicted reading achievement moderately. This factor's strength was comparable to the significant influence of two measures of students' social class background. This same measure of instructional time also significantly affected reading achievement in a subsequent study of 324 grade 6 pupils in Peru. And the recent studies of secondary school achievement in Tanzania (922 academic students) and Colombia (4,233 students) found that the number of class periods spent in academic or vocational courses help predict performance on corresponding achievement exams. The strength of these instructional time measures usually exceeded the influence of pupils' social class background and were comparable in magnitude to other school factors.

Finally, Heyneman and Loxley's reanalysis of the IEA data on science performance revealed consistent achievement effects for different measures of

Table 11
Efficacy of School Quality Elements:
Teaching Practices / Classroom Organization

(1) School Quality Indicator	(2) Hypothesis	(3) Country (School Level)	(4) Achievement or Economic Outcome Measured	(5) Direction of Effect +	0	-	(6) Setting	(7) Study (Method)
1. Length of instructional program	More hours or days of instruction will increase achievement	India (Primary)	Science	+				Heyneman & Loxley
		Iran		+				
		Thailand		+				
		Chile		+			Hours reading science text	
				+				Schiefelbein & Clavel (MP)
		Peru	Reading	+				Arriagada (1983)
		Colombia		+				Arriagada (1981)
		Colombia (Secondary)	Vocational knowledge	+			Hours spent on vocational instruction	Psacharopoulos & Loxley
		Tanzania	Language & math (Academic students only)	+			Class time spent on science & social studies	
					0		Class time spent on language	
			(Vocational students only)	+			Number course periods in vocational area	
		Brazil (Primary)	Comprehensive exam	+			Rural schools	Wolff
					0		Urban schools	
2. Homework	Assignment and close evaluation of homework will boost learning	Botswana	Reading & math	+				Heyneman & Loxley
		Chile (Primary)	Reading & science	+			Biology homework	Thorndike (MR)
		Chile (Secondary)	Language & math	+				Schiefelbein & Farrell (1973)
		Tunisia (Primary/sec.)	Language	+			Urban students	Simmons (MR)
		Iran	Reading & science	+				Comber & Keeves
		India			0			
		Thailand			0			

3. Active teaching and learning roles in classrooms	Time spent explaining a lesson by the teacher will limit the student's own engagement in the material, lowering achievement	Peru (Primary)	Reading & science		0		Arriagada (1983)
			Math		0		
	Classroom discussions will encourage active student learning and raise achievement	Botswana (Primary)	Reading & math		0		Loxley
4. High teacher expectations for student performance	Teachers who expect high achievement receive stronger commitment and performance from students	Hong Kong (Primary)	Language & math	+			Rowe (CG)
		Uganda (Primary & sec.)	Comprehensive exam	+			Durojaiye (MR)
		Thailand (Primary)		+			Fuller & Chantavanich
5. Teacher's time spent on class preparation	More hours spent preparing for class will raise the quality of instruction and boost achievement	India (Primary)	Science	+			Heyneman & Loxley
		Iran		+			
		Chile		+			
		Thailand			0		
		Botswana	Reading & math	+		Hours marking papers	Loxley
6. Teacher evaluations of pupil performance	More frequent feedback to pupils and parents on achievement levels will encourage higher performance	Colombia	Science	+		Urban schools	Arriagada (81)

instructional time. For instance, hours of instruction (per year) spent on general science was significantly associated with (science) achievement in India, Thailand, and Iran. Hours of instruction in reading also helped predict achievement in Chile and India. This study did not estimate the magnitude of these instructional time effects; but the consistency of positive findings across different indicators and countries is notable.

The assignment of homework -- a second aspect of the organization of instruction -- also shows promise in raising student achievement (Indicator 2). The early IEA survey accounts for two analyses, where positive findings were reported in Chile and Iran (but not for India and Thailand). The magnitude of effects was small, although multivariate models simultaneously tested for possible effects of many school factors. One modest study of 83 urban Tunisian students found that reported conditions at home for studying were related to language achievement. This measure is not an indicator of teaching practices. But the factor was stronger than other school quality elements and equalled the magnitude of effect from pupils' social class.

Additional mechanisms for encouraging higher student performance have received only slight attention from researchers working in developing countries. Two studies have examined the extent to which active learning roles are created for students in classrooms (Indicator 3). Self-reports by teachers on the amount of time they spent explaining academic material to students had no relationship to reading or math achievement within Peruvian primary schools. One recent study in Botswana (37 schools) found no relationship between the frequency of classroom discussions reported by teachers and achievement on national reading and math exams.

In contrast, the level of teacher expectations for higher pupil performance was related to their actual achievement in three independent studies (Indicator 4). For instance, the large survey of 23,555 third grade students in Thailand found a modest relationship between pupils' actual achievement and teachers' assessment of their "learning ability" ($r=.22$). This factor remained significant, though not strong, when entered into a multivariate model. Significant effects were also found by researchers in Hong Kong (stratified sample of 100 low and high achieving students) and Uganda (540 pupils from standards I, II, and III). However, the magnitude of these effects was comparable to the findings from the Thai study.

Alternative indicators of how much time teachers spend in class preparation have been used in two studies (Indicator 5). For example, analysis of the IEA data showed that the amount of time science teachers spent in preparing lessons (self-report) was significantly related to pupil achievement in Chile, Iran, and India, but not in Thailand. Three different measures were used: hours spent preparing lessons in and out of school, and hours spent marking papers. The latter measure was also used in the more recent Botswana study of standard 7 pupils. This factor was significantly related to both math and reading achievement. The magnitude of the effect was statistically significant ($p<.05$). However, the full model included 10 student background variables and 17 school factors [3.11].

School Management and Structure

Beyond organization of the classroom, management of the entire school also represents an important component of school quality. The school's organizational structure drives the efficiency with which inputs are managed. The first four sets of school quality factors -- expenditures per pupil, specific material inputs, teacher quality, and teaching practices -- apply to various types of schools. Once a culture decides to formalize the socialization and training of their children, these four sets of school factors are important in improving various types of schools. But this fifth school quality area -- management and organizational structure -- raises issues which at times are pertinent to particular kinds of schools. For instance, the structure of vocational schools may differ substantially from basic education in a rural primary school. In addition, the social rules which comprise management practices often are tied to the local culture or grow from social norms within the government sector. A hierarchical style of school management would be viewed as desirable in some national contexts; a more participatory and professional school structure would be normative in other cultural settings.

Organizational structure refers to two features of schools. First, schools vary in terms of their goals. For instance, different schools may emphasize vocational, academic, or artistic instruction. Also schools vary in their social goals. Headmasters may emphasize tightly disciplined classrooms which stress obedience, or instead stress more active roles and individual initiative. Second, the management practices of headmasters can vary enormously, at times independent of the school's official goals. Headmasters employ a variety of means in supervising staff, in managing the school budget, in motivating teachers to improve their practices, in working with parents, or in disciplining errant pupils.

The "quality" of school management can be conceptualized within a unilinear framework. A principal aquires a variable level of skills and credentials necessary in becoming a strong leader and supervisor. Or "quality" of management can be view in a multidimensional way. For example, headmasters differ qualitatively on several aspects of school management: (a) whether they enforce a hierarchical power structure or encourage participation of teachers in addressing problems; (b) the frequency with which and how they evaluate teachers' performance in classrooms; (c) the extent to which they prescribe curricula to teachers or encourage different approaches and professional judgement; and (d) their competence in budgeting and accounting for material inputs.

Research on management practices of headmasters is blossoming within industrialized nations [3.12]. Unfortunately, very little is known about how headmasters in the Third World act to improve the school's instructional program. Table 12 summarizes the research that has occurred in developing countries. This research has largely employed proxies which presumably indicate the quality of a school's headmaster. For example, one recent study in Egypt of 60 primary schools found that students performed better in schools

Table 12
Efficacy of School Quality Elements:
School Management and Structure

(1) School Quality Indicator	(2) Hypothesis	(3) Country (School Level)	(4) Achievement or Economic Outcome Measured	(5) Direction of Effect +	0	-	(6) Setting	(7) Study (Method)
1. Quality of headmaster or principal	The principal's length of formal training will boost management and instruction-related skills, indirectly increasing achievement	Egypt (Primary)	Science	+				Heyneman & Loxley
		Paraguay	Reading & science	+				
		Bolivia (Primary)		+			Urban schools	Morales & Pinellsiles
		(Secondary)			0			
		Botswana (Primary)	Reading & math		0		All schools	Loxley
					0		Headmaster's experience	
	Higher salaries will attract stronger principals, improve the instructional program, and raise achievement	Indonesia (Secondary)	Reading & math	+				Seabiring & Livingston (MR)
2. Number of class shifts	More than one shift of classes each day will strain the effectiveness of resources and lower achievement	Egypt (Primary)	Literacy & numeracy		0			Hartle, & Swanson
		Malaysia (Secondary)	Comprehensive exam	+				Beebout
		Chile (Primary & sec.)	Language & math		0			Schiefelbein & Farrell (1973)
3. Student boarding	Living at the school will raise student motivation and achievement	Kenya (Secondary)	Cambridge exam	+				Thias & Carnoy
		Tunisia	Grade point average	+				Carnoy & Thias
		Congo	Language & math	+				Youdi
		Malaysia	Comprehensive exam		0			Beebout
4. Student repetition	Holding low achieving students at a grade level will boost academic performance	Tunisia (Secondary)	Grade point average			-		Carnoy & Thias
		Egypt (Primary)	Reading & math exam		0			Hartley & Swanson
			(Lowering) dropout rate			-		
		Thailand	Academic exam	+				Fuller & Chantavanich
		Brazil			0			Costa

5. School monitoring	More frequent monitoring by the education ministry will improve instruction and raise achievement	Botswana (Primary)	Math	+				Loxley
			Reading		0			
6. Student achievement information	National exams will improve school management, raising achievement	Kenya (Primary/sec.)	Comprehensive exam	+			In affluent schools	Somerset (CS)
					0		In poorer schools	
7. Academic versus vocational curriculum	Tracking students into vocational curricula, where academic achievement is not emphasized, will lower student achievement	Chile (Secondary)	Level of first job	+				Schiefelbein & Farrell (1984)
		Colombia	Academic exam		0		For 3 of 4 vocational tracks	Psacharopoulos & Loxley (HR)
			Vocational exam			-	For 4 of 4 vocational tracks	
		Tanzania	Language & math	+			For 3 of 3 vocational tracks	
	Vocational curriculum will prepare youth more effectively for the labor force and will increase earnings	Colombia (Secondary)	Earnings (short-run)		0			Psacharopoulos & Zabalza (CS)
		Colombia	Rate of return (income)	+			Compared to academic track	Psacharopoulos (CO/CS)
		Philippines				-		
		Turkey				-		
		Thailand				-		
		Indonesia				-		Clark
		Cross-national	National income		0		Over 1950-1970	Benavot (HR)
8. School versus in-plant vocational training	In-plant training is more cost-effective	South Korea (Secondary)	Individual income	+				Lee (CS)

with principals that had attended more training courses and had longer teaching experience prior to becoming a principal (Indicator 1). This finding also appeared for science achievement among primary and secondary school students in Paraguay, coming from the Latin American school quality project. In each case, the principal's level of training was significantly related to achievement; the magnitude of these effects was not reported.

Stronger findings come from the Indonesian study of 124 secondary schools. Two characteristics of headmasters were among the strongest three school quality elements associated with pupil achievement levels. This inquiry found moderately high associations between pupil performance with both the headmaster's salary level (r=.50) and the headmaster's length of teaching experience (r=.33). Both factors remained strongly associated with pupil achievement within a large model which estimated achievement from 13 student background factors and 17 other school factors. The magnitude of these headmaster effects exceeded the significant influence of most student background factors (comparing t-statistics). The analysis failed, however, to explore whether these characteristics of headmaster's were acting as proxies for other aspects of school quality. The headmaster's salary level holds no logical relationship to pupil achievement. Yet salary could be acting as a proxy for length of training or experience. This work does encourage deeper investigations into an important issue: What specific actions do headmasters engage in which directly affect student achievement?

In Bolivia, a study of 53 primary and secondary schools found a relationship between student achievement and the headmaster's length of tertiary schooling. The magnitude of this factor was comparable to the influence of expenditures per pupil in a simple model which included just seven other school quality factors. Each of these two significant predictors of achievement was stronger than the student's social class background (when comparing t-statistics). However, these results held only for urban, not rural schools. And the recent study in Botswana mentioned above found no effect from the the headmaster's years of experience among grade 7 students. (Note, however, that values from only 37 cases (schools) were assigned to 869 pupils, constraining the variance in this measure of headmaster experience.)

Research has looked sporadically at other areas of school structure, including the number of class shifts each day and student boarding practices. An insufficient number of studies have occurred from which to generalize. However, two of three studies found no detrimental effect on achievement from the number of class shifts which operated each day (Indicator 2). In Malaysia (89 secondary schools), a negative achievement effect was observed where schools had two sessions of classes each day. However, the marginal achievement return from investing resources in eliminating double sessions was moderate. The researcher estimated that a $100 investment per pupil toward reducing double sessions would yield a seven percent increase in language achievement. The analysis does not clarify whether this level of investment was affordable or even sufficient to eliminate double-sessions. This level of marginal effectiveness was higher than the benefits gained from investing in lower class sizes, but would yield a lower return than directing the same resources to improvement of teacher training.

Another area of school structure -- repetition of grade levels by low achieving students -- also holds significant cost implications (Indicator 4). Four analyses have examined whether repeting a grade improves performance in the long run. This is a difficult issue to model and study empirically. Yet positive effects have been observed in just one study. The recent well designed study of 8,570 primary students in Egypt found no effect from grade repetition on pupils' academic achievement. Nor did repetition lower the probability of eventually dropping out of school, holding constant pupils' skill level.

The relative effectiveness of vocational versus academic curriculum is one piece of school structure which has generated considerable research. Table 12 includes a summary of this work (Indicators 7 and 8). This ingredient of school structure also has enormous cost implications. Third World governments and development agencies continue to invest in technical training schools and in vocational components of comprehensive (or diversified) secondary schools. However, earlier optimism that vocational training would raise student motivation, school achievement, and subsequent earnings has not be substantiated by the research. This element of school structure relates to specific types of institutions. Since my review focuses on elements of school quality which are present across various kinds of schools, the vocational issue will not be discussed in detail. For readers curious about this area, two recent publications thoroughly review work on this question [3.13].

A Narrow View of School Quality?

As a body of work, this collection of school quality studies is impressive. Over the past 15 years much has been learned about the influence of school quality in the Third World This research demonstrates the importance of school quality in shaping achievement, net the influence of pupils' family background and their community context. In addition, this literature has begun to delineate which specific school characteristics efficaciously raise student achievement.

But we should step back from this body of research and question its basic premises and weaknesses. A critical analysis is useful before applying research findings to investment strategies or to efforts by local schools designed to improve school quality. Questioning the research conducted to date may also prompt more refined investigations.

Here we summarize two sets of limitations. The first set reflects technical problems with how the basic production-function has been applied to the "output" of learning. The second set raises more fundamental questions as to whether this model, borrowed from the economic process of material transformation, is appropriate in trying to understand the social process of teaching and learning.

Refining Production Functions. Early in this chapter, the school quality literature was introduced by placing it in an historical context. Large scale

school surveys were undertaken in developing countries to answer the basic question: Do schools make a difference in shaping children's school achievement and eventual occupational attainment? The generally positive findings for developing countries importantly contradicts more limited effects of schooling within industrialized nations. But the methods employed to respond to this initial policy question may not be well suited to answer the second-generation issue: Which specific elements of school quality effectively boost student achievement? This history constrains how we represent the process of teaching and learning within formal models and empirical studies. [In addition to the following discussion, the limitations of production function studies in education have been explored elsewhere, see Note 3.14.]

First, large scale surveys of easily countable school characteristics are very helpful in answering the aggregate question, Do schools make a difference? But by including a grand number of school variables, the behavior and influence of a few characteristics are more difficult to study. The true influence of a particular school attribute may not be observed, given the simultaneous effects of other school factors. For instance, the study of Indonesia secondary schools found an overwhelming effect of the principal's level of training. But the functions typically included 45 different school characteristics. Thus the influence of other school characteristics were eclipsed by this strong proxy of principal quality.

This suggests that production-function studies may be more useful in disconfirming that a certain school characteristic influences achievement, rather than identifying which specific elements are efficacious. Where production function studies include a large number of variables, the least ambiguous proxies of quality may show the most robust statistical findings. This occurs not because the school factor exerts the strongest influence. But this input may be more easy to measure. For instance, the teacher's level of training may be a rough proxy for verbal skill in the classroom. Yet quickly measuring the first is possible on a survey form. The second construct is more problematic to assess. On the other hand, the fact that class size (a discrete variable) rarely is related to student achievement is useful knowledge. In this way, the task of disconfirmating relationships is easier to accomplish within large scale production-function studies.

Second, large scale surveys encourage the measurement of material aspects of schools. When pressure exists to gather data on a sizeable number of variables from a large number of schools, material features can be more quickly counted. The assessment of underlying social and management processes is more problematic, including how teachers use textbooks, laboratories, or writing materials.

The recent experimental school quality studies in Nicaragua and the Philippines go far in addressing weaknesses of production-function studies mentioned thus far. By focusing on a small number of school characteristics, the relative magnitude of achievement effects can be more clearly determined. Simply looking at the influence of additional textbooks and the introduction of radio instruction, the research design controlled for the intervening influence of other school quality elements. Concentrating only on these two

quality inputs, the research group could then estimate the relative magnitude of discovered gains in achievement. Experimental designs also minimize the danger of inferring the wrong direction of causality which is present in correlational studies. It may be that more competent students attend higher quality schools, rather than higher quality schools actually increasing pupils' achievement. Cross-sectional data (from one point in time) can not fully rule out the first direction of causality. But with an experimental design, assessment of the school's effect follows the introduction of a discrete intervention within specific schools. Longitudinal surveys within the production-function framework would at least strengthen the case for the postulated direction of causality.

A third limitation of production-functions is their implicit assumption that each school characteristic behaves independently in shaping pupil achievement. But the interaction of two or more school characteristics is clear to most observers of schools. For instance, the influence of textbooks is bounded by the skills of teachers necessary in using these materials. Interaction terms are commonly included within the production-function frame in other fields. This would be one step toward more realistic representations of the instructional process. Identifying the most efficient mix of essential school inputs and practices may be more important than determining the independent influence of any one factor.

Fourth, typical models assume that school characteristics influence achievement in a linear fashion and that each factor can be substituted for another. Researchers often infer that a positive effect of, for instance lengthening the school day, is generalizable to all conditions. However, achievement gains would be constrained if teachers were not competent in effectively using additional instructional time. Investing more resources to lengthen the school day may have no influence on achievement until teachers' skills are upgraded. Here the influence of one school characteristic depends upon the threshold level of a second factor.

Production-functions in education could be designed to capture the relative advantages of input mixes. In modeling agricultural production, for example, the relative efficiency of various input mixes (land, labor, and capital) often are compared in determining productivity advantages. Such work examines both the magnitude of an input's effect on agricultural product and its cost. In addition, farmers vary on their capacity to manage constant mixes of inputs. This resembles the efficiency with which material inputs are managed by headmasters and teachers [3.15].

Fifth, researchers should be more careful in specifying the conditions under which findings apply. Large scale surveys invite inferences that certain school characteristics influence achievement across all settings. Little work has clarified the conditions under which school factors do or do not shape pupil performance. An important exception to this general weakness: School quality elements appear to exert a stronger influence in rural areas and among lower achieving students. Within relatively affluent urban areas, school effects diminish somewhat, though by no means entirely.

Finally, the traditional production-function literature rarely identifies the costs of various elements of school quality. This is particularly troublesome given the need of policymakers to determined which school factors efficiently boost achievement. Again, the historical priority placed on establishing that schools do or do not have an effect has eclipsed concern over cost-effectiveness. Making schools more effective is somewhat independent of making schools more efficient. Both goals require establishing which school factors increase student achievment. But once efficacious elements of school quality have been identified, analysis of their relative costs is necessary. Chapter 4 will address the question of how school quality research can better look at this issue of efficiency.

Abandoning material production-functions. The research literature's historical context has led to a second, more serious, set of constraints. The production-function metaphor has encouraged study of material inputs which flow into the school rather than focusing on variability in the social organization of these inputs. Within the production-function tradition the teaching-learning process is defined simply as a system which combines material inputs to produce achievement. From this viewpoint, the production-function approach has ignored non-material behavioral aspects of school quality which can not be measured through large-scale surveys -- especially how teachers and headmasters manage and organize material inputs within the instructional process. This point of criticism suggests that the production-function framework be abandoned, replaced by new methods and a fresh set of school quality elements which may be more strongly linked to student achievement.

Material inputs clearly contribute to the quality of instruction and management of the school. But my emphasis here is on pin-pointing elements of the school's social structure which strongly influence achievement. For instance, research within industrialized countries consistently demonstrates that children learn more when more class time is spent on actual engagement in instructional tasks. In contrast, students often spend time talking to friends, idly waiting for the teacher to get organized, and sitting passively while the teacher checks the work of other children. Headmasters may be proficient in evaluating teachers' performance, in stimulating instructional improvement, and in creating a sense of camaraderie among staff and students. Or the headmaster may remain in his or her office and attend to normal administrative tasks. But these elements of school quality are social in nature, not material. Material resources provide the instruments and simple technology necessary for effective instruction. But the use and management of these material inputs occurs through social practices.

This second line of research has been more fruitful in explaining student achievement within industrialized nations than has the study of material determinants. Several reviews of school quality research within industrialized countries have been conducted and are summarized in the annex. In general these reviews have found only a slight relationship between global measures of material inputs (for example, expenditures per pupil) and achievement, after controlling for the influence of community wealth and pupil background. Exceptions do arise. For instance, several studies in the U.S.

found that the length of the school year does affect achievement. But in general, the level of material inputs fails to significantly boost pupil performance within industrialized settings.

School quality effects within industrialized countries are more robust when looking at social factors, including teacher quality, classroom structure, teaching practices, and school management. For example, empirical research frequently finds achievement effects which stem from the teacher's verbal ability, teaching experience, and level of training. In developing countries, we have seen that material resources make a greater difference in raising achievement. But even in Third World countries, it appears that material inputs must be directly related to the instructional process to influence pupil performance.

Regrettably, little research on the management and social organization of instruction is being conducted in the Third World. Intellectual and resource constraints make surveys of material school features less costly (in the short run). Research on management and social factors — a relatively new field within industrialized countries — is slow to influence the older, materialist line of thinking. Third World research continues to follow the production-function form of investigation, even though this approach has been largely abandoned among investigators in industrialized countries. As we have seen, material inputs (such as a book or writing pad) play a sizable role in raising achievement in Third World schools. But this historical emphasis on studying material indicators of school quality inadvertantly discourages deeper examination of classroom practices and social factors.

One recent review does summarize studies of social factors which influence achievement in Third World classrooms. This work is still in an embryonic stage, limited by methodological problems and unconvincing evidence. Yet these early studies do enumerate several characteristics of teachers and ways of organizing classrooms which may help improve learning (Avalos & Haddad, Note 3.16).

Teachers' attributes and skills

1. Academic and intellectual proficiency
2. Creativity and inventiveness
3. Internal motivation for teaching
4. Participation in inservice teacher training
5. Teacher holds high expectations for student performance
6. Knowledge of subject matter
7. Teachers' beliefs about the purpose and utility of schooling

Classroom social structure and management

8. Teacher lectures at the class versus encourages questions and discussion with students

9. Learning occurs within cooperative groups versus individual study and competitive achievement
10. Lessons emphasize problem-solving skills versus subject matter
11. Teacher praises student achievement
12. School climate or organizational norms which encourage effort, trust, and mutual respect among students and teachers

Attention to a subset of these factors and careful empirical research would be very helpful. Deliberate observations of teachers and classroom organizations are necessary. Considerable progress within industrialized countries has occurred in defining and measuring these social factors with sufficient validity and reliability. Hard evidence is abundant on several of these social elements of school quality within industrialized countries. But the traditional production-function method must be adapted in studying these factors. A narrower and deeper focus on a limited number of classrooms would provide a wealth of data on the relative effectiveness of varying teaching practices. This approach would move us far beyond looking only at proxies of quality; instead evidence could accumulate on specific behaviors of teachers and concrete ways of organizing classrooms which are empirically linked to higher student achievement [3.17].

Finally, materialist assumptions underlying the production-function framework ignore the symbolic dynamics of school quality. The body of research reviewed in this chapter stands upon the rationalist assumption that policymakers want to identify those elements of quality which increase student achievement. But attention to (or neglect of) improving school quality occurs within institutional contexts, be they governments or development agencies. These institutions necessarily are concerned with both the visibility and the perceived legitimacy of their actions. Early in this paper, the point is made that school expansion often receives more attention than improving quality. This may stem from the concrete and salient signals provided by the construction of new school buildings. The sight of a new school building in a village or urban neighborhood is a powerful signal of "modernization" and change. Simply sending new textbooks into an old school is not as powerful in symbolic and political terms.

Little thinking has occurred on how the task of improving school quality can incorporate more vivid signals of progress and come to be seen as a more legitimate policy initiative. The lack of political will, in part, stems from the lack of clear, effective signals that quality is important within the context of national development. Reform of national examinations may be one device for making the issue of school quality more visible and for providing benchmarks of progress. China, Malawi, and Kenya recently have been considering improvements in their examination systems. Exams could become useful tools for mapping changes in student achievement and even in discovering what school factors appear to boost pupil performance. More vivid and more public recognition of excellent teachers may be another way of building popular support for the improvement school quality. Importantly, the task here centers on improving the legitimacy of the school quality endeavor. This involves the use of school quality elements as signals of social change, just as the construction of new schools has come to mean "progress" in developing countries.

Chapter 4

What School Characteristics Boost Efficiency?

Introduction

The research reviewed in Chapter 3 identifies effective elements of school quality. That review sorted out those school factors which help raise student achievement from those which do not. But among this former subset of efficacious school factors, very little is known about the efficiency with which these inputs raise student achievement. Wise investment decisions rest not only on understanding which school characteristics effectively boost achievement. In addition, understanding both the magnitude of achievement effects and the cost of alternative school characteristics could raise the efficiency with which scarce school resources are allocated. This chapter reviews the few efficiency studies which have been conducted.

More efficient schools provide higher levels of achievement at constant or lower costs. One way of achieving greater efficiency is to invest in those material elements of school quality which are most cost-effective or efficient. This requires choosing among various possible school inputs and practices. For instance, we now know with some certainty that textbooks and school libraries influence student achievement. Determination of which is the more efficient strategy for boosting achievement requires two additional pieces of information. First, we need to know how strongly textbooks versus school libraries influence pupil achievement. That is, the magnitude of each intervention's effect should be determined. Second, the cost of each strategy must be determined. These two variables -- magnitude and cost -- indicate the relative cost-effectiveness of differing strategies.

Building a school library, for instance, might boost student achievement 10 percent higher than would a doubling of available textbooks. Yet the former strategy may cost 50 percent more than the latter. Directing resources to textbooks, therefore, would be more cost-effective in raising achievement (per constant unit of investment).

Investing in those school factors which rarely correlate with higher achievement is very inefficient. In fact, resources allocated to ineffective material inputs or management practices could be reduced. This would generate cost-savings that could be redirected to more effective elements of school quality. For instance, the consistent finding that (within reasonable limits) increasing class size does not diminish achievement is very important from an efficiency standpoint. The cost-savings of even incremental increases in class size can be substantial.

This chapter speaks primarily to the issue of internal efficiency. The policy issue here: Given a limited level of material and human resources, can the school attain higher levels of student achievement? A second aspect of school efficiency deals with the relationship between the cost of schooling overall and students' subsequent streams of income. Schooling costs and eventual income benefits flowing to graduates vary greatly for different types of schools (for example, primary or secondary, vocational or academic schooling). Therefore, schools differ on their external efficiency as well as their internal efficiency. A few studies reviewed below look at the relationship between school quality and eventual income effects experienced by graduates. This work crosses over the two spheres of school efficiency.

Method 1: General Comparison of Cost and Benefit

General comparisons between the relative costs and the achievement benefits of school quality inputs can be quite revealing. For instance, one cost study in Bolivia found that achievement levels were no higher in schools with lower class size. This finding stems from a comparison of a random sample of 63 urban and rural schools (29 private and 34 public institutions). This does not rule out the possibility that the independent force of lower class size acts to improve achievement. School quality factors associated with higher class size could be exerting an offsetting influence to increase student performance (for instance, a threshold level of textbook availability). But this lack of correlation between class size and achievement suggests that the allocation of additional resources to lower class size would lower efficiency [4.1].

The Bolivian study also found that unit costs were 10 percent lower in private schools compared to pubic schools in both the fourth and twelfth grades. Reading scores among private school students were 40 percent higher in grade 4 and 30 percent higher in grade 12, compared to public school pupils. The difference in unit costs was more strongly linked to higher class size in private schools, not lower teacher salaries. In addition, the investigators found that the size of school enrollment held no effect on unit costs. Unit costs were lower in schools with better qualified principals. More sophisticated models which look at the independent influence of various factors would be necessary to estimate unit costs. But these straightforward comparisons strongly suggest where cost-savings can be obtained and how some schools could become more efficient.

Simple evidence on the cost of school quality elements can also point to possible efficiencies. For instance, a study of (preservice) teacher training costs conducted in Pakistan identifies where inefficiencies exist. The analysis included cost data from six of Karachi's colleges that were involved in teacher training and a survey of 400 recent graduates. Two findings are especially relevant. First, the unit cost of training one new teacher varied by a factor of six among the colleges. Cost accounting in education is not a precise science, nor are data reported on graduates' average achievement level across the institutions (necessary in determining cost-benefit). Yet this

wide variation in costs does suggest that some colleges are operating more efficiently than others.

Second, only 40 percent of the graduates were actually employed as teachers 13 months following their graduation from the training colleges. Over 55 percent were not working in any job. Despite a documented teacher shortage in this region of Pakistan, particularly in rural areas, many graduates were not teaching. Only 31 percent reported that they would be willing to teach in a rural area. Employment as a teacher was unrelated to their area of specialization in the training program (for instance, mathematics, science, or language instruction).

These findings suggest a low level of efficiency in teacher training programs. The variation in unit costs also suggests that greater efficiencies can be pursued within particular programs. Again, more careful analysis is necessary to see how teacher quality may covary with higher training costs. But this simple analysis points to clear inefficiencies [4.2].

The low efficiency of some teacher training programs was also revealed within the early Chilean study of school quality (grade 8 students within 439 classrooms) [4.3]. Whether teachers were trained in the university or normal schools was unrelated to the achievement of their pupils. Yet university-based training was much more costly, in terms of direct cost of instruction and relative salary levels of teachers. Based on actual cost data, the researchers estimated that if only normal school graduates had been hired as teachers in the previous five years, a cost-savings equal to two percent of the national education budget would have been generated. In addition, the researchers estimated that a 15 percent increase in average class size would have no diminishing effect on pupil achievement -- and would free resources equal to five percent of the education budget. Moving to double shifts in schools, also unrelated to pupil achievement levels, would create an additional cost-savings equal to six percent of the sector's budget.

Method 2: Analysis of Discrete Marginal Cost and Product

More precise methods have been employed to estimate the cost-benefit of specific school quality elements. This approach has two advantages over general cost and benefit comparisons. The independent effect of a school quality element can be isolated through an experimental design where an intervention is applied to a treatment group; the magnitude of the effect is then compared to the control group of classrooms or schools. Alternatively, the cost of different quality improvements can be calibrated against a marginal increment (say a US$100 investment in quality) in alternative school inputs (for instance, textbooks or lengthening the school day). The size of marginal products (or achievement benefits) can then be compared with the alternative investments, holding the marginal cost increment constant.

Experimental studies. The Nicaragua textbook and radio experiment discussed in Chapter 3 includes a cost-benefit analysis. Here the benefit or outcome variable utilized was the first grade passage rate among pupils receiving radio lessons in school versus students in the control classrooms. Among control-group students, an estimated 45 percent failed or dropped out before completing the first grade, versus 33 percent of students in the radio mathematics program (Table 14). The cost-savings (benefit) resulting from this lower failure rate was calculated. The overall cost per primary school student in Nicaragua at that time was US$54.00. The cost per first grade graduate, including resources expended on pupils who failed or dropped out, equalled $99.50. By increasing the grade passage rate, the cost per graduate in the radio mathematics program approximated $12.16 less than in the control classrooms. The per pupil cost of the intervention was $3.00 per student.

Table 14
Nicaragua Radio Efficiency Study

	Nicaraguan Classrooms	
	With Radio Instruction	Without Radio Instruction (controls)
1. Mean math test score	52.5	37.6
2. Percent children failing grade 1	33%	45%
3. Cost per graduate from grade 1	$87.34	$99.50

Source: Jamison (1978); Jamison, Searle, Galda & Heyneman (1981)

Relative costs can also be calculated backwards, holding constant the increment of benefit (or achievement gain) which is observed. For example, students who received textbooks within the Nicaragua mathematics project scored .22 standard deviations higher than pupils in the control group on tests given following the intervention. The cost per student of the textbook component of the project equalled $2.00. This level of achievement gain was then calibrated against the magnitude of achievement gain which is observed when class sizes are lowered (based on the U.S. research literature). To accomplish this same magnitude of achievement gain, average class size must be lowered from about 40 to 10 students. Clearly the cost of this change would be enormous.

Multivariate survey studies. Experimental studies are rare in school quality research that is conducted in developing countries. The large scale survey, as discussed above, is more commonly used. The marginal product of

incremental investments in elements of school quality can be estimated from empirical models which attempt to report the independent influence of several factors. Based on a conventional production-function analysis (using a Cobb-Douglas model), the Malaysian study of 89 schools estimated the marginal gain in achievement associated with a constant level of new investment. The researcher determined the cost of each school factor that significantly influenced achievement, including the level of teacher training, double sessions of classes, and class size.

The marginal gain in language test scores was then estimated for each $100 increase in investment. Table 15 illustrates the various levels of effect found for this constant cost increment.

The production-function transformation provides information on the magnitude between a change in the school quality factor and the achievement effect (a one percent change in the independent factor leading to an x percent change in achievement, depending upon the observed elasticity). The one percent change in the school quality element can be costed out. When calibrated against the $100 increment in investment, the size of each achievement effect can then be estimated.

Table 15
Malaysia Efficiency Study

School Quality Element	Percent Gain in Language Test Score Per $100 Investment
1. Teacher training	8%
2. Reduced use of double session	8%
3. Reduced class size	3%

Sources: Beebout (1972), Alexander & Simmons (1975)

This form of analysis first provides information on how strongly the quality improvement will boost achievement. In the Malaysian case, a $100 increase in cost is very sizable given the moderate achievement effect observed. Second, the analysis indicates the relative efficiency with which alternative elements of quality will yield higher achievement, holding the marginal cost increment constant.

One cost-benefit study used several experimental and multivariate studies to compare the relative efficiency of increasing instructional time, reducing class size, or using a pupil tutoring program to boost achievement. All data used in the analysis come from the U.S. The latter intervention involved

tutoring of young children (grades 1-4) by older children (from grades 5 and 6). Several experimental and multivariate studies were reviewed to estimate the relative effect of the three school quality interventions. First, the effect size of each program on reading achievement was calculated in terms of standard deviation units (Table 16, Column A). Second, the annual cost per student was determined for each intervention (Column B). Third, the effect size was calibrated per $100 increment of cost (for the base program, not for an additional increment of investment as with the Malaysia study).

This form of analysis provides information on the relative efficiency of different strategies for improving school quality. In addition, the unit cost data help demonstrate which intervention is most feasible within limited resources. For example, the peer tutoring program is very efficient. But within developing countries, this approach would be more feasible if its unit cost could be lowered.

Table 16
U.S. Efficiency Study (Reading)

School Quality Element	(a) Effect Size	(b) Cost Per Student	(c) Effect Size Per $100 in Cost
1. Lengthen instructional time	.07	$ 61	.12
2. Reduce class size (fm 35 to 20 pupils)	.22	$201	.06
3. Peer tutoring	.48	$212	.22

Source: Levin, Glass & Meister (1984)

Method 3: Estimating Rates of Return

Two studies which link school quality, pupil achievement, and graduates' subsequent earnings were mentioned in Chapter 1. The recent study in Brazil found that school quality (measured by the length of teachers' schooling) more strongly influenced pupils eventual stream of income than did (pupils') length of school attendance. Similarly, the research in Kenya and Tanzania found that workers' earlier level of school achievement (measured with standardized literacy exams) also influenced achievement. And a considerable body of research within industrialized countries demonstrates that the quality of school attended significantly affects graduates' eventual earnings.

Empirical data could be collected to estimate (a) the efficiency with which alternative elements of school quality influence achievement or

literacy, and (b) how strongly levels of school achievement or literacy shape eventual earnings after leaving school. The early study of secondary school graduates in Kenya did undertake this type of two-step rate of return study. In part, the analysis reports on the relative efficiency of alternative school quality elements. Here the benefits are in terms of future earnings. The achievement gain associated with one school quality factor is seen as an intermediate factor which influences subsequent earnings. This work examined a limited number of school characteristics. But the method employed is important to note.

The analysis calibrated costs against a one-point increase in the national exam. For example, the cost of increasing the average test score by one point -- via an increase in per pupil expenditures -- was estimated at 62.50 (Kenyan) pounds per year (Table 17, Column A). The study also had found a significant achievement effect for higher teacher salaries. Assuming that this input measure was not acting as a proxy for another factor, the cost of boosting the average test score by raising salaries was estimated at 52.60 pounds per year. As reported in Chapter 3, low achieving students (as a subgroup analyzed separately) realized a higher earnings benefit from higher school achievement. For instance, a one-point gain in achievement was associated with a 15 pound per year difference in earnings, controlling on individual background factors (Column B). But for high achieving students (the second subgroup), a one-point gain in achievement was associated with only a 1 pound gain in earnings. The researchers then calculated rates of return by relating the cost of each element of school quality (per pupil expenditures and teacher salaries) with the realized earnings benefit. The intermediate process lies in each school factor's influence on pupils' national exam scores. The calculated rates of return are reported in Column C.

Table 17
Kenya Rate-of-Return Study

School Quality Element	(a) Cost Per Year Per 1-point Gain (pounds)	(b) Earnings Benefit Per Year (pounds)	(c) Rate-of-Return
Lower Achieving Students			
1. Expenditures per pupil	62.50	15.00	5.0%
2. Teacher salary	52.60	15.00	7.2%
Higher Achieving Students			
1. Expenditures per pupil	62.50	1.00	0.4%
2. Teacher salary	52.60	1.00	0.5%

Source: Thias & Carnoy (1972)

Note that earning gains associated with each quality element are equal, given that the marginal cost of each quality element was calculated on the basis of a one-point gain in earnings. A one-point gain in the national exam is related to an equal gain in earnings regardless of which element of school quality determines that one-point increase.

This type of analysis is helpful in estimating the relative efficiency of different elements of school quality, in terms of eventual gains in earnings. For instance, the influence of per pupil expenditures is somewhat greater than teacher salaries. In addition, this analysis can determine which students will benefit most from improvements in school quality. Here we see that quality investments at the margin will not significantly benefit pupils who are already achieving at relatively highly levels.

Annex / Review of School Quality Research from Industrial Countries

A brief review of school quality research from industrialized countries was undertaken. This exercise brought together several articles and books which have summarized the influence of school characteristics on student achievement. Since the Coleman and Plowden reports in the late 1960's, the school quality field has grown dramatically and broadened into a variety of specialized fields. The extent of Third World research, however, is considerably more modest. For developing countries it was useful to pull together the individual empirical studies which have been completed.

Table A-1 summarizes the several research reviews which apply to school settings in Western Europe or the U.S. Individual review papers, cited at the end of Table A-1, can be consulted for information on specific empirical studies.

Material Inputs

The influence of material inputs on achievement is inconsistent within industrialized countries. Even when a material variable influences pupil performance, the effect often is quite small. This is the case with smaller class sizes. One exception: schools with longer academic years tend to raise student achievement more efficaciously (at least within the U.S.).

Teacher Quality

The quality of teachers more consistently influences achievement. The most marked effects are for teachers' level of experience and verbal competence. Teacher salary levels appear to have little consistent influence on achievement. Mean salary levels within a school district, however, may determine its ability to attract staff with higher verbal skills.

Classroom Organization

Consistently positive achievement effects are found for several factors related to the organization and management of schools. Particularly potent classroom characteristics include time spent on instructional tasks, assignment and close evaluation of homework, placing students in active learning roles (not passively listening to lectures), tight evaluation of students' performance, and the teacher's clarity in presenting material.

Table A-1
Influence of School Quality Elements on Student Achievement:
Research from Industrial Countries

School Quality Element	Hypothesis	Evidence & Method	Study
A. MATERIAL INPUTS			
1. Expenditures per pupil	A higher level of resources will raise student achievement levels	MIXED effects found in three U.S. studies; POSITIVE effects found in two other studies, with expenditure operating indirectly via pupil/teacher ratio (Method:CS,MV Sig:BT Level:I,S,R)	Bridge, Judd & Moock (1979)
		NO or NEGATIVE effects found in 50 of 55 U.S. studies (Method:CS,MV Sig:BT Level:I,S,R)	Hanushek (1981)
		POSITIVE effects found for total instructional expenditures six models reported in four U.S. studies (Method:MV,CS Sig:BT Level:I)	Glasman & Biniaminov (1981)
		NO EFFECT found in four U.S. studies; POSITIVE effect found in one U.S. study (Method:MV,CS Sig:BT Level:I, S)	Jamison, Suppes & Wells (1974)
2. Class size	Fewer students per teacher will improve the quality of instruction	POSITIVE effect of smaller class size found for science classes in Belgium, Germany, and the U.S.; NO EFFECT in six other industrial countries (Method:CS,MV Sig:BT Level:I)	Heyneman & Loxley (1983)
		POSITIVE effects found in 10 models estimated within five U.S. studies; NEGATIVE effect in two models report in same studies (Method:MV,CS Sig:BT Level:I)	Glasman & Biniaminov (1981)

		NO EFFECTSfound in 100 of 109 U.S. studies reviewed (Method:CS,MV Sig:BT Level:I,S,R)	Hanushek (1981) Also reviewed in Averch et al. (1974)
		NO EFFECT found for class size difference within the 20-40 students/teacher range within the U.S. and England; POSITIVE EFFECT for class sizes of less than 20 (Method:CS,MV Sig:BT Level:I,S)	Glass & Smith (1978) Rutter (1983)
		NO EFFECT found in comparing class size of Japanese and U.S. classrooms (Method:CS,CO Sig:BT Level:I,S)	Stevenson (1983)
3. School size	Smaller schools will increase the [illegible]ount and quality of teacher-student [illegible]raction	NO EFFECT found in six U.S. studies (Method:CS,MV Sig:BT Level:I,S,R)	Bridge, Judd & Moock (1979)
		MIXED and inconsistent effects found in six studies reviewed from England and the U.S. (Method:RS)	Rutter (1983)
4. Instructional materials	Higher availability of textbooks and other instructional materials will boost the quality of learning activities, especially in reading instruction	POSITIVE effect found for the school's expenditures for books in Germany & Hungary; NO EFFECT found for nine other countries (Method:CS,MV Sig:BT Level:I)	Heyneman & Loxley (1983)
5. Length of school day/year	More total hours spent in school, on instructional activities will boost achievement	POSITIVE and consistent effects found in four U.S. studies (Method:CS,MV Sig:BT Level:I,S)	Bridge, Judd & Moock (1979)
6. Physical facilities	Better facilities provides better, more motivating conditions for learning	NO EFFECT found in 64 of 71 studies reviewed: (Method:CS,MV Sig:BT Level:I,S,R)	Hanushek (1981)
7. Library	Libraries provide higher levels and variety of reading materials	NO or MIXED EFFECT found in all eight U.S. studies reviewed (Method:CS,MV Sig:BT Level:I,S,R)	Bridge, Judd & Moock (1979)

B. TEACHER QUALITY

1. Pre-service training	More years of college instruction will boost teaching effectiveness	POSITIVE effect found for reading teachers in Hungary, New Zealand, and England; NO EFFECT found in ten other industrial nations (Method:CS,MV Sig:BT Level:I)	Heyneman & Loxley (1983)
	More years of graduate teacher-training will boost instructional skills	NO or NEGATIVE effects found in seven U.S. studies; POSITIVE effect found in two studies (Method:CS,MV Sig:BT Level:I,S,R)	Bridge, Judd & Moock (1979)
2. Teacher experience	Teachers with longer tenure will develop stronger instructional skills	POSITIVE effects found in five U.S. studies; MIXED or NO effects found in five other studies depending on specific student achievement variable examined (Method:CS,MV Sig:BT Level:I,S,R)	Bridge, Judd & Moock (1979)
		POSITIVE, MODERATE effects found in review six U.S. studies; NO EFFECT in one additional study (Method:CS,MV Sig:BT Level:I)	Jamison, Suppes & Wells (1974)
		POSITIVE effect found in 30 U.S. studies NO EFFECT reported in 74 other examinations of this factor (Method:CS,MV Sig:BT Level:I,S,R)	Hanushek (1981) Also reviewed in Averch et al. (1974)
		POSITIVE effects found in all 23 models reported in eight U.S. studies (Method:MV,CS Sig:BT Level:I)	Glasman & Biniaminov (1981)
3. Teacher's verbal ability	Teachers with greater verbal skills will increase the quality of student-teacher interaction	POSITIVE effects found in four U.S. studies; MIXED or NO EFFECT found in three other researches (Method:CS,MV Sig:BT Level:S)	Bridge, Judd & Moock (1979)
		POSITIVE, MODERATE effects found for verbal skill of teacher, standardized test (Method:CS,MV Sig:BT Level:I)	Jamison, Suppes, Wells (1974)

		POSITIVE effects found for teachers' verbal achievement from all 15 models reported in four U.S. studies (Method:MV,CS Sig:BT Level:1)	Glasman & Biniamino (1981)
4. Teacher salary	Higher salaries will attract better qualified people and more strongly motivate teachers	NO or MIXED effects found in six U.S. studies: (Method:CS,MV Sig:BT Level:1,S,R)	Bridge, Judd & Moock
		NO EFFECT found in 51 of 60 studies reviewed (Method:CS,MV Sig:BT Level:1,S,R)	Hanushek (1981)
		POSITIVE effects found in two U.S.studies NO or NEGATIVE effects found in five other studies (Method:CS,MV Sig:BT Level:1)	Jamison, Suppes & Wells (1974) Also reviewed in Glasman & Biniamino (1981)
C. CLASSROOM STRUCTURE / TEACHING PRACTICES			
1. Classroom time spent on instructional tasks	More time spent on concrete learning activities, versus time on disciplining students, managing records, or arranging lessons, will increase achievement	POSITIVE effect found for time reading science text in seven industrial nations; NO EFFECT found in five other countries (Method:CS,MV Sig:BT Level:1)	Heyneman & Loxley (1983)
		POSITIVE effect found for hours of instruction spent per week on reading in Germany & Hungary (Method:CS,MV Sig:BT Level:1)	Heyneman & Loxley (1983)
		POSITIVE effect found for number of academic courses completed (versus vocational or elective courses) in national sample of U.S. students (Method:MV Sig:BT Level:1)	Walberg & Shanahan (1983)
	Assignment and close evaluation of homework will boost student learning	POSITIVE effects found in two British studies (Method:CS,MV Sig:BT Level:S)	Rutter (1983)

2. Cooperative instructional tasks	Arrangement of and rewards with cooperative instructional tasks will increase interaction among students and subsequent learning	POSITIVE effect found in 29 evaluations of cooperative instructional tasks in the U.S.; NO EFFECT found in 21 other studies (Method:EX,CO Sig:BT Level:I)	Slavin (1983) Also reviewed in Webb (1982)
3. High teacher expectations for student performance	Teachers who expect high standards of performance receive stronger commitment and achievement from students	POSITIVE effects found when teacher expectations are matched with effective classroom management and active learning exercises, U.S. studies (Method:MV,CS,EX Sig:BT Level:I,S)	Brophy (1979) Walberg (1984)
4. Active teaching and learning roles	The level of interaction between teacher and student, and with learning materials, will increase student achievement	POSITIVE and consistent findings: the amount of time teachers spend interacting with the class, not only with individual students, is related to student achievement; efficacy of instructional materials in facilitating active learning remains unclear; British and U.S. studies (Method:CS,MV Sig:BT Level:I,S)	Brookover et al. (1979) Rutter (1983)
5. Tight evaluation of student achievement	Close contingency between student effort and teacher rewards will boost student's motivation and achievement	POSITIVE correlation between students' perception that their classroom efforts were noticed and rewarded and their achievement in 120 U.S. schools (Method:CS,MV Sig:BT Level:S)	Brookover et al. (1979)
		POSITIVE effect found for consistent recognition of high student performance (Method: not specified in review)	Walberg, 1984
	A student's perception of efficacy and ability to influence the teacher or school structure may lead to higher motivation and achievement	POSITIVE effects found in four U.S. studies (Method:CS,MV Sig:BT Level:I)	Bridge, Judd & Moock (1979)
6. Clarity of teacher's presentation	Clear explanations of material and will raise student comprehension & clarity of evaluation criteria	POSITIVE findings found in 50 studies reviewed from the U.S. (Method:CO Sig:BT Level:I)	Rosenshine & Furst (1971) Also reviewed in Averch et al. (1974)

7. Individualized instruction	Curriculum which allows each student to progress at his/her own pace will increase mastery of material and student motivation	NO EFFECT found in 39 U.S. studies; POSITIVE effects in 10 reports (Method:EX Level:I)	Bangert, Kulik & Kulik (1983)
D. SCHOOL STRUCTURE			
1. Academic vs. vocational curriculum	Tracking students into vocational curriculum, where academic achievement is not emphasized, will lower student performance	NEGATIVE effect of vocational track found in Scotland, New Zealand, Netherlands & Austria; NO EFFECT found in nine other industrial nations (Method:CS,MV Sig:RS)	Heyneman & Loxley (1983)
2. Student tracking by competence level	Placing students in different tracks will hinder performance of students who are expected to perform at lower levels	MIXED effects found in nine studies from the U.S. and England (Method:MS)	Rutter (1983)
3. School selectivity	Admitting more able students will encourage higher achievement standards	POSITIVE effects found: a school's student composition moderately effects the individual student's achievement, after controlling on the latter's family background; findings from eight British and U.S. studies (Method:CS,MV Sig:BT Level:I,S)	Rutter (1981)
4. Participatory management	Greater involvement of teachers in school decision-making will improve teacher motivation and commitment	POSITIVE effects found in British and U.S. studies (Method:ET)	Rutter (1983)

5. Size of administrative staff	Ample staff to deal with administration will improve quality of teaching and efficient use of resources	NO or MIXED effects found in six U.S. studies; POSITIVE effects found in just one study (Method:CS,MV Sig:BT Level:1,S,R)	Bridge, Judd & Moock (1979)
	Administrators with more training and from higher quality universities will more efficiently utilize resources	NO EFFECT found in 50 of 54 studies (Method:CS,MV Sig:BT Level:1,S,R)	Hanushek (1981)
6. Integration of school and work	More time spent in out-of-school work will lower school achievement	MIXED results from U.S. studies: moderate levels of work outside school may positively influence school commitment and achievement (Method:CS,MV Sig:BT Level:1)	D'Amico (1984)

* The following codes are used in Column 3 to signify the method of analysis used in specific studies.

METHOD's of analysis:

- CS = cross-sectional data from one point in time
- LG = longitudinal time-series data
- CO = simple correlational relationship
- MV = multivariate method used to control on family background, community wealth, or other antecendent determinants of school achievement
- EX = experimental design with classroom or school control groups
- ET = ethnographic case studies, often linking observed school characteristics with empirical data
- NS = method not specified in review article

Statistical importance or significance:

- BS = the factor explains at least five percent of the variance in school achievement measure
- BT = beta coefficient is significant at .10 level or better in regressions or at .05 level or better with bivariate correlations

LEVEL or unit of observation:

- I = individual student
- S = school
- R = region, community, or state
- N = aggregate national level

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Notes

Full citations to the studies listed below appear in the reference list (page).

Summary and Chapter 1

1.1 Dore (1976)
1.2 Unesco (1983a)
1.3 Egypt data, Hartley & Swanson (1984); Kenya, Somerset (1983); Brazil, Behrman & Birdsall (1983); Peru, Cespedes (1984).
1.4 de Regt (1982)
1.5 Heyneman & Loxley (1983); this issue is discussed in detail in Chapter 2.
1.6 For reviews see, Heyneman (1980) and Niles (1981).
1.7 Heyneman & Loxley (1983)
1.8 Heyneman, Jamison & Montenegro (1983)
1.9 Kravis (1984)
1.10 Schiefelbein & Farrell (1982, 1984)
1.11 Brazil study, Behrman & Birdsall (1983)
1.12 Distribution of educational benefits, Mingat & Tan (in press).
1.13 Boissiere, Knight & Sabot (in press)
1.14 Jamison & Moock (1984). Studies from industrialized countries on the economic effects of school quality are reviewed in Solmon (1985).
1.15 Fuller, Gorman & Edwards (in press)
1.16 Behrman & Birdsall (1983)
1.17 Fuller (1985)
1.18 Current work is looking at (a) the tradeoff between expanding enrollments versus increasing quality, in terms of expenditures per pupil, and (b) tradeoffs in investing among different school characteristics. For a draft paper, see Mingat & Tan (1984).
1.19 Unesco (1983a)
1.20 World Bank (1984)

Chapter 2

Many studies referred to within the text are clearly cited in Tables 8-12. Only papers not clearly identified in the narrative and tables are noted below.

2.1 For examples of this research, see Bing (1963), Hess & Holloway, (1984)
2.2 Mexico, Bowman (1984); Brazil, Armitage, Ferreira Gomez, Holsinger & Leite (1984).
2.3 This paper focuses only or the **internal** effectiveness and efficiency of schools. External efficiency is also an important issue related to school quality. That is, do elements of school quality influence the student's occupational success and social

quality of life after leaving school? This question has spawned a large amount of research -- which will not be reviewed here.

2.4 For review, see Schiefelbein & Simmons (1981).

2.5 Heyneman & Loxley (1983)

Chapter 3

3.1 My review builds from earlier summaries of the school quality literature. Especially helpful reviews include Simmons & Alexander (1978); Husen, Saha & Noonan (1978); Heyneman, Farrell & Sepulveda-Stuardo (1978); Schiefelbein & Simmons (1981).

3.2 Jamison, Searle, Galda & Heyneman (1981)

3.3 For examples, Thorndike (1973) and Rivarola & Corvalan (1976).

3.4 The cost-benefit analysis for Nicaragua appears in Jamison (1978).

3.5 Summarized in Heyneman & Loxley (1983).

3.6 The Chilean data are reported in Husen (1977). For Puerto Rico findings, see Carnoy (1971).

3.7 For review, Husen, Saha & Noonan (1978).

3.8 For a report on the World Bank's lending in education, see Romain (1974).

3.9 See Husen et al. (1978) and Heyneman & Loxley (1983).

3.10 The efficiency analysis appears in Thais & Carnoy (1973).

3.11 The IEA analysis is reviewed in Husen et al. (1978).

3.12 For reviews, see Edmonds & Frederiksen (1979), Rosenholtz (1985), Fuller, Izu & Berman (1985).

3.13 Metcalf (1985) and Psacharopoulos & Loxley (1985)

3.14 For examples, see Levin (1976) and Klees (1984).

3.15 Noted earlier, initial results of ongoing work is reported in Mingat & Tan (1985).

3.16 Avalos & Haddad (1981)

3.17 For reviews of reliable measures of observable teaching and classroom management practices, see Flanders (1985), Karweit (1985), and Peterson, Micceri & Smith (1985).

Chapter 4

4.1 For the Bolivian analysis, see Morales & Pinellsiles (1977). For an efficiency study of class size reduction, see Jamison (1982).

4.2 Klitgaard, Siddiqui, Arshad, Niaz & Khan (1985)

4.3 This efficiency analysis for Chile is detailed in Farrell & Schiefelbein (1974).

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