How to Raise the Effectiveness of Secondary Schools?
Universal and Locally Tailored Investment Strategies

Bruce Fuller
Prema Clarke
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Bruce Fuller
Prema Clarke
Harvard University

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Summary

We have learned much -- over the past 20 years -- about school inputs and investment strategies that best yield gains in student achievement. The bulk of this empirical research, however, has been conducted with primary schools.

Efforts aimed at raising the quality and learning effects of secondary schools are mounted under quite different institutional conditions: (1) the selectivity and general quality of secondary schools are often protected by third-world governments, even when primary school quality is low or declining, (2) secondary schooling has been more differentiated historically, and increasingly is split between junior-secondary schools which are attached to "basic education" vis-à-vis still selective senior-secondary schools, and (3) secondary education is further removed from local communities, often serving the interests of universities, technical economic priorities, and status concerns of elite and middle-class families. Thus, how we conceive of "effectiveness" within the secondary subsector -- and how we study achievement effects from alternative investments -- differs from the primary-school subsector.

This paper explores two particular questions:

1. How do school-effectiveness findings differ for secondary education, compared to evidence on primary schools? What are the implications for government policies and lending priorities? For example, would the World Bank's investment emphasis on textbooks, at the primary level, likely yield similar achievement effects at the secondary level?

2. Will the on-going search for school investments that universally raise achievement -- a thirst fed by operational pressures to design projects with discrete sets of inputs -- continue to hold utility for governments and Bank staff? We summarize the evidence to date regarding which investments appear to spur achievement more consistently at the secondary level. But since the institutional positioning of secondary education varies across countries, a new research strategy aimed at understanding the locally situated effects of alternative inputs may be more useful in the long run.
What Secondary School Investments Raise Achievement?

Part 1 of this paper reviews key empirical findings from over 100 studies that have been conducted within primary and secondary school systems. This builds on and extends earlier reviews.

We separate studies that have been conducted within primary versus secondary schools. Comparatively little is known about effective school investments within secondary schools.

Within primary schools, the achievement effects of 20 different school inputs and teaching practices have been formally modeled in at least 5 different studies (with adequate controls for the prior influence of pupils' family background). Within secondary schools, only 10 different inputs have been formally studied in at least 5 independent studies, permitting fewer inferences about likely achievement effects of alternative investment strategies.

Table 1 summarizes empirical findings for primary and secondary-school studies.

- **Teaching materials.** Within secondary schools, only textbooks have received considerable attention, and their effect is less consistent than at the primary level. At the margin, supplementary readers may more effectively boost learning. Initial evidence also suggests that school libraries do encourage more reading and yield higher achievement. The cost-effectiveness of libraries has received little attention from researchers.

- **Teacher preparation.** The novice teacher's total length of schooling may be more important than costly preservice training per se (similar to findings at the primary school level). In some settings inservice teaches training yields gains in pupil achievement. The verbal proficiency and subject-matter knowledge of teachers, while studied infrequently, shows consistent effects on pupil achievement.

- **Class size** among secondary schools is even less related to achievement than in primary schools, probably due to already low pupil:teacher ratios observed in many countries.

- **Teacher salary levels and experience** show no consistent effect on pupil achievement. This lack of effect is even more clear in secondary-school studies than at the primary level.

- **Instructional time.** Even rough measures for the amount of classroom time are consistently related to higher levels of achievement within secondary schools. Similarly, the frequency with which homework is assigned helps explain variation in achievement levels.
Teaching practices have received very little attention from researchers working in secondary schools. More active forms of pedagogy are not consistently related to higher achievement. The importation of North American conceptions of "effective teaching" may not be the best way to empirically identify pedagogical practices that boost achievement in developing-country secondary schools.

We located 25 original primary-school and 18 secondary-school studies that had not been reviewed earlier (in Fuller 1987 or Lockheed and Vespoor 1991). These studies are listed in Annex 1. They include multivariate models of achievement, specifying adequate controls on the prior influence of pupils' family background.

New Definitions of School Effectiveness: Identifying Country-Specific Factors that Boost Achievement?

Part 2 pushes forward on the question of whether the search for universally effective school factors is useful for governments or Bank staff. Certainly conducting country-specific school effectiveness studies can help determine investment priorities. And summarizing these studies, as we do in Part 1, is informative, at least in pinpointing school inputs that rarely hold any influence on pupil achievement.

But country-specific conceptions of "school effectiveness" are arising with increasing force. Both in eastern Europe and southern Africa, schools have recently come to be viewed as instruments for socializing youths toward democratic values and skills. In east Asia, talk of school reform centers on how to encourage individualistic thinking and creativity, balanced against traditional collective commitments. In many parts of the world, the attachment of junior secondary schools to the basic education cycle aims to provide terminal schooling for the bulk of youths who remain in agricultural or who enter service-sector jobs. These policy concerns focus more on how secondary schooling socializes youths toward certain values and orientations, rather than on the academic content or mix of school inputs purchased. While the Bank's role may have been traditionally limited to the latter -- the more mechanical piece of raising school effectiveness -- the former element is gaining importance within some government policy circles and within the school-effectiveness research literature.

We discuss how the local meanings of basic school inputs -- such as, textbooks, teacher guides, and pedagogical practices -- may vary across societies. Increasingly, governments and local educators are asking not only whether the supply and mix of basic inputs is adequate -- but also whether these secular inputs are mobilized and energized in ways that motivate learning. Lending strategies and policy advising that sees the meaning of school inputs or teaching practices as culture-free will become less useful as governments become more sophisticated in how they are attempting to broaden the meaning of "effective" schooling.
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How to make schools more effective? It's become a timeless question -- one that troubles and intrigues policy makers, educators, and parents. Two facets of the issue continue to engage the curiosity of scholars and observers of the school institution. On the learning-outcome side: What are the aims of culturally diverse communities when they seek to raise "school effectiveness"? That is, what is the daily treatment that they wish to administer to their children inside classrooms? Backing-up from these (hoped for) cognitive and socialization outcomes, what instructional tools and teaching practices are more likely to yield intended forms of learning?

Two major frameworks for studying school effectiveness have evolved since the 1960s. Members of these two intellectual camps advance competing models for how schools work; they are separated by normative and empirical crevices that remain wide and deep. The policy mechanics -- spurred by central agencies' search for universal determinants of effective schools -- have tried to empirically isolate those instructional inputs and uniform teaching practices that yield higher achievement. This line of inquiry, working from a production-function metaphor, has yielded impressive findings that distinguish those instructional tools which likely yield achievement effects within impoverished settings from those that usually do not (Heyneman & Loxley, 1983; Fuller, 1987; Lockheed & Verspoor, 1991). This paper
updates empirical findings from this tradition, stemming largely from work in developing countries, and details how these findings have proven useful to policy makers and central budgeteers. While variation in the level and mix of instructional materials is inconsistently related to achievement in the United States (Hanushek, 1986), a similarly mechanical approach to teacher effects continues to be pursued: searching for discrete pedagogical behaviors that universally yield cognitive achievement gains (for reviews, Anderson & Burns, 1989; Waxman & Walberg, 1991).

The classroom culturalists emphatically object to this culture-less conception of the particular effects that different schools, located in diverse societies and ethnic communities, are attempting to realize. These observers of schools focus on the normative socialization that occurs within classrooms: the value children come to place on individualistic versus cooperative work, legitimated forms of adult authority and power, and acquired attitudes toward achievement and modern forms of status (Durkheim, 1925; Dreeben, 1968; Willis, 1977; Apple, 1990; Mehan, 1992). This line of analysis, until quite recently, has ignored links between child socialization and narrower forms of cognitive achievement. Antecedent inputs or classroom rules, manipulable by central education agencies, have not been of any particular interest, since the socialization process occurs largely through a "hidden curriculum."¹

Our review does not deal with this second line of work in any depth. However, we will focus on how the policy mechanics are creeping into territory originally discovered by the classroom culturalists. These intellectual developments are brightly illuminated by following the school-effects literature from developing countries which
has evolved steadily over the past two decades. Looking across societies, rather than remaining focused only upon the United States, we see more variation in (1) the school's aggregate effect relative to the influence of family background within impoverished communities, (2) the influence of particular instructional tools or pedagogical skills, like textbooks or teacher training, relative to other discrete inputs, and (3) the contrasting socialization agendas pursued by central educational agencies and local communities, and thus sharp variation in the local meanings attached to constant types of instructional tools and teaching behaviors.

Organization of the review. First, we describe why the policy mechanics and their production-function metaphor remain influential in developing countries and international agencies, even as researchers in the West move further from input-output conceptions. Second, we review major findings from this line of work, broadening and updating earlier reviews that covered portions of this work (Fuller, 1987; Lockheed & Hanushek, 1988; Lockheed & Verspoor, 1991; Velez et al., 1993). We emphasize similarities and differences in what school factors raise achievement within primary versus secondary schools. Third, we focus on how the policy mechanics have begun (a) to situate discrete school inputs within classrooms, emphasizing how instructional materials are mobilized within classrooms and the mechanisms through which effects are realized, and (b) to conditionalize their findings within national or local settings, thereby moving into the culturally constructed character of teaching practices and classroom rules. Fourth, we conclude by outlining a culturally situated model of school effectiveness which pays serious attention to how
school actors in different locales may variably define the meaning of instructional tools, pedagogical practices, and rules of membership within the classroom organization. Note that for the moment we narrowly define "achievement" as the acquisition of basic literacy and cognitive skills.

The utility of culturally situating instructional tools and pedagogical behavior within particular school settings has been brought to light by recent work on school effects in Japan and other Asian countries (Hess & Azuma, 1991; Stevenson & Stigler, 1991). How a strong socialization agenda is wrapped around the technical task of raising cognitive achievement also is illuminated by work on the effects of Catholic schools in the U.S. (Bryk et al., 1993). Even educational psychologists are moving away from universal constructions of cognitive development. Rogoff (1990) and Wertsch (1991), for instance, emphasize how learning is culturally situated, whereby mentors and instructional tools -- which are charged with meaning-filled rules of authority and task performance -- mediate the surface-level content of what is taught and learned. Cross-national study of educational policies and the administrative organization of schooling has long been a vibrant field (recent reviews, Cohen & Spillane, 1992; Cummings, 1992; Fuller & Rubinson, 1992). But local research is just now emerging on how the social organization of classrooms and schools, including the meanings attached to the same instructional tools and teacher behaviors, can vary across cultural settings.

We argue that as the policy mechanics move from their search for universal effects of specific teaching tools and teaching behavior -- to specifying the local
conditions under which these factors yield achievement gains -- they are beginning to confront the issue of how these tools and pedagogies are actually perceived by local actors. Then, after local meanings of instructional tools and pedagogy are taken into account, the technical question of which particular tools and teaching practices are empirically related to achievement remains a pressing one. This is why bringing together the policy mechanics and the classroom culturalists provides an exciting frontier for how we study the culturally situated effectiveness of local schools.

1 CENTRAL POLICY AND THE SEARCH FOR UNIVERSALLY EFFECTIVE TEACHING TOOLS AND PRACTICES

The Resilient Production-Function Metaphor: Studying Schools within Impoverished Settings

North American readers may be asking: Why do the policy mechanics -- and their production-function conception of school effectiveness -- continue to be influential? Certainly educational interest groups and policy makers in the West -- be they active around governments or local school authorities -- continue to tussle over levels of discrete school inputs (pupil:teacher ratios, length of teacher training programs, mixes of instructional materials). Debates over inequities in school finance return tirelessly to per pupil spending levels, even when many parties realize that money will not likely equalize achievement outcomes. Indeed, since James Coleman demonstrated that material school inputs influence achievement levels only slightly, especially relative to family background (Coleman et al., 1966), educational
researchers have moved away from input-output conceptions of school effectiveness.\(^4\)

The search for universally effective factors branched first into studies of school management and organizational culture. Second, the effective-teaching literature, initially hoping to identify universally efficacious pedagogical practices (e.g., time spent on instructional tasks), has edged toward the more modest ground of conditionalizing effects on the basis of subject matter being taught, the organization of classroom tasks, or child characteristics and developmental appropriateness (e.g., Needels & Gage, 1991).

Four forces have bolstered the production-function metaphor's credibility and policy influence outside the United States, especially in developing countries: (1) After almost 20 years of empirical work, we now know that under some conditions school effects on achievement are greater than family background influences within impoverished settings (Heyneman & Loxley, 1983; Fuller & Heyneman, 1989). Where this is true, policy makers are now on much firmer ground in using the school as an instrument for reducing inequality. (2) The over 100 production-function studies that have been conducted in developing countries also have discriminated between those inputs that are more likely to raise achievement from those which are not. Third-world governments and schools in impoverished settings possess very scarce resources; evidence that helps to boost allocational efficiency is sorely needed and often listened to by policy makers. (3) Institutions that aim to raise achievement in impoverished settings usually fund research that informs central policy making, and the levers available to central governments and international agencies, are limited -- usually
confined to budget allocations and policies linked to time in school, instructional materials, teacher licensing and training programs. Production-function research yields evidence that is useful to centralized policy mechanics. Central agencies, according to modern rules of development, are in the business of reducing inequality in pupil performance according to universal forms of achievement, not in reinforcing local literacies or forms of knowledge (Carnoy & Levin, 1985; Fuller, 1991). (4) Work in the classroom culturalist tradition has held less utility in the eyes of policy makers. Accumulated evidence on cross-cultural variability in meanings assigned to teaching tools and pedagogical behaviors by school actors, and how these "socially constructed inputs" influence achievement or child socialization, remains scarce. No body of literature from the classroom culturalist framework rivals the production-function literature in third-world settings. In short, the classroom culturalists have yet to focus on how policy levers can be manipulated to yield higher achievement, or boost learning of a different form.

Since the mid-1980s, even leading policy mechanics have pointed out serious limitations with their own paradigm. The original model emphasized the level and mix of discrete inputs that were dropped into classrooms, just as agricultural economists would view investments in the local site of farm production. Production-function research outside of education, however, distinguishes between allocational and technical efficiency, the latter focusing on how the farmer or factory manager mobilizes inputs and motivates workers. Similarly, recent work in the Third World includes observation of how teachers mobilize inputs -- textbooks, teacher guides, and
libraries -- within their instructional scripts (Lockheed & Komenan, 1989; Fuller & Snyder, 1991).

Beyond this technical conception of teacher action, recent work also focuses on the school's organizational structure and the classroom's social rules. Working from the policy mechanic frame, for instance, comparative researchers have looked extensively at variability in the amount and uses of instructional time. The concept of "opportunity to learn" -- how much of the designated curricular content is actually covered during the school year -- stems from cross-national studies of the International Association for the Evaluation of Educational Achievement ([IEA] Westbury, 1989; Anderson, 1991). While lagging behind work on teacher effectiveness in the United States, third-world school effectiveness researchers are now examining uniformities and variation in teaching practices across societies, how pedagogy is culturally constructed and understood by children, and the effects of different teaching behaviors on achievement (Anderson et al., 1989; Chapman & Walberg, 1991; Tatto et al., 1992).

The policy mechanic camp also has suffered historically from a tendency to generalize empirical findings from one country to other quite diverse settings. This stems from the strong desire of many international education advocates to show that James Coleman was wrong and that schools do make a difference in many societies. The hunger for universal remedies also stem from the desire of our benefactors, such as the World Bank and central governments, to find simple investments (like textbooks) that raise classroom quality and achievement, independent of local
conditions. Yet as empirical findings accumulate, the inevitable question keeps arising as to why the same factor exerts an influence on school achievement in one setting but not another (thoroughly pursued by Schwille et al., 1986). This pushes us to more carefully conditionalize observed effects from school inputs and teaching practices (e.g., Jimenez & Cox, 1989). And detailed below, this necessarily moves researchers into the culturally situated nature of instructional tools and teaching practices. Advances in analytic methods also are sparking clearer assessment of scope conditions. For example, the development of hierarchical linear models is allowing comparative researchers to more carefully look at the distribution of school inputs and child characteristics across differing communities, allowing us to formally conditionalize empirical findings (Riddell, 1989; Raudenbush & Bhumirat, 1992).

Finally, the original production-function metaphor assumes that the preeminent mission of schools and teachers is to raise cognitive achievement. The modeling exercise has come to mechanically portray and reify the policy mechanics' own presumption about a certain form of learning that should occur inside classrooms. But in developing countries (as well as within the West) children are being variably socialized to accept certain norms about authority, expertise, and social participation (Dreeben, 1968; Carew & Lightfoot, 1978; Prophet & Rowell, 1990; LeVine et al., 1991). Current political emphasis on how to efficaciously use the school as an instrument to socialize children toward democracy -- currently in eastern Europe, parts of Asia, and South Africa -- clearly illustrates that cognitive achievement is simply one element of the intended classroom process. Emerging debates in Japan
and China over how to socialize pupils to become more individualistic in their achievement orientation offer additional examples of how "school effectiveness" often has broader connotations than simply boosting cognitive forms of learning. By ignoring this broader socialization process, the embedded meanings of instructional tools and teaching behaviors will be missed, greatly constraining how we model learning inside classrooms.

This brings us to two questions: What are the basic findings from this long production-function tradition? How is the field moving to address these admitted weaknesses of the paradigm's core assumptions?

**Current State of the Production-Function Art**

What are the major lessons-learned from the production-function tradition? How do these empirical patterns, based on evidence in developing countries, differ from how we have come to understand ingredients of effective schools in the United States and western Europe? To answer these questions we have collected empirical studies from developing countries, conducted since 1987, that estimate the effects of specific school factors on achievement, after controlling for the influence of students' family background. A portion of these multivariate studies for primary schools were pulled together by Lockheed & Hanushek (1988) and Lockheed & Verspoor (1991). We also include the empirical papers contained in Fuller's (1987) initial review. We
made a strong effort to uncover recent multivariate studies conducted within secondary schools, since earlier research focused on primary schools.

In selecting these recent papers we have followed commonly used criteria: All studies included statistical controls on pupils' family background or involved random assignment of children to classroom experiments; and effects of specific school or classroom factors are included only when statistically significant at \( p < .05 \) or better. Hierarchical linear models (HLM) are constructed and assessed in a growing number of studies (Bryk & Raudenbush, 1992). This addresses the statistical problems involved in simultaneously assessing factors that may operate at the school or classroom level when pupil-level background influences also are present. HLM modeling provides the opportunity to explain why mean levels of achievement vary across classrooms or schools and why the distribution (or degree of inequality) in achievement also may vary among children within classrooms.

Recent work suggests that the aggregate effect of schooling vis-à-vis family background can be seriously over-estimated unless culturally-sensitive indicators of social class and family differences are utilized (Lockheed et al., 1989). This is an important model-specification issue. It also represents a substantive breakthrough in how to better situate school effects within local settings, where the character and measurable indicators of social-class differences vary substantially across societies. We return to this issue in Part 2 of this paper. A related issue is the scarcity of longitudinal achievement data from developing countries (for exceptions, see Raudenbush et al., 1991; Riddell & Nyagura, 1991; Fuller & Hua, 1992). In the
absence of pre and post-test data, we continue to rely on cross-sectional associations and limited SES measures, rather than truly modeling how school factors influence growth in learning (Willett, 1988; Willms & Raudenbush, in press).  

Several pitfalls emerge as one attempts to summarize the over 100 third-world production-function studies that have been conducted to date. Models vary in terms of the number and type of school inputs, management practices, teacher attributes, and (most recently) pedagogical practices that are included in multivariate estimations. Accumulated evidence on school factors that consistently show no significant relationship to achievement is perhaps more convincing than significant findings, since the latter are more sensitive to differences in specified models. Few researchers working in the Third World have reported effect-sizes, rendering impossible a more precise meta-analysis. Models have rarely included interaction terms, nor have investigators systematically examined substitutability between different school inputs. Cost data pertaining to specific school inputs are rarely reported. So, even when significant effects are observed, it remains difficult to assess the relative cost-effectiveness of alternative factors (for important exceptions, see Lockheed & Hanushek, 1988; Harbison & Hanushek, 1992). Scope conditions are infrequently specified. We return to a recent trend towards specifying general conditions under which particular factors are more likely to operate. Notwithstanding these limitations, the overview of recent findings which follows is quite instructive.

Basic Map of School-Effects Studies. Table 1 summarizes the range of investigations conducted over the past two decades and findings for specific school
factors. Three general points are notable. First, comparing columns 1 and 2, one can see that many more studies have been done within primary schools, compared to secondary schools. At the primary level, 20 different school factors have been modeled in 5 or more multivariate analyses; at the secondary level, half as many inputs or teaching practices have been studied in at least 5 studies. Second, factors that are more directly manipulable by central policy makers and more easily measured through large-scale surveys have received the lion's share of attention: average class size, textbook supply, presence and use of school libraries, teacher training levels and experience, and length of the instructional program. Third, very little empirical work has occurred inside classrooms. A few initial studies, drawing mainly on IEA survey data, have focused on teacher's own reports of what they claim to do within their classrooms. This initial work is beginning to distinguish between near universal, subject-specific, and culturally situated pedagogical practices that help explain variation in achievement levels (e.g., Anderson et al., 1989; Fuller & Hua, 1992; Tato et al., 1992).

Table 1

Across the variety of societies and local conditions in which these studies were conducted, rather consistent school effects have emerged in 3 major areas.

Availability of textbooks and supplementary reading materials. The earliest studies revealed wide variation in the availability of textbooks between and within developing countries and covariation with pupil achievement levels. IEA researchers
in the early 1970s relied on surveys given to teachers or students, yielding evidence of
textbook effects on science achievement in Chile, India, and Iran (Comber & Keeves,
1973; Purves, 1973). Investigators also began to actually observe the number of
textbooks available and used by pupils within classrooms (Heyneman, 1976; for
review, Heyneman & Loxley, 1983). The World Bank supported two experiments,
introducing varying doses of textbooks into randomly selected classrooms. In the
Philippines, math, science, and Pilipino texts were introduced in 52 primary schools at
ratios of 2 pupils per book and 1 pupil per book. A control group of similar
classrooms and children also was selected (a total of 2,295 first and second-grade
students were involved in the experiment). Achievement differences for the treatment
groups were .30 to .51 SD higher across the 3 subject areas. This improvement was
estimated to be twice the gain that would result by cutting size from 40 to 10 pupils.
No significant advantage of supplying 1 text per child, versus 1 book for every 2
children, was observed (Heyneman et al., 1983). Less robust effect-sizes were found
in a similar textbook experiment in Nicaragua (Jamison et al., 1981).

Recent work within primary schools continues to find positive achievement
effects from textbook supplies and utilization. In the impoverished northeast of
Brazil, the availability of textbooks and basic writing materials held effect-sizes of one-
third to one-half a standard deviation, depending on the grade level and subject
(Harbison & Hanushek, 1992). The importance of supplementary reading materials
and pupil exercise books also emerges from the IEA's recent study of reading
achievement in 4 developing countries. These two inputs, along with the presence and
utilization of school libraries, were significantly related to achievement in Indonesia, Trinidad and Tobago, and Venezuela, but not Hungary (Postlethwaite & Ross, 1992). The discrete influence of texts, exercise books, and/or school libraries also has been observed in recent studies from Egypt (al-Baz et al., 1992), Malaysia (Leong, 1990), Swaziland (Johnson, 1992), Thailand (Raudenbush & Bhumirat, 1992), and Zimbabwe (Nyagura & Riddell, 1992; Ross & Postlethwaite, 1992). No significant effects were found from reading materials, after taking into account pupil background, teacher subject-matter knowledge, and other school factors, in a recent study from Indonesia (Ross & Postlethwaite, 1989).

Research within secondary schools reveals less consistent effects from textbooks. Quality, in general, often is higher and more uniform across third-world secondary schools, relative to primary schools. This raises the general issue of whether school effects may be less at the secondary level, particularly in educational systems that remain highly selective and allow only a small proportion of youths into junior or senior secondary schools. This raises modeling problems as well. Where secondary schools are highly selective, variance in pupils' family background can be severely constrained. Family background, in reality, may largely explain which students persist through primary school and gain places in secondary school (e.g., Riddell, 1989; Fuller et al., 1992). But achievement variation among youths within secondary schools may not covary with family background, since variability in student SES has been institutionally narrowed.

Where baseline levels of textbooks are generally low or highly variable,
covariation with achievement has been observed within secondary schools (Heyneman & Jamison, 1980; Sembiring & Livingstone, 1981). Not surprisingly, when schools are well stocked with texts, covariation with achievement is difficult to observe. In these settings, variation in supplemental reading materials and utilization of school libraries does help to explain variation in achievement levels (e.g. Fuller & Hua, 1992; Glewwe & Jacoby, in press). The frequency and duration of teachers' actual utilization of textbooks also is influential in some settings (for Thailand, see Lockheed & Longford, 1991). Similar findings appear in Glewwe et al.'s (1993) study of Jamaican primary schools. Levels of basic inputs were generally sufficient; what made a difference was variability in the rate at which teacher utilized textbooks. In addition, Glewwe and colleagues found that some teaching practices influential within resource-poor school systems, such as, assigning written exercises in class, actually depressed achievement. Baseline input levels and those practices that raise achievement on the frontier may vary dramatically across societies and local settings within.

**Teacher qualities.** The general background and preservice training of teachers rarely helps to explain variation in children's achievement in the United States and Europe (Murnane, 1975; Hanushek, 1989; Harbison & Hanushek, 1992). Table 1 reveals a contrasting picture when looking at developing-country studies. The influence of teachers' own social-class background has not been extensively researched, but the majority of studies reveals significant effects within primary schools. Much of this evidence comes from Latin America (Farrell & Schiefelbein, 1974; Heyneman & Loxley, 1983).
Teachers' own knowledge of the subject matter and their verbal proficiencies have held strong effects on achievement in the few primary-school studies that have included these related factors. In Brazil, Harbison & Hanushek (1992) gave identical math and Portuguese exams to students and their teachers. For math, a 12% higher math score for teachers was associated with a 10% higher pupil score. The influence of teacher knowledge on children's Portuguese achievement was similar, although of a lower magnitude. Similarly strong effects from teachers' written language proficiency were observed in Indonesia (Ross & Postlethwaite, 1989).

Findings are mixed on the influence of teachers' formal education and postsecondary training. Preservice training does appear to be effective in countries with low or highly variable teacher quality. In these situations teacher training often is occurring after junior secondary school (9th or 10th grade). Teacher training has recently been associated with primary-school student achievement in rural Colombian schools (Psacharopoulos et al., 1992) and in Zimbabwe (Nyagura & Riddell, 1992; Ross & Postlethwaite, 1992). In Sri Lanka, Tatto et al. (1992) found associations between training within particular types of preservice colleges and the performance of their new graduates' own pupils. Importantly, the preservice training effect in Brazil was eclipsed by the more specific influence of teachers' subject-matter knowledge. Preservice training in specialized colleges is expensive and at times not related to student achievement (Lockheed & Verspoor, 1991). In Pakistan, while teachers' own levels of secondary schooling was related to their pupils' achievement, the amount of tertiary preservice training held no effect (Warwick & Reimers, 1992). Training levels
have been found to hold no effect in other recent studies: in Egypt (al-Baz et al. 1992) and in Thailand (Raudenbush et al., 1992).

Within secondary schools one might argue that covariation between teacher training and pupil achievement may be less, given higher and less variable levels of teacher preparation. Yet several studies have shown effects from teachers’ total years of schooling, and specifically from their postsecondary training. Again, these effects are likely conditioned by the level of variability in secondary school quality. Teacher training levels were found to covary with achievement in Brazil (Lockheed & Bruns, 1990), the Philippines (Lockheed & Zhao, 1992), Thailand (Jimenez et al., 1988; Lockheed & Longford, 1991), and Zimbabwe (Riddell & Nyagura, 1991) — all countries where secondary school quality varies significantly. The precise mechanisms through which teacher training influences pupil achievement remain unspecified. Chapman & Snyder (1992), in their observation study of Botswana classrooms, found that better trained teachers asked fewer open-ended questions, yet utilized more instructional tools and provided feedback to pupils more frequently about their comprehension and performance. Also in Botswana, inservice training for junior-secondary math teachers helped to explain growth in pupils’ math proficiency over one school year (Fuller & Hua, 1992).

The achievement effects of inservice teacher training, in general, are quite mixed. This area has received much less attention from researchers, particularly within secondary schools. Inservice training may be effective when it interacts with prior levels of teacher education or training. Harbison and Hanushek (1992), for
example, report positive yet inconsistent effects for an inservice program serving teachers in Brazil with at least 8 years of prior schooling. A similar program serving less educated teachers held no discernible effect. An evaluation of inservice training in Haiti showed an initial effect on achievement, but one that diminished over time for teachers who had not recently participated (Haiti Foundation, 1991). In rural Thai primary schools, Raudenbush et al. (1992) compared the relative influence of preservice, inservice, and instructional supervision by school principals on pupils' achievement level. Inservice training held no effect. Both the frequency of principal supervision and preservice teacher training exerted a significant influence, each with an effect-size of about one-fifth a SD. The achievement effect of principal supervision operated through "instructional quality," defined by more active teaching methods, more frequent teacher assignment of tasks to pupils, and frequency of feedback to pupils. On instructional mechanisms from the Philippines, Lockheed et al. (1988) found that the use of science labs covaried with student achievement, and the frequency with which teachers utilized the labs was related to inservice training.

Inservice training for secondary school teachers has been studied within just 4 investigations. Work in Thailand revealed that inservice training was related to student achievement in private but not public junior secondary schools (Jimenez et al., 1988). In Botswana, inservice training in mathematics, although infrequent and not costly, yielded a significant effect on pupil achievement, equalling .40 of a SD. Similar to the direction of research in the United States, much more work remains to be done on the types of inservice training and school conditions under which sustained effects
are observed (e.g., Joyce & Showers, 1983; Anderson & Djalil, 1989).

**Instructional time and work demands placed on students.** In the United States, the influence of instructional time on achievement has been the subject of much debate. For young children, the length of academic programs appears to exert a considerable influence (Brown & Saks, 1986). Within secondary schools, typical North American students actually learn very little (academically) over the school year (Sociology of Education, 1985). Within European secondary schools, the time spent on specific curricular topics (opportunity to learn) is more directly related to achievement than are gross measures of instructional time (Westbury, 1989; Schaub & Baker, 1991). And lengthening the school day or school year does not guarantee that the share of classroom time focused on instructional tasks will rise (Karweit, 1989).

In contrast, Table 1 shows that even gross indicators of instructional time, across a variety of developing countries, are consistently related to achievement. The early IEA studies revealed consistent effects from the length of the school day and year (for review, Heyneman & Loxley, 1983). More recent work, even in secondary schools, shows positive effects. Private secondary schools in 5 third-world countries, for example, tend to differ markedly from government schools in the number of school days in which students attend, and this helps to explain achievement advantages in the former (Jimenez & Lockheed, 1993). In Nigeria, the gross amount of instructional time across schools helped to explain achievement levels (Lockheed & Komenan, 1989). Where longitudinal data allow assessment of learning growth within grade levels and across consecutive grades, time in school also holds stronger effects.
than the limited growth observed within the United States. In Botswana, pre and post-tests were administered to students in Form 1 and Form 2. Achievement gains during the school year equaled .55 SD for English and .45 SD for math. Similar differences were observed between Form 2 and Form 1 students (with very little pupil attrition between grade levels, and thus cohort biases [Fuller & Hua, 1992]).

Anderson et al. (1989) argue that time in school may be more efficiently used in some developing countries than within industrialized societies, since student misbehavior and time off academic tasks occur less frequently, at least based on their classroom studies in Nigeria, South Korea, and Thailand (for review of instructional time issues, see Anderson, 1991).

Table 1 also reveals inconsistent or lack of effects from other policy-relevant school factors.

**Class size.** School-effects surveys commonly collect information on pupil:teacher ratios and average class size. Recent studies continue to confirm the lack of significant achievement advantages from smaller classes. The cost of realizing significant achievement gains is usually prohibitive. In northeast Brazil, lowering the average class size by 10 children (current mean equalled 25-30 pupils) would raise 4th grade performance by just one point on Harbison & Hanushek's (1992) 100-item exam. Reductions in the pupil: teacher ratio may yield stronger effects in the poorest countries and/or for certain grade levels. In Malawi or Namibia, for example, class sizes in the first two grade-levels often exceed 60 children (Fuller, 1991). Within secondary schools, where class-sizes are generally smaller, only 2 of 21 analyses have
revealed a significant effect on achievement. This absence of any relationship has been observed in secondary schools in a variety of settings: Botswana, the Philippines, and Thailand. Jimenez & Cox (1989) investigated the possible influence of specific ranges of class size, finding no relationship in Colombia and higher achievement in larger classes in Tanzanian secondary schools.10

**Teacher salaries.** Very few studies have found any independent influence of salary levels on student achievement. In some countries, salary levels are colinear with teachers' age and length of experience, given the emphasis placed on seniority in determining salary rates. Here alternative model specifications need to be studied carefully. In rapidly expanding educational systems, including the secondary-school subsector, younger and lower paid teachers often are better trained. Yet even in these cases, such as Botswana (Fuller & Hua, 1992), the truly exogenous salary variable is rarely related to pupil achievement. In Brazil, teacher training levels were related to achievement but salary levels were not (Lockheed & Bruns, 1990). Links between salary incentives and achievement may differ in private secondary schools. In Tanzania, Jimenez & Cox (1989) found that teacher salaries were positively related to achievement in private, but not government, schools. In general, salaries tend to be lower in private secondary schools while achievement is higher (see evidence from Colombia, Dominican Republic, Tanzania, and Thailand [Jimenez & Lockheed, 1993]).

**Active pedagogy and classroom processes.** Very few third-world researchers have studied teaching practices. Recently, however, several analyses have been
completed on the influence of more active or complex forms of pedagogy, that is, taken-for-granted attributes of "good pedagogy" within the North American teacher-effectiveness literature (Anderson 1991, Waxman & Walberg, 1991). Results from developing countries to date have been quite mixed. In Nigerian and Swazi secondary schools, time students spent listening to the teacher lecture was positively related to achievement (Lockheed & Komenan, 1989). A second study in Nigeria, with less adequate controls on student background, found that more frequent probes and questions posed by teachers were positively associated with math achievement (Chacko, 1989). Less didactic, more active forms of pedagogy were negatively related to science and math achievement in the Philippines (Lockheed & Zhao, 1992). The influence of pedagogical practices may depend on what particular subject is being taught. In Botswana, for instance, the number of open-ended questions asked by teachers was negatively related to math achievement but not to English performance (Fuller & Hua, 1992). Use of cooperative student groups has shown positive achievement effects in two studies, although this evidence pertains only to a controlled experiment in Israeli secondary schools (Sharan & Shachar, 1986) and to the use of cooperative groups in Filipino primary-school science labs (Lockheed et al., 1988).

**Scarce Cost-Effectiveness Findings**

These now plentiful school-effects findings help to distinguish between factors that are more consistently related to higher achievement from those that are not. But among the former set of school factors we know very little about their relative cost-
Raising Secondary School Effectiveness

effectiveness. Earlier reviews have rather consistently shown, within developing countries, that lowering class size is not a cost-effective strategy for raising achievement, while the provision of more textbooks and use of interactive radio instruction in classrooms (at least in the short run and under controlled conditions) are quite cost-effective interventions (Lockheed & Hanushek, 1988). More recent work on alternative forms of teacher training demonstrates that the cost of requiring more years of preservice teacher training, say relative to additional years of secondary schooling for new teacher trainees, can be very costly and yield scant returns in terms of higher pupil achievement (Lockheed & Verspoor, 1991).

We located just three additional cost-effectiveness analyses that have been completed since this limited literature was last reviewed (by Lockheed & Hanushek, 1988). An extensive and innovative analysis has been completed by Harbison and Hanushek (1992) within Brazilian primary schools. They first estimated achievement gains associated with each additional dollar invested in school infrastructure or "hardware" (classrooms, desks, facilities improvements), "software" (textbooks, writing materials), and pre- or inservice teacher training options. Relative achievement effects were disaggregated for 2nd and 4th grade pupils, between achievement in math and Portuguese, and among the three years in which cross-sectional student samples were drawn. Software elements were most consistently related to higher achievement. For example, spending an additional US$ 1.00 per pupil on a mix of basic instructional materials was related to a 1-2 point gain in their achievement test, depending on the subject area and the particular sample cohort. Marginal effects of
additional hardware were lower, particularly the purchase of more school furniture.

Since students achieving at higher levels were being promoted through the grade levels at a quicker pace, Harbison and Hanushek went on to estimate the net cost-savings associated with these alternative interventions, given that more normal promotion rates open-up additional places for new cohorts of children. Mean estimates of the cost-savings associated with a US$ 1.00 investment in additional software (via higher promotion rates) equalled almost US$ 7.00 in the second grade and US$ 4.00 in the fourth grade. Inservice training for more highly schooled teachers also yielded highly cost-effective benefits. A sensitivity analysis was then conducted to more conservatively estimate these returns, indicating that the effects were more robust in the earlier grade level, Grade 2.

Cost-effectiveness findings may be dissimilar under differing conditions. Fuller and Hua's (1992) cost-effectiveness analysis based on achievement in Botswana's junior secondary schools, for example, also found that reductions in class size would be enormously expensive and yield slight gains in student achievement. Departing from earlier work conducted in primary schools, however, they found that additional investment in basic instructional materials (textbooks, desks, exercise books) would not likely yield gains in pupil performance. This is probably due to the fact that sufficient supplies of these materials were observed in classrooms, quite unlike the situation in the impoverished northeast of Brazil. On the other hand, the presence of supplementary reading materials in classrooms was associated with higher achievement and the cost-effectiveness of these materials was quite high. The per-
school cost of raising mean achievement by the equivalent of one grade-level via additional supplementary readers for all classes was estimated at US$ 727. To realize this same level of achievement gain, 14 times this amount would be required if the chosen strategy was to lower class size. Equally competitive in terms of cost-effectiveness, inservice teacher training for math teachers also appeared to lead to achievement gains, but no significant effect on pupil performance in English was detected.

Finally, Murphy (1993) recently compared the relative cost-effectiveness of two types of secondary school training in Malawi: regular day schools, often involving student boarding facilities versus a long-standing distance education program. Murphy reports exhaustively on the cost elements associated with each type of program, finding that Government spends almost five times more on day secondary school pupils, compared to distance-education students. The average teacher in a regular secondary school earns three times more than the study-center teacher, who supplements, in a classroom, correspondence materials and radio broadcasts. Given the lower proportion of distance-education pupils who pass the junior secondary exam the relative effectiveness of the program (ignoring relative costs) is somewhat less than conventional secondary schools. However, it costs Government three times more to produce one junior-certificate graduate in day schools, relative to the cost of each graduate coming from the distance education program.

These types of cost-effectiveness analyses can certainly help to refine the forms of policy advice provided to government decision makers. And consistent cost-
effectiveness findings across varied settings -- such as the costly and ill-advised strategy of lowering class size -- do hold a significant level of generalizability. The scarcity of cost-effectiveness studies remains disappointing, and it constrains our capacity to compare findings across differing situations. Levin (1991) emphasizes three major obstacles that stunt development of this field. First, too few people are available to conduct sound cost-effectiveness studies. In developing countries it takes considerable energy and commitment to even conduct a large-scale school effectiveness study. Going the next step to properly cost alternative inputs and analyze relative effects takes another increment of resources and expertise. Second, data requirements are great to properly cost various school inputs. Third, procedures for modeling achievement effects and then assigning costs to effective factors usually differ across studies -- even when the same intervention is being studied. When the number of variables (and how they are measured) varies within an estimation model, coefficients and effect-sizes will differ. Then, if costs of these school factors are calculated differently by different investigators, the estimated achievement returns associated with similar school factors will be quite different. Levin's suggestions for employing more uniform procedures in carrying-out cost-effectiveness studies should be seriously considered.

**Departing from Western Conceptions of School Effectiveness?**

In the United States, crafting an efficacious role for central policy makers has
proven to be quite problematic. Hot debate persists over the equity of school finance schemes, teacher salary levels, and class size -- even though none of these inputs are consistently related to higher achievement (Hanushek, 1989). How North American educators and scholars define school effectiveness has largely shifted to micro school factors and classroom-level processes. In many developing countries, however, central policies hold a greater potential in actually touching the quality of instruction and the achievement of students. The basic availability of textbooks and reading materials, the quality of teacher preparation and selection, and even blunt ways of lengthening instructional time, (as summarized in Table 1), are all empirically related to higher achievement levels. Yet the influence of these policy-manipulable inputs will likely diminish as overall school quality rises, a process clearly seen in much of east Asia and urban areas of Latin America (Fuller, 1987; Raudenbush et al., 1989). The production-function line of research may continue to provide useful policy guidance to the poorest nations and for impoverished areas of so-called middle-income countries. But in the absence of significant adjustments to their traditional priorities and assumptions, the work of policy mechanics will hold utility within a shrinking number of policy circles.

2 SPECIFYING LOCAL CONDITIONS FOR SCHOOL EFFECTS:
THE END OF PRODUCTION FUNCTIONS?

As the policy mechanics continue to accumulate evidence, two especially troubling weaknesses are becoming more salient. First, only modest progress has occurred in specifying the conditions under which certain school factors are more likely to influence pupil achievement. For example, earlier reviews have argued that the school's aggregate effect, vis-à-vis family background, tends to be greater in more impoverished regions or communities. School effects also tend to be stronger for math and science achievement, knowledge which is more foreign to indigenous communities, than for language learning (Fuller & Heyneman, 1989). Mentioned above, effect-sizes for basic inputs (like textbooks) also tend to be larger when the baseline level is lower; as mean levels of inputs rise, marginal effects decline. But beyond these general patterns, researchers have spent little energy in specifying scope conditions for their findings.

Second, little work has occurred that looks at how basic inputs are mobilized within classrooms. Initial third-world studies of classroom practices, a line of research running a decade behind work in the West, have yielded mixed results. Once we set teaching practices within the classroom culture of a particular country, not within the reified classroom described by U.S. researchers, pedagogical methods may be more consistently related to achievement. This is essential if we are to describe the mechanisms and social processes through which basic instructional tools actually influence children's learning.
We argue that simply accumulating more evidence from production-function studies -- without specifying local conditions and without linking inputs to teaching practices -- is becoming a less useful exercise. In countries providing a reasonable level of basic materials, including much of east Asia, Latin America, the middle-east, and eastern Europe, additional production-function studies will hold limited utility. Two exceptions are notable: work in the poorest regions of these societies (including the U.S.) could help guide basic school investments; and school-effects research in secondary schools lags far behind primary-school investigations. Overall, however, the patterns described in Table 1 are very close to those observed in Fuller's (1987) earlier review of 68 multivariate analyses. For the present paper we found 37 additional studies that have been completed since this earlier review. This recent work, by and large, replicates the patterns observed six years ago.

Specifying Conditions for School Effects: The Rules and Culture of Classrooms and Families

School effects in developing countries, and perhaps within impoverished Western communities, can be conditionalized at two levels. First, the school institution's aggregate effect on learning, relative to family effects, may stem from two contradictory forces: (a) the local level of family demand for schooling, linked to how parents view the legitimacy and economic utility of the school, and (b) the school organization's capacity to respond to family demand while offering forms of knowledge that are foreign to the community's indigenous knowledge. The second
level of conditionality pertains to how achievement effects of specific instructional tools (inputs) and teaching practices are conditioned on (c) the teacher's capacity and preference for mobilizing (variably complex) instructional tools, and (d) the degree of consonance between the teacher's pedagogical behavior and local norms regarding adult authority, didactic instruction, and social participation within the school (which may be further conditioned by teacher and pupil gender). Evidence is beginning to emerge on each of these 4 types of local conditions.

**Family demand and overall school effects.** The aggregate influence of schooling in developing countries has likely been overstated due to the under-specification of student background factors, including prior effects of family processes and current effects from labor demands placed on children. The greatest weakness here is the lack of social-class measures that are culturally relevant to the particular society or community being studied. If imprecise SES indicators from the West are simply imported and error terms contain unmeasured elements of family background that are highly correlated with school quality, achievement effects will be mistakenly attributed to school factors. Evidence from Indonesia, Malawi, Thailand, and Zimbabwe shows that when multiple, situationally relevant indicators of class and ethnicity are utilized, the remaining proportion of achievement variance that can possibly be related to school factors diminishes (Lockheed et al., 1989; Ross & Postlethwaite, 1992). In Indonesia, Ross & Postlethwaite included 11 modern possessions and 10 types of livestock to validly discriminate families' levels of wealth and social class; together, over half of the total variance explained was attributable to
these factors, for achievement in Bahasa, math, and science. Ethnic membership also may play a stronger role in shaping school performance than material affluence or poverty per se, as evidenced by studies in Malaysia (Ching et al., 1990) and Ethiopia (Abraha et al., 1991).

We also know that family practices related to later school achievement vary within social classes. Much of this empirical work comes from the United States and other industrialized countries (for reviews, Hess & Holloway, 1984; McLanahan 1991). After controlling on surface-level indicators of family SES in Japan and the U.S., Holloway et al. (1990) show how the perceived legitimacy and importance of the school institution held by parents and their parenting practices in the home strongly predict school performance in children's first 5 years of schooling. Work in southern Africa also reveals how material facets of class are certainly one source of family demand for schooling. But within low-income communities, parents vary significantly in the labor demands they place on their children, their commitment to literacy, the presence of reading materials at home, and their willingness to engage in modern child-health and nutritional practices -- all factors empirically linked to school demand, time in school, and achievement (Fuller et al., 1992). Recent work in Uruguay also shows how family practices can vary among poor urban households and covary with later school achievement (Comisión, 1992). In Colombia, Psacharopoulos et al. (1992) report how the amount of TV viewing at home is negatively related to school achievement.

The consistent influence of instructional time also should push us to rethink
how family demand for schooling interacts with specific school factors to shape achievement. In Ghana, for instance, Glewwe & Jacoby (in press) first investigated which family characteristics and school factors helped to explain when children started junior-secondary school (age at entry), which school they chose to attend (the most proximate or another school via fostering-out), and their attainment level. After modeling their selection of school, the same school factors were utilized to estimate children's achievement levels. Years of school attainment -- and thus aggregate time in school -- were sharply influenced by child and family attributes, particularly pupil gender and whether he or she came from a Muslim family or from the inland savannah region. Elements of the school also helped to explain children's attainment: distance to school, quality of facilities, presence of basic instructional tools (e.g., a chalkboard) and an experienced teacher. Such school characteristics likely signal to parents whether this is a serious school which offers some utility. In the next stage of the analysis, Glewwe and Jacoby found that time in school influenced achievement in both math and reading. This kind of study illustrates how the school's aggregate effect is conditioned by deeper levels of family demand for schooling within a particular local context.

Family demand for more schooling is patterned by youths' gender and age in many developing countries. The recent IEA study of reading achievement in 32 countries helped to illuminate a disturbing irony: In 8 of the 9 developing countries included, girls (at age 14) outperformed boys in reading achievement; yet their attainment in the later grades of secondary school begin to lag behind that of boys in
many cases (Elley, 1992). Young females often feel the pressure of labor demands and social expectations regarding child bearing and marriage earlier than do young males. These forces likely influences the regularity of their school attendance and thus the aggregate amount of instructional time received.

Family demand for schooling also is shaped by ethnicity in many societies, at times independently of material aspects of social class. In Ethiopia, Oromo children tend to outperform other pupils, even though their families have been historically subordinate to other groups (Abraha et al., 1991). In Zaire, Sheline (1984) found that secondary school performance was strongly explained by the demands of Baluba parents to find spaces in high-status Catholic boarding (secondary) schools. And ethnic membership continues to exert a strong influence on school achievement in Malaysia (Ching et al., 1990). If we more carefully studied the influence of ethnicity on family demand and parenting practices prior to and concurrent with children's school attendance, we would more completely condition the value-added effect of school factors.

Effective schools transmit foreign knowledge. Intuitively, one might feel that the aggregate effect of schools would be greater when they respond to family demand by converging with indigenous forms of knowledge. But, of course, the central state usually has an agenda that emphasizes modern forms of secular knowledge: a lingua franca that may be held by a minority of the population, and math and science knowledge that holds some economic utility and a great deal of status under modern rules (Benavot et al., 1991). Indeed, when the school positions its curricula apart
from the family, the school's effect can operate more independently of parental 
influences. This relative positioning of school and family represents the second major 
institutional condition under which school effects are more likely to occur. This 
pertains both to the subject matter being taught and the distribution of school 
resources vis-à-vis family resources across communities within a society. We address 
each of these elements in turn.

Inferences about the school's aggregate effect in developing countries has been 
disproportionately influenced by studies of math or science achievement. Indeed, 
Heyneman & Loxley's (1983) oft cited empirical findings from 29 countries, showing 
lower family effects in poorer countries, were based primarily on science achievement. 
The school's relative efficacy in language and reading achievement is usually much 
less. For instance, early studies found inconsistent or no effects from textbooks or 
instructional time on reading achievement: in urban Brazil (Wolff, 1970), Indonesia 
(Sembiring & Livingstone, 1981), Malaysia (Smart, 1978), and Tanzania 
(Psacharopoulos & Loxley, 1986). More recently, Harbison & Hanushek (1992) found 
that teachers' subject matter knowledge of math was strongly related to children's 
math achievement (mentioned above), but no cross-over effect occurred for 
Portuguese, and teacher qualities were less consistently related to Portuguese 
performance. In Israel, Yair (1992) found much greater variability in Hebrew 
achievement, compared to math scores, and teacher effects were stronger in 
explaining variation in math performance than in language scores. Elley (1992) shows 
how reading achievement in the school's official language suffers when children speak
another language at home, a specific condition that affects the school's discrete influence.¹³

The foreign character of school knowledge and written literacy is dramatically illustrated by one study from the very poor country of Malawi, where the supply of textbooks and teacher guides helped to raise teachers' own literacy scores (Fuller & Kapakasa, 1991). Subject matter and family practices also can interact, as found in Malaysia where the frequency with which parents read to their child in English held a predictably positive effect on English achievement in school (Ching et al., 1990). In sum, to more carefully study the school's aggregate effect within impoverished settings we must differentiate the subject-matter being taught and its relation with indigenous forms of knowledge, as well as family practices and demands that may condition the school's specific influence.

Parallel distributions of school resources and family demands across different communities also may condition school effects. For example, Raudenbush's work in Thailand has been the most sophisticated in showing that effects from specific school inputs and teacher attributes are greatest in the poorest communities and when baseline levels of school resources are low (Raudenbush et al., 1989). The pupil:teacher ratio, quality of school facilities, textbooks, and presence of a school library all showed significant effects under these two conditions, diminishing in less poor urban areas (as the school institution becomes less foreign and better stocked with these basic inputs). Lockheed & Komenan (1989) demonstrate how certain teaching practices may hold non-linear effects, such as the diminishing utility of
seatwork after a threshold amount of time is spent on this activity.

Teacher preference for mobilizing complex instructional tools and social rules? As empirical work in classrooms expands, a major dialectic between Western policy-mechanics and third-world teachers comes into clearer focus: The former would like to show that teaching practices from the West can raise pupil achievement across very different cultural settings. For instance, Anderson (1991, p.42) puts forward a universal postulate about effective classrooms: "Teachers should develop classrooms in which there is mutual respect between teachers and students and a high degree of cohesiveness among students themselves." Yet qualitative work in third-world classrooms reveals hierarchical forms of teacher authority and infrequent lateral discussion among students (e.g., Nitsaisook, 1985; Prophet & Rowell, 1990; Fuller, 1991). Not surprisingly then, when teachers display more participatory forms of pedagogy, achievement gains are not always observed. Mentioned above, Lockheed & Komenan (1989) found that time spent by pupils listening to the teacher lecture was positively related to achievement. In Swaziland, seatwork -- the dread of teacher-effectiveness experts in the West -- was positively associated with achievement as well. In the Philippines, achievement was lower in classrooms with teachers who reported more active and participatory forms of pedagogy (Lockheed & Zhao, 1992). In some subject areas, such as math, more questions by teachers and broader discussion of material have been found to suppress achievement (Fuller & Hua, 1992). Contradictory signals also may be coming from the policy mechanics. In Gamibia, one ethnographic study found that teachers appreciated the government's emphasis on
supplying more textbooks, but many felt that the texts constrained the range of pedagogical practices that were perceived as legitimate (Sarr, 1989).

On the other hand, Western forms of "effective teaching" have shown positive effects in some settings. In Malaysia, achievement was higher when students reported that their teacher took greater care to assess their comprehension and when given more opportunities to discuss topics in class (Ching et al., 1990). In Sri Lanka, Tatto et al. (1992) show that subject-matter knowledge and teacher-centered instruction, when blended with interaction and explanations for pupils, are positively associated with higher achievement.

**The cultural meaning of pedagogical behaviors.** Observation studies of classrooms -- in both the United States and the Third World -- often reveal key dimensions of the classroom's social rules: (a) norms about the teacher's authority, (b) implicit rules about pupil participation (pertaining to interaction with the teacher and with fellow students), and (c) the structure of classroom work and tasks, including what instructional tools are employed, how task demands are placed on students, and whether work is performed individually or cooperatively (in the U.S., Goodlad, 1984; Stodolsky, 1991; in Japan and China, Stevenson & Stigler, 1992; in other third-world countries, Anderson et al., 1989; Prophet & Rowell, 1990; Fuller & Snyder, 1991). A serious weakness of the production-function line is that instructional tools and even teaching practices are seen as culture-less, technical instruments for raising achievement. Efforts have been made to identify the human mechanisms through which inputs are mobilized in the classroom: Lockheed et al.'s (1986) study in
Thailand illustrates how textbooks interact with the teacher's level of training, the amount and structure of instructional time, and levels of homework that flow from greater use of the text. Particular social rules that may operate independently of local culture also have been studied, such as the IEA finding that across 8 varied countries, teachers feel very little control over the content of what is taught (Bourke, 1990). But very little is known about how key inputs, such as textbooks or pupil exercise books, act to mediate implicit cultural rules found within different classrooms. An important starting point is to discover the meanings and constructed uses that are attached to pedagogical behaviors and instructional tools -- through the eyes of teachers and students.

On teacher authority, we know that many teachers exercise their role by exhibiting expertise and knowledge of facts. In southern Africa, for example, Prophet and Rowell (1990) detail how science teachers take little time to check pupils' comprehension of biological processes (related to plant reproduction or crops). Instead they keep pressing to be sure that students have memorized the "proper" English vocabulary pertaining to parts of plants. Similarly in Guatemala, Laserna's (1988) classroom ethnography reveals how teachers almost never took into account indigenous arithmetic knowledge held by children, instead didactically presenting the abstract, reductionist concepts appearing in the textbook.

We know very little about how basic instructional tools, like texts or exercise books, reinforce (or subvert) the teacher's conception of authority. It is likely that an insensitive press to use novel teaching tools could undermine highly effective forms of
authority, for example, Chinese teachers' use of competition among cooperative groups within their classrooms (Stevenson & Stigler, 1992). If policy mechanics pressed for a more teacher-centered use of texts, or monitoring of individually-performed exercises, the intervention might well suppress pupil achievement in the Chinese context. We also know that teachers' conceptions of authority and rules about how classroom work should be organized varies dramatically within multicultural societies. Saad & Hendrix (1993), for example, found that Israeli and Arab teachers differed sharply in their beliefs about how hierarchical and didactic teachers should be in the classroom. This also interacted with the urban or rural location of their schools.

The culturally constructed meaning of classroom inputs. When governments or development agencies purchase instructional materials, assumptions are made about what learning effects these teaching inputs will yield, and via what process. These presumed causal sequences rely on secular, culture-less conceptions of the meanings assigned to these materials by teachers. For example, earnest policy mechanics (including the first author of this paper) have conducted country studies which show an association between the supply of pupil exercise books and higher achievement. The inference is then made that more exercise books lead to more frequent cognitive exercise and independent work by students, either in class or at home. Resulting policy advice: buy and distribute more exercise books.

Our research group, however, is currently observing classrooms in the South African township of Soweto, where the majority of teachers simply instruct their
students to copy material from the board or from the teacher's recitation into their "exercise book." This same instructional tool is assigned a particular local meaning by Soweto teachers, quite different from its actual meaning and use elsewhere in the southern African region. Unless these local meanings, activated by classroom teachers in a specific institutional culture, are taken into account, we will fail to understand the process by which a classroom "input" influences student learning.

Studies are emerging that focus on how teachers assign variable meanings to the same instructional tools. Ethnographers Prophet and Rowell (1993), introduced above, observed how teachers mobilize teaching tools within Botswana's (junior secondary) science classes. Despite how texts and teacher guides proclaim the virtues of pupil discovery, Botswana teachers focus on enforcing the use of English terms and vocabulary, rather than being concerned with pupils' knowledge of biological processes. Nor do teachers build on what students do understand, instead relying on sentence-completion questions, even during pupil-performed experiments. Well intentioned curricular materials are actively interpreted by science teachers, who simply fail to decode the notion of "discover," and lapse back into didactic forms of pedagogy.

Rugh's (1992) ethnographic work within Pakistani primary schools reveals that teachers are rewarded for covering the curriculum "on time" and seeing that their pupils can provide the correct, memorized responses from their textbooks to questions posed by headmasters. The textbook is the key collection of facts around which proper socialization and "achievement" is defined. The surface-level transmission of
knowledge occurs on top of a much deeper process of child socialization and normative ways of behaving in the school setting, with recall exercises indicating whether the student has been serious and hard working. The textbook becomes a central tool for reinforcing this sacred method of socialization.

Active construction of what a teaching "input" really means in practice is not restricted to developing countries. Cohen's (1990) observation of one North American mathematics teacher, and her unknowing subversion of California's innovative curriculum framework, is a notable study. This teacher was delighted with how these state-level curricular guidelines, encouraging more inventive teaching practice, had in her own eyes revolutionized her pedagogy. Yet researcher Cohen observed only glimpses of altered teaching methods; instead the math teacher simply recast called-for innovations into her traditional didactics. By simply studying empirical links between this new teaching tool and achievement, we would miss the active interpretation of what the tool really means to the teacher.

In Israel, Zuzovsky and Aitkin (1991) similarly found that many science teachers followed the spirit of a new curriculum, emphasizing inquiry methods of teaching. Yet most teachers blended this with traditional didactics; science labs were used much less frequently than anticipated. Uniform expectations were held at the central ministry for this innovative teaching tool, but teachers assigned variable meanings and mobilized this "input" in quite different ways.

A final example of the cultural variability in meanings attached to pedagogical practices and tools: The production-function line has pushed forward discussion on
the relative effectiveness of particular types of school organizations. For example, private schools do appear to outperform government schools in certain settings; and all-girls schools are sometimes more effective, as are mission schools and quasi-Islamic schools. But the next generation of questions relates to why certain forms of school organization are more effective, and why do differences in their supplies of material inputs often explain little (Jimenez & Lockheed, 1993)? We argue that the cross-cultural study of teacher authority, rules of classroom participation, the structure of classroom work -- and how teaching tools or inputs mediate these social forces -- represent the frontier for understanding underlying differences among school organizations.

Variability in technical conditions. The limited range of universal school effects observed above can be attributed to two other types of interrelated conditions. Political and organizational conditions that influence the supply or distribution of an input may be such that an achievement effect can not be observed. For instance, where textbooks are scarce or distribution is skewed, detecting any correlation may not be statistically possible. The reality set by organizational constraints yields input levels that fall short of required thresholds or manifest insufficient variances. Similarly, where the validity of measurement tools is weak -- especially in the complex area of classroom observation -- achievement effects will not likely be observed. Validating instruments by gleaning what teaching tools and pedagogical behaviors actually mean in the eyes of teachers and students, through interviews and longer term ethnography, would take us quite far in culturally situating what classroom practices
likely boost achievement.\textsuperscript{14}

The inconsistency of school-effects findings also may be due to the fact that some school systems operate so inefficiently that certain teaching tools, which under more optimal organizational conditions would yield achievement gains, fail to be utilized efficaciously. It is like an inexperienced peasant farmer who has all the productive ingredients he or she needs, but lacks the organizational know-how to deploy the inputs in productive ways (Hanushek 1986). If we took into account the conditions under which school inputs are well, or poorly, organized, links with school achievement might become more consistent (Finnan and Levin 1993).

\textbf{The Remaining Utility of Modeling Achievement}

Critics of the policy mechanics often confuse the limited range of what factors have been measured with how variation in pupil achievement is modelled. We should not necessarily throw-out the method associated with the latter as we broaden and culturally-situate the range of tools, classroom rules, and pedagogies we observe. School and classroom ethnographies have contributed much in opening-up the field of classroom culture. But the classroom culturalists have yet to delineate which forms of teacher authority or social participation are empirically predictive of student achievement. Similarly, if we are to strive for a more balanced focus on cognitive achievement and socialization, we must necessarily broaden our dependent variables. But let's agree on these outcomes, then back-up and identify which specific elements
of classroom culture are empirically associated with achievement and normative socialization.

In parallel, how we think about human learning is undergoing a reformation, moving from purely developmentalist or behaviorist perspectives to one that emphasizes how children construct and assign meanings to "facts", tasks, and behaviors within particular cultural contexts (e.g., Rogoff, 1990; LeVine et al., 1991; Wertsch, 1991). Here cognitive knowledge and achievement blends with the normative rules and meanings that children learn implicitly (socialization). Instructional tools and tasks mediate this learning, both in school and out of school with teachers, parents, and other adult mentors. The classroom culturalists have advanced our understanding of how motivated learning occurs within particular social contexts, like classrooms. The production-function gurus continue to hold comparative advantage in empirically linking classroom tools to achievement. But this advantage will only be retained if these inputs and teaching practices are awarded real cultural meanings -- and within a particular context which is energized by variable forms of teacher authority, social participation, and classroom tasks.

CONCLUSIONS: TEACHERS AND TOOLS IN LOCAL SCHOOL CULTURES

The policy mechanics have contributed much to our understanding of the school institution's effectiveness across diverse cultural settings: We no longer assume that the family's influence eclipses the school's impact under all conditions. We have
accumulated much empirical evidence on which certain policy-manipulable inputs -- instructional time, texts and reading materials, and certain forms of teacher education -- will likely make a difference within impoverished communities. And we have become more sensitive to empirical evidence regarding the relative magnitude of achievement effects of alternative school inputs, and at what cost these effects will likely be observed.

Equally important, we are realizing how teaching practices and classrooms differ across societies and local communities. In the United States only a few researchers have been sensitive to variability inside classrooms -- variation linked linked to the community's cultural norms or to how teachers construct different socialization experiences based on students' ethnic or social-class characteristics (Carew & Lightfoot, 1979; Everhart, 1983). Cross-cultural variability, in contrast, has received more serious attention by classroom observers overseas. A few researchers working from production-function roots, have begun to empirically relate this cultural variation in teaching practices to student achievement.

We delineated above the types of local attributes that may condition these effects from inputs and classroom practices: the intensity of families' demand for schooling; the school's aggregate influence on learning vis-a-vis contextual forces; the foreign or indigenous character of knowledge being instructed inside classrooms; the level (and forms) of complexity traditionally demanded of teachers inside their classrooms; the meanings of different pedagogical behaviors from the viewpoints of teachers and children; and, similarly, how basic teaching tools are assigned culturally
variable meanings. We also noted other types of local conditions that are not cultural in nature also must be taken into account: whether input levels have reached necessary thresholds before effects can be observed; whether inputs and teaching practices are distributed with reasonable proximity to normality; and whether measures and instruments have been validated within local contexts. Conducting school-effectiveness studies which are sensitive to, and attempt to measure, variability in local conditions will require more resources and broader technical competence on study teams, not the least of which is deeper local knowledge.

Small steps have been taken, in designing and implementing research programs, to take local conditions into account. This research remains largely bounded by our Western conception of (teacher-centered) pedagogical practice and by implicit social rules pertaining to authority and social participation. But it does shift attention to how policy-manipulable inputs are actually mobilized by teachers. More fundamentally, the marginal effect of dropping more inputs into classrooms or lengthening instructional time will surely diminish as basic quality levels rise. Simple adjustments to the production-function framework may not be sufficient to further illuminate effective policy measures. The next generation of questions pertain to how these tools are culturally situated and understood in the eyes of teachers and pupils, including how these tools help to structure the classroom's social rules.

Closely following is another challenging issue: Are these inputs and teaching practices reproducing the forms of learning and socialization that are truly desired by educational leaders or local communities? We may be simply raising the efficiency
with which governments push an excessively narrow form of learning and socialization -- even in newly democratic societies that are struggling with how to broaden their conception of school achievement.
References


Raising Secondary School Effectiveness

University Press.


Raising Secondary School Effectiveness


Lockheed, M., Fuller, B., & Nyirongo, R. (1989). Family effects on Students' achievement in Thailand and
Raising Secondary School Effectiveness


Sharan, S., & Shachar, C. (1986). Cooperative learning effects on students' achievement and verbal behavior in multi-ethnic junior high-school classrooms in Israel. Tel Aviv: Tel Aviv University, School of Education (processed).


Raising Secondary School Effectiveness

Lumpur.


1. >> Colleagues reviewing earlier drafts have responded sharply to these labels of "policy mechanics" and "classroom culturalists." To be clear, we are not assuming that these two fields are mutually exclusive, nor that some of us do research with a foot in each camp. We do want to emphasize that researchers begin with quite different assumptions when they their research design is grounded in one field or the other. And these distinctions hold real implications for how research programs in the future will be formulated. As Steve Heyneman points out, from Emile Durkheim onward, several scholars have attempted to identify the moral and cultural ends to which school ingredients are organized and mobilized by states and educators. The issue for us is the relative priority placed on the universal and mechanical effects of school inputs vis-à-vis their cultural meaning and socializing effects — and how this may more thoughtfully shape the policy advice that we commonly advance. <<

2. No altogether satisfactory term exists for societies that are not industrialized. By "developing countries" we mean low-income societies that might be called part of the Third World, as well as somewhat more affluent nations, such as those found in east Asia, parts of Latin America, and eastern Europe. No narrow and linear conception of "development" is implied.

3. Earlier reviews have focused on research conducted within primary schools. We have attempted to locate sound studies done at the secondary-school level. For a review of work on the effectiveness of private and public schools in developing countries, see Riddell (1993).

4. A counter movement to Coleman's argument has reemerged recently, often in the context of school finance debates where sharp disparities in per-pupil spending levels persist. On the debate over whether material school inputs make a difference, and the conditions under which their influence may be higher, see Hanushek (1986) and Hedges, Laine and Greenwald (1993).

5. One exception: researchers and practitioners interested in cooperative learning have attempted to alter the cultural norms of classrooms. But whether the pedagogical complexity entailed can be sustained within impoverished school contexts, within the West or overseas, remains to be seen (for review, Cohen, 1986).


7. One exception is Lockheed et al.'s (1986) study of how textbooks appear to raise pupil's math achievement by substituting for specific teacher training in mathematics.

8. Difficulties in summarizing this line of school-effects research are detailed in Schwille et al. (1986).

9. The effect in Brazil was observed for pupils' math achievement but not for their Portuguese performance. Similarly, the Thai effect pertains to teachers who were specifically trained in mathematics. The effect in the Philippines was for teachers who studied science at the postsecondary level.
10. This positive relationship may result from inadequate controls on family background. Achievement may simply be higher in urban (and rural) areas where family demand for schooling is stronger and government is unable to provide more teachers and classrooms (for the case of Ethiopia, see Abraha et al., 1991).

11. More complex models are worthy of further investigation in the United States. For instance, Murnane et al. (1992) show that rising teacher salaries in the U.S. have helped to attract and retain better qualified teachers. The remaining empirical issue, of course, is whether this stronger preparation is manifest in pedagogical practices that boost student achievement.

12. Developing countries include Botswana, east Germany, Hungary, Nigeria, Philippines, Thailand, Trinidad and Tobago, Venezuela, and Zimbabwe.

13. For the 9 developing countries included in the IEA reading study, the percentage of children who did not speak the school language at home ranged from 0.6% in Hungary to 89.6% in the Philippines. For the latter case, children who spoke the school language scored two and one-half SDs higher on the reading exam. On the other hand, in Thailand and Nigeria where 38.7% and 41.2% of all 14 year-olds do not speak the school language at home, respectively, insignificant achievement differences were observed (Elley, 1992).

14. We thank an RER reviewer for pushing us to think about the variability of non-cultural factors that condition school effects.
Table 1

EXPLAINING ACHIEVEMENT IN DEVELOPING COUNTRIES: EFFECTS OF SCHOOL INPUTS, TEACHER ATTRIBUTES, AND PEDAGOGICAL PRACTICES

<table>
<thead>
<tr>
<th>School/Teacher Factor</th>
<th>Number of Significant Effects : Number of Analyses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Primary Schools</td>
</tr>
</tbody>
</table>

**School Spending**

1. Expenditures per pupil 3:6 3:5
2. Total school expenditures 2:5 --

**Specific School Inputs**

<table>
<thead>
<tr>
<th></th>
<th>Primary Schools</th>
<th>Secondary Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Average class size</td>
<td>9:26</td>
<td>2:21</td>
</tr>
<tr>
<td>4. School size (enrollment)</td>
<td>7:8</td>
<td>1:5</td>
</tr>
<tr>
<td>5. Teaching tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Textbooks</td>
<td>19:26</td>
<td>7:13</td>
</tr>
<tr>
<td>Supplementary readers</td>
<td>1:1</td>
<td>2:2</td>
</tr>
<tr>
<td>Exercise books</td>
<td>3:3</td>
<td>--</td>
</tr>
<tr>
<td>Teaching guides</td>
<td>0:1</td>
<td>--</td>
</tr>
<tr>
<td>Desks</td>
<td>4:7</td>
<td>0:1</td>
</tr>
<tr>
<td>6. Instructional media</td>
<td>3:3</td>
<td>--</td>
</tr>
<tr>
<td>7. Quality of facilities</td>
<td>6:8</td>
<td>1:1</td>
</tr>
<tr>
<td>8. School library</td>
<td>16:18</td>
<td>3:4</td>
</tr>
<tr>
<td>9. Science laboratories</td>
<td>5:12</td>
<td>1:1</td>
</tr>
<tr>
<td>10. Child nutrition and feeding</td>
<td>7:8</td>
<td>1:1</td>
</tr>
</tbody>
</table>

**Teacher Attributes**

<table>
<thead>
<tr>
<th></th>
<th>Primary Schools</th>
<th>Secondary Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Teacher's length of education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total years of schooling</td>
<td>9:18</td>
<td>5:8</td>
</tr>
<tr>
<td>Earlier measured achievement</td>
<td>1:1--</td>
<td></td>
</tr>
<tr>
<td>Tertiary or teacher college</td>
<td>21:37</td>
<td>8:14</td>
</tr>
<tr>
<td>12. Inservice teacher training</td>
<td>8:13</td>
<td>3:4</td>
</tr>
<tr>
<td>13. Teacher gender (female)</td>
<td>1:2</td>
<td>2:4</td>
</tr>
<tr>
<td>14. Teacher subject knowledge or language proficiency</td>
<td>4:4</td>
<td>--</td>
</tr>
<tr>
<td>15. Teacher experience</td>
<td>13:23</td>
<td>1:12</td>
</tr>
<tr>
<td>16. Teacher salary level</td>
<td>4:11</td>
<td>2:11</td>
</tr>
<tr>
<td>17. Teacher social class</td>
<td>7:10</td>
<td>--</td>
</tr>
</tbody>
</table>

Continued... [Rev. 3 October 1993]
### Table 1 (con’t)

#### Classroom Pedagogy and Organization

<table>
<thead>
<tr>
<th>Item</th>
<th>First</th>
<th>Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 18. Instructional time&lt;sup&gt;7&lt;/sup&gt;</td>
<td>15:17</td>
<td>11:15</td>
</tr>
<tr>
<td>19. Active, complex pedagogy</td>
<td>3:8</td>
<td>2:5</td>
</tr>
<tr>
<td>&gt; &gt; In-class written exercises</td>
<td>0:2</td>
<td>--</td>
</tr>
<tr>
<td>&gt; &gt; 20. Frequent monitoring of pupil performance</td>
<td>3:4</td>
<td>0:1</td>
</tr>
<tr>
<td>21. Class preparation time</td>
<td>5:8</td>
<td>1:2</td>
</tr>
<tr>
<td>22. Frequency of homework</td>
<td>9:11</td>
<td>2:2</td>
</tr>
<tr>
<td>23. Teacher efficacy</td>
<td>1:1</td>
<td>0:1</td>
</tr>
<tr>
<td>24. Cooperative-learning task structure</td>
<td>--</td>
<td>2:2</td>
</tr>
</tbody>
</table>

#### School Management

<table>
<thead>
<tr>
<th>Item</th>
<th>First</th>
<th>Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. School cluster membership</td>
<td>2:2</td>
<td>--</td>
</tr>
<tr>
<td>26. Independence from central government</td>
<td>--</td>
<td>0:1</td>
</tr>
<tr>
<td>27. Principal’s staff assessment</td>
<td>3:4</td>
<td>0:1</td>
</tr>
<tr>
<td>28. Principal’s training level</td>
<td>3:4</td>
<td>1:2</td>
</tr>
<tr>
<td>29. School inspection visits</td>
<td>2:3</td>
<td>0:1</td>
</tr>
<tr>
<td>30. Tracking or pupil segregation</td>
<td>1:1</td>
<td>--</td>
</tr>
</tbody>
</table>

### NOTES:


2. All school and teacher factors are expected to have a positive association with pupil achievement levels, except average class size is hypothesized to hold a negative relationship.

3. A criterion of p < .05 is used for statistical significance. Only studies that controlled on students' family background within multivariate or experimental designs are included. Models differ in terms of how student background is specified and the number and type of school factors included in specific models.

4. Refers primarily to evaluations of radio-assisted instruction. For details, see Lockheed & Hanushek (1988).

5. These studies have looked at the simple presence of a school library (dichotomous variable), size of holdings, and reported frequency of use.

6. See text for details on the match between female teachers and students, particularly with regard to language achievement.

7. Instructional time includes school-level measures of the length of the academic year or length of the school day, as well as observational findings on time spent on instructional tasks within classrooms.
## Annex 1

### DEVELOPING-COUNTRY SCHOOL EFFECTIVENESS STUDIES

**1987-1993**

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>School Inputs, Teacher Attributes, Pedagogical Practices Assessed¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary School Studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>al-Baz et al. (1992)</td>
<td>Egypt</td>
<td>Lecture time, rewards for positive pupil performance, homework, school library, teacher training, salaries, teacher experience, encourage reading outside of school.</td>
</tr>
<tr>
<td>Ching et al. (1990)</td>
<td>Malaysia</td>
<td>Textbooks, school library utilization, facilities, pedagogy emphasizing discussion, use of textbooks in lectures.</td>
</tr>
<tr>
<td>Eisemon, Schwille &amp; Prouty (1989)</td>
<td>Burundi</td>
<td>Headmaster supervision, teacher absence, class size, school size, language of instruction.²</td>
</tr>
<tr>
<td>Harbison &amp; Hanushek (1992)</td>
<td>Brazil</td>
<td>Textbooks, exercise books, facilities, teacher training, subject matter knowledge, multi-grade, classrooms, salaries, class size.³</td>
</tr>
<tr>
<td>Researcher(s) (Year)</td>
<td>Country</td>
<td>Key Variables</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Johnson (1992)</td>
<td>Swaziland</td>
<td>School library, facilities, instructional time, school size, textbooks, desks, teacher training.</td>
</tr>
<tr>
<td>Lockheed, Fonacier &amp; Bianchi (1988)</td>
<td>Philippines</td>
<td>Class size, school size, teacher training, use of science lab, group work, pupil assessment.</td>
</tr>
<tr>
<td>Nyagura &amp; Riddell (1992)</td>
<td>Zimbabwe</td>
<td>Textbooks, teacher gender, age, training level, planning time, class size, instructional time, teacher experience.</td>
</tr>
<tr>
<td>Palafox, Prawda &amp; Velez (1992)</td>
<td>Mexico</td>
<td>Day shifts, preschool access, attempt to control on ability.</td>
</tr>
<tr>
<td>Postlethwaite &amp; Ross (1992)</td>
<td>Hungary&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Textbooks, school library, supplementary reading materials, class size, homework, principal assessment of teachers, teacher experience.</td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trinidad-Tobago</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Venezuela</td>
<td></td>
</tr>
<tr>
<td>Raudenbush et al. (1989)</td>
<td>Thailand</td>
<td>Teacher efficacy effects, after accounting for child nutrition and earlier identified factors.</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Focus</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>-----------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Raudenbush &amp; Bhumirat (1992)</td>
<td>Thailand</td>
<td>Conditionalized effects from textbooks, exercise books, teacher training, inservice.</td>
</tr>
<tr>
<td>Raudenbush et al. (1992)</td>
<td>Thailand</td>
<td>Principal supervision of teaching, inservice training, teacher age and experience (with covariates above).</td>
</tr>
<tr>
<td>Ross &amp; Postlethwaite (1989)</td>
<td>Indonesia</td>
<td>Teacher subject knowledge, instructional time, teacher training, experience, class size, teacher guides.</td>
</tr>
<tr>
<td>Ross &amp; Postlethwaite (1992)</td>
<td>Zimbabwe</td>
<td>Textbooks, exercise books, desks, teacher training, length of instructional program.</td>
</tr>
<tr>
<td>Tatto et al. (1992)</td>
<td>Sri Lanka</td>
<td>Complexity of pedagogy, class size, teacher training, inservice.</td>
</tr>
<tr>
<td>Willms &amp; Chen (1989)</td>
<td>Israel</td>
<td>Tracking and between-class segregation on the basis of pupil ethnicity.</td>
</tr>
<tr>
<td>&gt; &gt; Mullens (1993)</td>
<td>Belize</td>
<td>Teacher training and prior achievement of teachers.</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Findings</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Glewe et al. (1993)</td>
<td>Jamaica</td>
<td>School inputs, pupil tests, time in school, classroom activities, and gender effects.</td>
</tr>
<tr>
<td><strong>Secondary School Studies</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anderson et al. (1989)</td>
<td>Nigeria, Thailand, South Korea</td>
<td>Instructional materials and teaching practices.</td>
</tr>
<tr>
<td>Fuller &amp; Hua (1992)</td>
<td>Botswana</td>
<td>Textbooks, supplementary reading materials, class size, teacher training, complexity of pedagogy, instructional time.</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Key Findings</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Keeves (1992)</td>
<td>Hungary</td>
<td>Instructional time, homework, class size, active teaching methods.</td>
</tr>
<tr>
<td>Lockheed &amp; Komenan (1989)</td>
<td>Nigeria, Swaziland</td>
<td>Teacher training, class size, lecturing, seatwork, teacher monitoring of pupil work.</td>
</tr>
<tr>
<td>Lockheed &amp; Bruns (1990)</td>
<td>Brazil</td>
<td>Public and private school comparison: instructional time, class size, teacher training and salary.</td>
</tr>
<tr>
<td>Lockheed (1991b)</td>
<td>South Korea</td>
<td>Single-sex schools, teacher gender, school size, instructional time.</td>
</tr>
<tr>
<td>Lockheed &amp; Longford (1991)</td>
<td>Thailand</td>
<td>Teacher qualification in subject (math), use of textbooks, school size, teacher experience, gender, age, class size.</td>
</tr>
<tr>
<td>Lockheed &amp; Zhao (1992)</td>
<td>Philippines</td>
<td>Teacher training, class preparation, science labs, complex and active pedagogy.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Country</td>
<td>Focus</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Riddell (1989)</td>
<td>Zimbabwe</td>
<td>School type (level of instructional resources) and pupil selectivity.</td>
</tr>
<tr>
<td>Riddell &amp; Nyagura (1991)</td>
<td>Zimbabwe</td>
<td>Textbooks, teacher training, stability of school staff, class size, school size.</td>
</tr>
<tr>
<td>Suriyadi et al. (1981)</td>
<td>Indonesia</td>
<td>Instructional time within different social class groups.</td>
</tr>
</tbody>
</table>

NOTES:

1. School inputs and teaching practices listed are those on which each paper focuses or those predictors that remain in final models reported. Not listed are variables specific as covariates or control variables. However, this latter set are included in summary Table 1.

2. Primarily correlational findings, with limited controls on the school’s socio-economic context.

3. Also see, Armitage et al. (1986) and Hanushek et al. (1992).

4. Findings should be interpreted cautiously: school-level analysis conducted with minimal controls for variation in the school’s socio-economic context.

5. Reading literacy assessment, International Association for the Evaluation of Educational Achievement (IEA).

6. Where models are similar with final models in Raudenbush & Bhumirat (1989), significant predictors are not reported again in Table 1.


9. Also see Lockheed’s (1991b) summary of the final model.

10. This study, published prior to 1987, is included since it has not been included in earlier reviews.