

**IMPROVING THE QUALITY AND
INTERNAL EFFICIENCY OF EDUCATION**

Volume III

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**EPP-IEES
MOEC-USAID**

**CONFERENCE ON
INFORMATION SYSTEMS AND POLICY ANALYSIS
JUNE 29 - JULY 3, 1992
YOGYAKARTA - INDONESIA**

PUSAT INFORMATIKA, BALITBANG DEPDIKBUD AND EPP - IEES PROJECT, USAID

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***The editors of this volume wish to express their appreciation to
Professor Dr. Harsja W. Bachtiar, Professor Dr. Moegiadi, and the other
members of the staff of Balitbang Dikbud, as well as to Dr. Norman Rifkin,
Dr. Richard Pelczar, Dr. Simon Ju, and others on the USAID staff without whose
help, sustained encouragement, and support the preparation of this volume would
not have been possible.**

**The analyses and conclusions reached do not represent the official policy
of the Indonesian Government, the Ministry of Education and Culture, or USAID.
All statements, and all errors, are the sole responsibility of the editors of this
volume and of the individual authors of the chapters.**

Published By:

**Office of Educational and Cultural Research & Development,
Ministry of Education and Culture, Jakarta, Ph. 581-177,
and**

**USAID, Educational Policy and Planning Project (EPP),
Education and Human Resources, USAID Mission, Jakarta, Ph. 360-360
and**

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Chapter I

Introduction and Overview

Walter W. McMahon, Boediono, and Don Adams

This volume is concerned with improving the quality and effectiveness of education, and with finding the resources for improving quality by improving internal efficiency.

Internal Efficiency and Quality

Internal efficiency means efficiency within the educational system in the efficient use of educational inputs such as books and teachers in educational learning processes to produce better outputs such as increments to learning, improved reasoning and problem-solving capacities, and other improvements in the quality of the outcomes. Efficiency thus may be defined at the ratio of outputs to the real cost of the inputs.

External efficiency which is addressed in Volume II is concerned with how the outputs of education, such as the graduates and the quality of what is learned relates to the needs of the economy and of society.

The quality of education is defined in terms of outputs such as student achievement or reasoning and problem solving capacities. But the term "quality" can also be used to refer to the quality of inputs or processes.

One source of financing improvements in quality is internal sources through internal reallocation. If there is waste, or educationally ineffective programs that are also high cost, then those funds now wasted by financing the internal inefficiency can gradually be reallocated internally and used to improve quality, and hence increase the efficiency of human resource development through education. The challenge is to determine which programs are not merely effective, and not merely of high quality, but which are comparatively cost effective in producing larger outputs, or higher quality, or both without commensurate increase in the costs.

The Importance of Internal Efficiency

Without efficiency, resources in the form of the time of the teachers, the time of administrators, the time of the students, and tax money are wasted, and too little learning occurs. If the quality of the graduates is inadequate to meet the

needs of employers in spite of considerable money and other resources used, the problem is inefficiency in the education process. Internal inefficiency not only squanders scarce resources that could be used to better effect, it also leads to an inadequately trained labor force, labor productivity and living standards rise more slowly, and economic growth is slowed.

From the wider point of view of economic and social development, therefore, efficiency is all important. Everybody is aware of how a nation's future is jeopardized when there is inefficiency. Burma for example, in the past had the highest standard of living in South East Asia and an exportable rice surplus. Now it has one of the lowest standards of living and must import rice, all because of inefficiency in the system. The education system in Indonesia is relied upon to develop the qualities and abilities of Indonesia's largest potential resource, its people. The importance of having efficiency in human resource development which means not just high quality in education but also higher quality education in relation to the cost, therefore, is strategic to the contribution of education to development. An educated, efficient, labor force has spill over effects that also help to improve the efficiency of the whole economy. The importance of efficiencies within the education system can hardly be over emphasized.

I. Conceptual Framework

Seeking improvements in quality that also improve internal efficiency must be done thoughtfully. Educational programs that are of modest quality can sometimes be very efficient because they are very low in cost. At the primary school level examples might include adequate numbers of good textbooks and teaching materials which are known to be very cost effective in producing large increments to learning. Furthermore programs of good quality can be very inefficient, and wasteful of resources, if they are only available at excessively high cost. At the same time, some very high cost programs can be efficient but only if the results they produce are extraordinary.

Finding the educational activities, processes, programs, or levels that are educationally effective in relation to their cost (and therefore should be expanded), or are wasteful of resources (in relation to their effectiveness) requires a continuing process of data collection, monitoring the system, and implementation. This suggests that it is extremely unlikely that large dramatic increases in internal efficiency will occur overnight, or that the need for continuing increases in external sources of funding will be eliminated. Instead, work on monitoring the system to prevent leakages and waste, and to improve quality, is an on-going process that must occur in any well-managed education system continually and throughout the long term future.

Measures of effectiveness and of quality are either absolute measures, such as increments in test scores or student capacities to reason and solve problems independently or measures of relative outputs such as comparative national rankings of college departments. Although they are a component of efficiency, effectiveness and quality measures alone say nothing about efficiency.

Efficiency involves more than this, since it is a ratio of effectiveness to costs. Since resources are scarce, it is not feasible for example to improve on the quality of educational programs through more and better textbooks, better lab space, and more highly trained teachers, without regard to the costs. Measures of efficiency involve a ratio of educational effectiveness or of quality improvements to the resource costs.

Measurements of the ultimate outcomes, outputs and the evaluation of quality in education programs are considered in this volume. But since these alone are relatively meaningless (unless there are implicit controls for the costs), the primary focus of the volume throughout is on the quality or the effectiveness of education relative to the resource costs.

Other volumes in this series deal with other aspects of overall economic efficiency and equity in human resource development through education. Volume I focuses on long range planning, keeping efficiency and greater equality of educational opportunity in view. Volume II deals with external efficiency, and is focussed on the employment of graduates and the relation of the human capital produced by the education system to the needs of society. Volume IV focuses on the financing of the education system, through both public and private sources. The attention to educational financing in Volume IV includes not just revenue sources, but also the financial transfer mechanism for transferring funds from the Central Government to the local schools. The latter is an important means of achieving internal efficiency (e.g., through performance budgeting). The financial transfer mechanism is inherently a set of incentives that can encourage internal efficiency as well as the achievement of greater educational opportunity and of distributive justice among the new generation of wage and salary earners.

II. Overview and Major Findings

- (1.) The process of improving efficiency can be greatly aided by a modern Efficiency-Based Management Information System (EMIS) providing the data necessary for objective data-based decision making. This includes publication of Education Indicators that report on and monitor cost effectiveness, quality, efficiency, and equality of educational opportunity.
- ** The rationale, and a specific design for such a system is presented in Chapter II.
 - ** Many of the elements of this "ideal" system are already in place in Jakarta, and other elements are being assembled. But decentralization of data and data analysis capacities is needed for strengthening effective management of education at the local levels. This requires refinement of the provisions for analysis of efficiency and establishment of effective EMIS systems in the remaining provinces, and in many Kabupatens and universities as soon as possible.
 - ** Chapter II gives explicit attention to the methods of adaptation of the data series to be maintained, the training of personnel, and the computation of Educational Effectiveness, Efficiency, and Equity Indicators at these local levels.
- (2.) To improve internal efficiency, it is also necessary to identify sources for improvement in effectiveness and efficiency.
- ** A perspective on the means of improving educational effectiveness and quality is presented in Chapter III.
 - ** The international and Indonesian research on educational effectiveness is analyzed and assessments are made of the cost/effectiveness of promising innovations.
 - ** The major findings in Chapter III are that:
 1. To increase effectiveness, improvements must include a focus by teachers, principals, central administrators, and other resources directly on the teaching learning-process.

2. To initiate and institutionalize effective and efficient changes requires a continuing process of joint professional and community involvement in planning.

3. To improve cost effectiveness requires a sustained effort in collecting the data on costs, (including the costs of teacher, administrator, and student time wasted), as well as collecting the data that evaluates quality and measures effectiveness (e.g. increments in test scores) followed by relating costs to effectiveness at each local or school level.

(3.) Capacities need to be strengthened concerning methods of calculating Indicators of educational efficiency, as well as market signals.

** Chapter IV offers a practical guide to calculation of cost/effectiveness, cost/benefit, and rate of return measures, for use in MOEC, BAPPENAS, MOM, universities, and at Provincial and Kabupaten levels.

** Social rates of return are the most sophisticated measure, because they take discounted present values of returns over the life cycle into account. Emphasis in these methods of calculation therefore is on social rates of return, using national labor force survey data on earnings by education level, or tracer study data, and using the Ministry of Education and Culture data on educational costs.

(4.) Means of improving the efficiency of vocational and technical education including internships with business, are analyzed using Indonesian data in Chapter V.

** Chapter V considers the relation of social rates of return to VOTEC, by sex and by region, to economies of scale (or the lack thereof), and the effects on rates of return under conditions where there is more rapid technological change.

** The major findings and policy implications for improving efficiency include:

1. Consolidation of VOTEC curricula, especially in some localities where there are too many separate curricula, so that economies of scale in each curricula and hence in the school can be realized,

2. More rapid expansion of investment in VOTEC where rates of return are high (i.e, where senior secondary VOTEC rates of return are high), and slower rates of expansion of VOTEC where rates of return are low relative to senior secondary general education in the localities identified in this study.

3. Improvement in the relation of VOTEC to newly emerging technologies. This could potentially be especially through the kind of student apprenticeships with modern firms that are suggested in Volume I of this series (e.g., the German "dual system"), and less severe tracking (e.g. some VOTEC courses in the secondary general high schools). Both are likely to reduce the public cost, and job-search time, while simultaneously increasing the technological progressivity and quality of the training. See also the chapter on Technology and Human Resource Development in Volume I which stress the capacity of the student to adapt later to change.

(5.) Implementation of the educational changes identified in the 25 Year and Repelita VI Planning Goals requires a set of implementation plans.

** Chapter VI considers the obstacles to implementation of educational plans, the sources of low absorptive capacity, and the conditions necessary for successful implementation.

** The major findings are that managing and administering the process of change and increasing absorptive capacity, require:

1. The location of responsibility and authority to make the change must be clearly specified, the necessary resources must be provided, the administrative organization must be established, and a system of accountability agreed upon.

2. Full implementation over time of the planning goals requires continuous evaluation, adaptation, and refinement of the innovations being considered. Meaningful and informed participation is one major key to successful implementation.

(6.) Within Higher Education, major opportunities for increasing internal efficiency appear to exist. The suggestions offered in Chapter VII include:

** Reduction in the time required to complete a bachelors degree from 6 1/2 or 7 years to 4 or 4 1/2 years. This would reduce the overage enrollment, and reduce the cost per graduate by 1/3 or 1/2, releasing resources that could be used to improve quality.

**** Increased resource recovery (through continuing increases in tuition and fees) can both help to encourage this internal efficiency by shorting degree times, and provide additional financial resources to improve quality. (The over-age enrollment in college in Indonesia is enormous, as shown in Volume I, Appendix to Chapter I, Table 3). As fees rise it becomes increasingly crucial that tuition waivers and other aid be provided to those students from low income families based on a new nationwide objective financial need analysis system.**

(7.) The internal efficiency (and quality) of overseas training could be greatly increased by:

- 1. Sending only those students abroad in academic fields where high quality domestic PhD programs do not yet exist.**
 - 2. Limiting overseas Masters degree support to 2 years and PhD support to 4 or 5 years. Application for the fifth year could require the student to apply based on exceptional circumstances or hold a dissertation fellowship. Both the student and the academic Department to which she has applied should be informed before she leaves Indonesia that these will be the conditions.**
 - 3. Requiring that the student take a 1 unit independent study course with a faculty member in the last semester of year 2 and/or the first semester of year 3 to complete a proposal for a dissertation topic that he/she is ready to defend by the end of the first semester of year 3.**
 - 4. Limiting full time grant support for PhD candidates to 2-3 years after which the Department accepting the student must agree upon admission to the PhD program to provide either 1/2 time teaching or 1/2 time research experience to able candidates accompanied by the usual tuition and fee waiver.**
 - 5. For years 3,4, and 5 the Donor's stipend could then be limited to 20% of the normal full stipend during this period. Special dissertation grants could be available for years 4 or 5 on a competitive basis.**
- ** Other suggestions for increasing the quality and internal efficiency of colleges and universities within Indonesia including methods of defining productivity, expanded course credit systems, and accreditation of private college and universities are discussed in Chapter VII.**

III. Summary of Major Conclusions

Quality improvements, and changes in internal efficiency to support them, require a well-maintained data system, plus incentives at both the central and local levels to continually search for efficiencies, and to maintain a sustained effort.

This volume therefore gives attention both to methods for monitoring internal efficiency and implementing change, as well as offering several studies of some of the possible specific sources for improvements in internal efficiency within primary education, vocational and technical education, and higher education based on Indonesian data. The policy options are suggestions for discussion, since there are alternatives. For successful implementation a process of consensus building may be required.

Major overall conclusions and/or recommendations are that:

- (1.) To monitor the system for efficiency, and facilitate eventual decentralization of objective data-based responsibilities and accountability for funds and results, a comprehensive Efficiency-Based Management Information System (EMIS) including sets of Education Indicators to monitor efficiency and equality of educational opportunity is needed. Many, but not all, of the analytical capacities for this already exist in Jakarta. This needs to be refined and the EMIS system replicated in the rest of the provinces and adapted further to college and local additional Kabupaten as soon as possible.
- (2.) Potential sources for improvement in internal performance budgeting and performance financing which requires:
 - ** A more comprehensive financial transfer mechanism for MOEC that provides incentives at the local levels for internal efficiency and equity (See also Volume IV). This require more comprehensive data on all sources of funds supporting each pupil than exist at present.
 - ** Increased resource recovery in higher education and tuition waivers based on a more systematic financial need analysis system.
- (3.) High cost/effectiveness of investments in improving the quality of primary education warrants support for:
 - ** Use of better quality basic education texbooks and materials at no cost to at least all lower income children soon in grades 1-9 (see the

primary school study (Ch. VIII and also Volume I, Ch.1). The research referred to in Chapter VIII shows the vast discrepancies between urban and rural, and between wealthy and poor districts, which leads to enormous social costs later.

**** Improvement in the support for primary school teacher pay in the rural and remote areas.**

**** Greater student time-on-task (related to the financial transfer mechanism).**

**** Encouragement of principals to discuss with teachers the quality of their work, to meet with parents, and to cooperate academically with higher levels and other academic units.**

**** Increased participation of teachers, principals and parents in making educational choices and setting educational priorities.**

(4.) Further investigation or why VOTEC has low rates of return in some provinces, and high returns in others. This includes:

**** Identification in each locality of which of the three major possible sources of efficiency (or inefficiency) identified in Ch.V exist so that corrective action could then be taken.**

**** Apprenticeships in industry for those in VOTEC schools, a method which is known to work elsewhere to reduce job-search time (e.g., the dual system).**

**** Some VOTEC courses in senior secondary general schools. Both apprenticeships for VOTEC students and joint use of general education curricula are a means of reducing the taxpayer costs, reducing job-search time, and improving the quality through contact with general education curricula and with new technologies. (See also Volume I, Chapter I; Volume II external efficiency, and Chapter V on VOTEC above).**

(5.) In higher education, the length of time taken to complete what should be a four year bachelors degree and the cost of overseas training of PhD's both appear to be high.

**** Policy options such as requiring the universities to compute average cost per graduate in each field, higher tuition, the use of TA's and RA's, certification of private colleges, extension of the course credit system,**

and elimination of the SCRIPSI requirement are all suggested for correcting the first of these problems.

**** Sending students abroad only in fields where domestic Masters and Phd capacities are inadequate and requiring apprenticeship training and expeditious completion of foreign degree program are suggested as a solution to the second problem.**

- (6.) For effective implementation of improvements in internal efficiency and increased absorptive capacity, an implementation plan for the accomplishment of each change is needed. It should identify who has the responsibility and the authority, and also provide the necessary resources.

Improvements in internal efficiency, brought about by a continued monitoring of the system, decentralization of adequate objective data, performance budgeting, and implementation of some of the additional specific policy options suggested above, have the potential for increasing the learning that occurs and hence the human capital that is produced by education without increasing the costs. Total financial resources available to the public sector are limited, and increased internal efficiency, although it is always controversial because various stake holders are affected, is one important potential source for improvements in quality.

The analysis of data must be objective, and change can be both gradual and humane. Then improvements in internal efficiency, in turn, can increase the contribution of human resources to raising labor productivity. Subsequently gains in efficiency increase the public support for education. They also contribute as time passes to enhancement of culture and the quality of life in Indonesia.

References

- Okun, Arthur M. (1983). "Equal Rights but Unequal Incomes", Ch. VIII in The Economics of Policymaking, Ed. by Joseph A Peckman, Massachusetts Institute of Technology Press, Cambridge, pp. 595- 605.
- Okun, Arthur M. (1983). "Further Thoughts and Equality and Efficiency", *ibid*, pp. 606-629.
- Levin, Henry M. (1976). "Concepts of Economic Efficiency and Educational Production", Ch.4 in Education as an Industry, National Bureau of Economic Research, Ballinger Publishing Co., Cambridge Mass, pp. 149-191.
- McMahon, Walter W. (1992). "Efficiency and Equity", Chapter 1 in W.McMahon and Terry Geshe, Eds, Financing Education: Overcoming Inefficiency and Inequity, University of Illinois Press, Urbana, Chicago, and London.

Chapter II

ABSTRACT

An Efficiency-Based Management Information System: Adaptation to Local Conditions in Indonesia

Walter W. McMahon and Boediono

To monitor the effectiveness and efficiency of Indonesia's education system, and to formulate policies for its continuing improvement, an effective and modern Management Information System containing data for special studies and including a set of published Education Indicators that focus attention on critical issues is an essential element.

This chapter does not talk vaguely about information systems in general, but presents the rationale, design, and data sources for specific data series to be collected and maintained. It stresses consistent coverage of educational inputs, processes, outputs, and outcomes, key Indicators for achieving

- *Educational Effectiveness
- *Efficiency, and
- *Distributive Justice.

It also describes other types of analyses using these Indicators.

Many of the features of this Efficiency-Based Management Information System (EMIS) already exist in Jakarta. This chapter is written in such a way that it can be accessible and useful for adaptation of an EMIS system to Province and sub-province levels. The latter is one important element needed for further decentralization of objective, data-based decision making.

Chapter II

An Efficiency-Based Management Information System: Adaptation to Local Conditions in Indonesia*

In developing countries where resources are scarce, and the needs for improving the quality of life and skills of the population through education are great, sustained efforts to improve the effectiveness and efficiency of the education system are critically important. This increases the contribution education can make to economic and cultural development, to the productivity and welfare of individuals, and hence to the future of the nation.

I. Introduction

This chapter seeks to improve the effectiveness and efficiency of education systems in Indonesia by offering guidance for improving the effectiveness of the Management Information System (MIS) as it is extended to the Provinces and sub-province units. A good MIS supports objective data-based decisions and effective management of the education system which are required if the education system as a whole is to improve its effectiveness.

A Management Information System may be defined here to involve a well selected, computerized data base that maintains a number of important education indicators over time and other data, and is operated by personnel trained in education and in economic analysis. These persons then supply this data in the form of education indicators covering education trends and the effectiveness of education to decision makers and to the public.

As these indicators are used to monitor the accountability, effectiveness, and efficiency of the education system, the education system should steadily improve. Resources that would otherwise be wasted in ineffective uses are identified and become available to improve the quality of the existing education, and to extend educational opportunity to underserved groups.

The purpose of this chapter is to disseminate the methodology of data collection, analysis, and presentation by a good MIS System for use in

*This chapter is an adaptation to Indonesia of parts of a Handbook prepared by Walter W. McMahon for the International Institute for Education in Paris.

educational decisions and planning. The MIS techniques addressed can be applied not only in Indonesia but also to the needs and changing educational policies and issues throughout the developing world.

The chapter is addressed to a relatively broad public. It is intended for people who are, or who are about to be engaged in some phase of educational planning, policy making, or administration. This includes especially those Provinces wishing to set up a good, efficiency-based Management Information System, or to improve an existing MIS to make it more effective. It is also intended for others engaged in the analysis of education data.

Other sources are listed at the end of this Handbook which the reader can use to pursue aspects of the topics addressed. Particularly noteworthy is the book by Douglas Windham (1988), Indicators of Educational Effectiveness and Efficiency, which has pioneered in this field, and the book by Kenneth Ross and Lars Mähic (1990), Planning and the Quality of Education, which complements this volume by going more deeply into quality and the background of many of the issues involved. In the U.S., the National Center for Educational Statistics (1990) has issued a useful Guide to Improving the National Education Data System as well as a broadly defined set of education indicators in Education Counts (1991), which offer insight into the relatively more extensive systems typical of the industrialized countries. The Center for Educational Research and Innovation, OECD, Paris (1991) has issued a number of recent surveys in depth on various aspects of Education Indicator Systems and their comparability across countries. These studies offer new perspectives on International Education Indicators in the OECD nations. Attention here, however, will focus on the needs and uses in developing countries for modern MIS systems.

II. Conceptual Framework

Selection of which data series are to be collected and maintained in an Efficiency-Based Management Information System (EMIS), and the education and training appropriate to this (with career paths for those who collect, maintain, analyze, and publish the data series and studies) are critical. Since these are the two central issues addressed it is important that the conceptual framework, or how the information collected by the EMIS system relates to the theory, be introduced briefly.

To produce education indicators that reveal effectiveness and efficiency for use in monitoring and improving the system, it is necessary to report not just the raw data on outputs of the education system but also the ratio of the outputs to

the inputs, or to the resources used. Outputs, whether reporting quantity (e.g., students graduated) or quality of the education (e.g., problem solving ability and creativity), are only absolute measures and do not reveal the productivity or the efficiency of the process. Efficiency, on the other hand, is always a ratio, such as bachelors degrees granted relative to the cost (i.e., cost per degree, a cost-effectiveness ratio), or increments to the problem solving skills or creativity relative to the inputs used (a productivity measure).

A good Efficiency-Based Management Information System therefore must provide data series on ultimate outcomes, outputs, processes, and inputs that are consistent with one another in such a way that these efficiency ratios can be calculated.

*Ultimate Outcomes refer to measures of eventual outcomes from education, such as increments to productivity, earnings, reduced crime rates, and other nonmonetary satisfactions. These are illustrated in Figure 1. Nonmonetary contributions, which can be measured in quantitative terms but are difficult to place a value on in monetary terms, are represented within the white area inside the outer-dashed line. Contributions of education to Gross National Product which can be measured and also valued at market prices are represented by the shaded area plus the center of the circle. Nonmonetary benefits of education include contributions to community service, to culture, to better health, to lower population growth rates, to leisure time enjoyment, and to the strengthening of voter knowledge and political democracy. The contributions of education to labor productivity, or National Income Per Person Employed (and hence to GNP) in the shaded and center areas include the normal scope of manpower planning which is normally limited to specific skills and to the industrial sector, but also includes services and agriculture. These contributions to economic growth include effects on labor productivity, the diffusion of and adaptation to technology, job mobility, and the labor force participation and productivity of women.

*Outputs of education are those that are more immediate, such as students graduated, degrees, and increments to test scores.

*Process measures relate to the learning processes being conducted such as average daily attendance (ADA), students' time-on-task, or library use.

*Inputs relate to the real resources used in the process, such as number of teachers, qualifications of teachers, student time (as measured by foregone opportunities including earnings), books, and other teaching materials.

III. Definitions of Basic Terminology

A glossary of basic terms that are used throughout follows, and can be used for easy reference later if needed.

Effectiveness refers to measures of the degree of attainment of educational objectives. These are absolute measures of outputs (e.g., increments to test scores), of processes (e.g., average daily attendance), or of ultimate outcomes (e.g., community service, achievements of graduates).

Efficiency measures the ratio of effectiveness to cost (e.g., cost per instructional unit) or benefits to cost (e.g., value of outcomes such as earnings, relative to the cost of the educational investment).

Distributive justice, or equity involves the distribution of the benefits or costs, and whether or not this distribution is "just" or "equitable." It will usually be used here to refer to the distribution of the benefits of education among students (e.g., who gets the good quality education). Measures of inequality such as Gini coefficients or standard deviations are objective and scientific (i.e., nonnormative). But whether this distribution is right or wrong involves a value judgement about "justice" or "equity" based on philosophical or religious values, that then makes equity a normative concept.

A Management Information System is data collected about the operation of the education system and people trained to maintain, present, and analyze it. Indicators of effectiveness, efficiency, and equity are constructed from this data base that are vital in assisting educational administrators who monitor the system and to make objective decisions that will increase educational effectiveness and equity.

Internal efficiency (or production efficiency in the economists jargon) refers to the efficiency with which learning and other educational outcomes are "produced" within the schools.

External efficiency (or exchange efficiency to the economist) refers to the extent to which the schools are producing those outcomes or outputs that are desired by the society.

Labor productivity refers to output per worker. It is heavily dependent on the human capital skills and capacities of the worker that are developed by

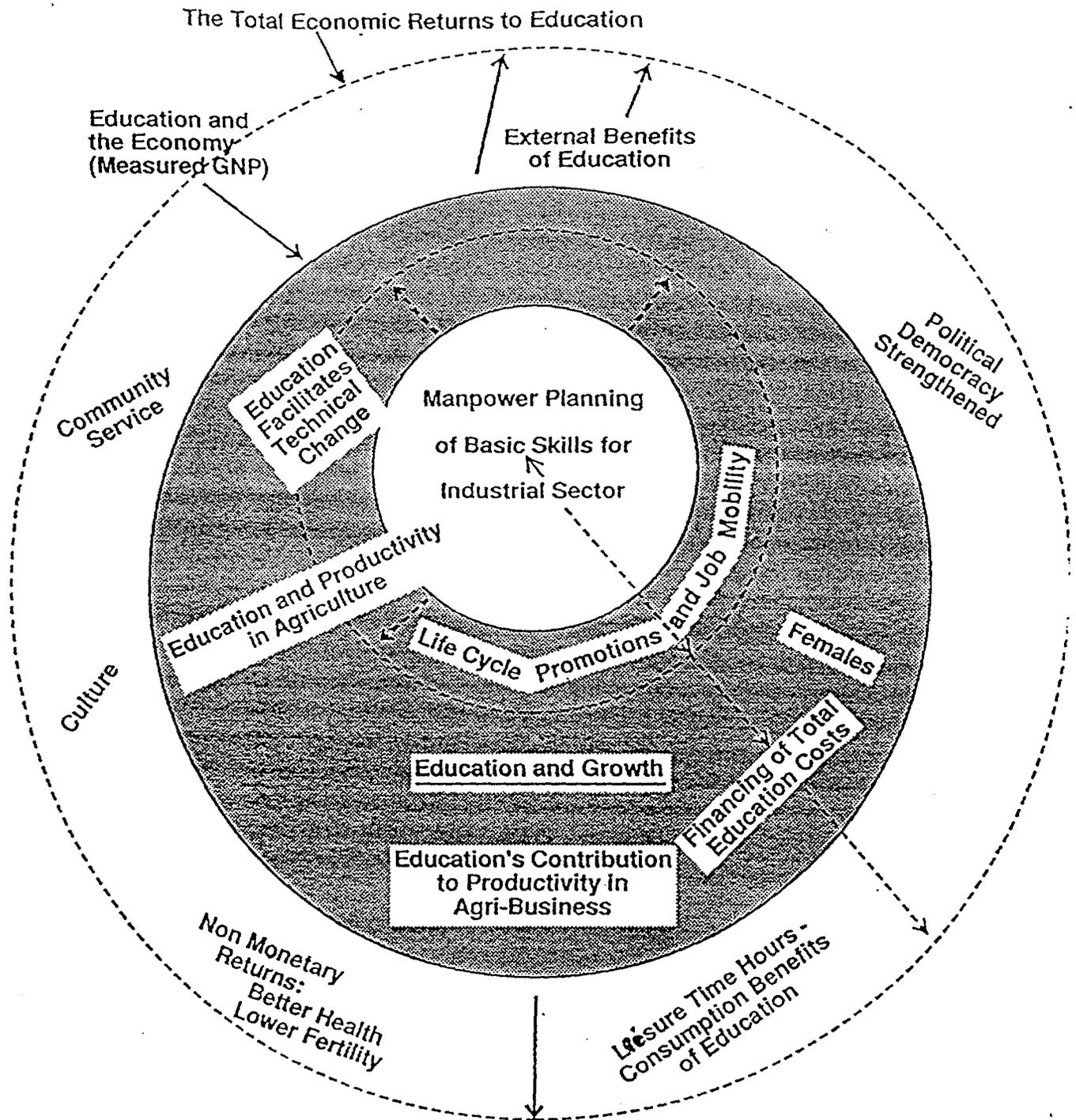


Figure 1

Illustration of Some of the Ultimate Outcomes of Education

education. But it also depends upon the physical capital or machinery per worker, and on technology which improves the techniques of production, management, and distribution of products and services. The effects of education on economic growth depend upon its effects on labor productivity and on the creation and diffusion of technology.

Cost Benefit is a measure of efficiency that applies when a value can be placed on the ultimate outcomes of education. The present value of the average increments to the earnings of graduates (which reflect increments to productivity, although not perfectly) relative to the cost of the last level of education associated with those earnings would be an example.

Cost Effectiveness is a measure of efficiency that applies when a value is not placed on the output. Examples include cost per instructional unit, or the educational investment cost per increment in math or reading comprehension test scores.

Rate of Return is a measure of efficiency that takes the life-cycle of benefits from education into account. It is that rate that discounts the stream of increments to future earnings attributable to education back to their present value and sets them equal to the educational investment cost. The social rate of return takes the full costs (including tax costs) and full benefits (before taxes) into account, and is the rate relevant to public decisions to invest in education. The private rate of return considers only private costs to the student or the family relative to private benefits after taxes, and is the rate relevant to the private decisions made by students and their families.

Intergenerational equity refers primarily to the presence or absence of intergenerational mobility. There is an absence if the children of the poor remain poor, and the children of the rich remain rich. This depends heavily on the degree of equality of educational opportunity, and in particular on access to reasonable quality senior secondary and higher education. In most developing countries there is very limited intergenerational mobility, and hence by common normative criteria a lack of intergenerational distributive justice.

IV. Quality, Effectiveness, and Efficiency

Each of these ultimate outcomes, outputs, processes, and inputs has both a quality and a quantity dimension. The quality of the inputs (e.g., the qualifications of the teachers) are important, and need to be monitored by indicators. But they will also be picked up to some extent in the measures of costs, or expenditure per pupil. It is especially important therefore to include in the education indicators some things that report trends in the quality of the outputs. But although all agree that the quality of education is important, it is also illusive and hard to define.

*Quality of an output of education usually means such things as contributions to rational thought processes and problem solving abilities, to incentives for life-time learning, to good judgment, and to creativity later. But an improvement in quality depends on the current quality when you start (e.g., simple literacy may be a more appropriate aspiration for poor rural schools, rather than contributions to creativity). Also quality can mean different things to different people, and in any event, is always more difficult to measure than is effectiveness.

*Effectiveness clearly refers only to outputs. It is also more concrete. It can generally be measured for school outputs (i.e., number of pupils graduated, multi-year test score increments, success later) or for intermediate outputs (e.g., test score increments in a one semester course). It is, however, an absolute measure.

*Cost and Resource Indicators are extremely important, but relatively meaningless unless developed in relation to the ultimate outcomes or absolute measures of effectiveness. Operating expenditure, for example, must be developed for each level of education. Then, for example, taken together with number of graduates, length of time to completion, number of pupils in ADA at these same levels, and number of credit hours, the cost per graduate, cost per pupil, and cost per credit hour can easily be computed.

*Cost/Effectiveness (and where possible, Cost/Benefit) ratios are the most powerful efficiency measures. These and related economic measures of the "productivity" of educational services are no longer a taboo issue among educationalists as understanding of their meaning and value spreads. An increase in the quality of education, or in its effectiveness, without increases in cost, results in a higher ratio of effectiveness to cost, and constitutes an increase in educational efficiency.

V. An Efficiency-Based Management Information System

The approach to data collection, and to the provision of data to educational administrators for use in making decisions, that involves "throwing everything into the data base, and all of the data into the report including the kitchen sink" is wasteful and ineffective. Developing countries (and industrial countries, for that matter) cannot afford to maintain and continually update data series that nobody uses. This is a waste of resources that could be used to improve the equality of the MIS system itself, and its effectiveness. Nor will many tables of uninterpreted raw data elicit the attention of policy makers. A modest degree of thoughtful analysis (e.g., trends and other comparisons of cost effectiveness ratios) is much more likely to get attention and have significant impact.

An Efficiency-Based Management Information System (EMIS) is defined to include data and capacities for developing meaningful education indicators for monitoring the system that accomplish the following:

*The data must describe the central features of the educational system consistently so analytical links can be made among components. Some of the statistics will be used as "indicators," and others as "variables" in research analyses. But in both cases consistency among the series (e.g., same years, same definitions over time, etc.) is important to their usefulness.

*The EMIS System must then develop a subset of strategic "education indicators" that are problem-oriented, and useful for monitoring the effectiveness and efficiency of the system. Specifically, the indicators should:

****Report effectiveness, costs, and cost effectiveness for monitoring accountability and efficiency,**

****Report equality of educational opportunity (or the lack thereof) for monitoring access and pupil equity (e.g., extension of opportunity to underserved areas can often be very cost effective).**

*The EMIS System should select and provide "indicators" that are policy-relevant. Some things can be changed more readily by education administrators and policy makers. Well-conceived indicators are more likely to gain attention and have an impact.

Later portions of this Handbook will deal with the kinds of education and training for EMIS personnel who are not to be just data collectors, but who also are to be able to do and actively engage in some analysis. The chapters that follow will also give attention to adaptation to local conditions, with large developing country and small country prototype models offered as examples toward that end.

VI. The Reasons Efficiency is Important

The theoretical framework focuses on uses intended to improve the effectiveness and efficiency of the educational system so that resources are not wasted. Instead they can be used to their best advantage in attaining improved quality and increased educational effectiveness.

The importance of improving the efficiency of educational systems derives not just from the immediate values of education per se, but also from the very important fact that expenditures are an investment with returns later. These returns occur throughout the life cycle of students as their productivity is raised, and as basic education permits a wider participation of individuals in the labor force that results in earnings that thereby reduce inequality, leading to a wider distribution of the gains from growth, and a stronger middle class. The education of women (once it extends beyond ninth grade) is also known to have very beneficial effects in lowering high fertility rates and in lowering high population growth rates. Given the national commitment of many countries to higher per capita growth, economic development, and improved distribution, and the other positive contributions of education to the lives of individuals, it is particularly important that education be effective and equitably distributed.

To maintain these contributions of education during periods of budget stringency, as well as to increase the effectiveness of education over time requires both internal efficiency and external efficiency as well as constructive innovation. The specific aspects of the theoretical framework that deal with the logic of how these factors can be evaluated and what data is needed to do this will be presented next in Part II.

VII. Selecting Indicators to Measure Efficiency

A basic step in increasing and monitoring effectiveness and efficiency is to maintain and use quantitative measures of what services are actually being delivered. This is almost an auditing function, but it is necessary to ensure simple accountability. These same measures then can be used, however, to achieve a second and higher level of efficiency, that of analysis of cost/effectiveness which considers the relative costs of the services delivered and whether or not they are the types that are most effective relative to cost.

The quantitative measures of services therefore have to be augmented with measures of their prices to determine their value. This process uses market signals of relative resource scarcity to determine resource costs. These costs in turn then have to be related to the outputs or outcomes as a ratio of costs to effectiveness. At this point there is a sound basis for determining meaningful trends in efficiency over time, as well as for comparisons with the experience in other provinces and in other countries; from this analysis should come insights for improving internal efficiency.

The final step necessary to achieving overall efficiency in strategies for investment in different levels and types of education are measures of the more ultimate outcomes or benefits of education. Internal data collected from within the education system must be supplemented with data collected from the external society nationwide by the central statistical office of the country (e.g., national household social and economic surveys, and labor market data) as well as by tracer studies. This data must not be limited to just the initial employment of graduates, but should stress earnings and other returns to education over their entire life cycles.

Data on students just after graduation is essential, but can be extremely misleading (since unemployment is a function of age) unless supplemented by what happens later in the life cycles. This is much simpler than it seems, because a great deal of this type of data has already been collected by the Central Bureau of Statistics (BPS) in the annual National Labor Force Surveys (SAKERNAS) and also in the National Household Social and Expenditure Surveys (SUSENAS). SUSENAS can be used to measure many ultimate outcomes of education (e.g., effects on the education and health of children, effects on fertility, effects on consumption behavior, effects on democratic participation, and other attitudes and behavior). All that is necessary is a request by the Ministry of Education to the Head of the Central Statistical Office requesting a copy of the data tapes from the most recent survey containing the raw data on individual's education, earnings, sex, and employment for use in educational planning.

Published data are totally unsatisfactory, and it is important to be persistent in requesting these data tapes. Although even the poorest countries (e.g., Nepal, Malawi, Bangladesh) have these government sponsored national labor force, household, and social surveys, sometimes it is difficult to obtain the tapes or diskettes, or the data may be inadequate. In these cases (as in all EMIS Systems), this data must be supplemented with tracer studies of graduates.

This data on ultimate outcomes is essential for improving external efficiency and in assisting the Ministry of Education to be responsive to the country's needs for knowledge of these outcomes in the desire to achieve growth and distributional equity. It also implements the vitally important concept that educational expenditures are not basically government assumption expenditures or a subsidy to the current real consumption of parents and children. They are instead an investment cost with returns later. Important parts of these ultimate returns include increased productivity, increased international competitiveness of exports, faster growth, and more widely shared development, and not just the nonmonetary returns mentioned in the preceding paragraph.

Indicators within this conceptual framework that are most helpful in monitoring the delivery of services, their efficiency, and the efficiency of investment strategies for human resource development consist of the following:

- (1) Inputs, such as the number of students in average daily attendance, number of teachers, teacher quality, operating expenditure at each level, teacher salaries, textbooks, textbook quality indicators (if any), textbook costs, and other fiscal resources, such as capital expenditure on classrooms.
- (2) Processes, such as number of years taken by students to complete each level (which with cost per year gives cycle costs), dropout rates, repetition rates, number of days per school year, number of hours per day, class size, and (hopefully) curriculum quality.
- (3) Outputs necessary to measure effectiveness, such as scores on achievement tests (needed at the beginning and end of each level to compute increments to test scores, or "value added"), numbers of graduates, number completing a partial course, and the effects of education on motivation and attitudes.
- (4) Final Outcomes, such as earnings, employment, unemployment, underemployment, job search time, emigration of graduates, health (as a function of education level), fertility rates (as a function of education), and data on nonmonetary outcomes of other types.

Overall economic efficiency of the educational system requires both internal efficiency as between inputs, processes, and outputs plus external efficiency which is concerned more with whether the outputs meet the larger society's needs. The economist's distinction between technical efficiency and price efficiency need not be stressed here because the cost/effectiveness and cost/benefit criteria developed as part of this conceptual framework already encompass both of these concepts.

Countries that have a declining population growth rate without coercion (such as Indonesia) can attribute this to an increasing percentage of females achieving education through ninth grade that gives females incentives to use family planning clinics. This leads to lower desired fertility rates. The result of this change is an average per capita growth rate that is higher, and less poverty due to large families.

There often is considerable inequality in the distribution of the benefits of education among the provinces in many developing countries, and especially as between urban and rural areas. In light of these apparent needs for economic growth, slower population growth, and for distributive justice, improved efficiency in human resource development, given that human resources are the largest underdeveloped resource, is a viable strategy and the one offering the greatest hope.

VIII. Selected Indicators of Effectiveness

Indicators of effectiveness are needed to cover, first, inputs and processes to ensure accountability in the delivery of services. Second, they also need to cover outputs and ultimate outcomes in order to provide a basis for evaluating (and improving) educational effectiveness and quality. Third, and very important for a good EMIS system, is that they include measures of efficiency, such as cost/effectiveness and cost/benefit indicators, and of equity so that the efficiency of the system and equality of economic opportunity can be improved. It is essential that the number of statistical data series included in this Efficiency-Based MIS be held to those that are the most critical for establishing the links and cost effectiveness between the costs or expenditure on inputs and outputs and ultimate outcomes.

Coverage

With respect to time period, annual data should be included for most series from 1965 through the present if possible. This permits linking to the 1965 benchmark data in the World Bank's Social Indicators (1987) and the World Development Report (1991, statistical appendix), as well as providing (just barely) enough observations to run time series regressions. It also is a suitable time frame for an eventual publication of Education Indicators for a country. However although annual data going back to 1965 is very desirable for purposes of research on the causal factors producing observed trends, this will not always be possible. It is important that unrealizable demands not be placed on data collection units. Education indicators for much shorter time periods combined with interpretative knowledge based on other research and experience will still have a great value for monitoring purposes.

With respect to geographic breakdown, it is suggested that all indicators be measured first on the basis of national totals. Beyond this, breakdowns of most series exist, and are needed by province, and by urban/rural categories within each province. To get urban/rural differences, a stratified random sample may sometimes be necessary (to include a major city in each province and a rural district in that province).

Further disaggregation that reports data at Kabupaten or by sub-provincial school administrative units is very desirable (e.g., for revealing efficiency of local units and pupil equity between schools). But this is more laborious, and although some series do need to be disaggregated to the Kabupaten level, and some kept in the computers at the school level (e.g., test scores, costs per pupil, average daily attendance), others are less strategic and do not need to be kept in the Central Government's EMIS system. The Provincial-level EMIS systems, and sub-province school administrative units including the local schools will normally maintain these same EMIS data series, but on a more localized level. Judgement in this matter however must be exercised, because to try to collect too much detail runs the risk of causing the whole MIS system to get bogged down in excessive detail, frustrating achievement of its main goal of supporting policy-relevant analysis.

Annual Education Indicators for the nation, with urban/rural breakdowns and breakdowns by Provinces, level, and type of school should be sufficient for establishing trends in the quantitative delivery of services and in cost effectiveness. These then can be calculated for international comparisons and province-wide means can be used as benchmarks for comparisons as needed later to particular local school situations.

IX. Input Indicators: Quantity, Quality, and Price

It is often necessary to judge the quality of a school or a university on the basis of the cost, quantity, and quality of its inputs, especially when there is no other information for use in evaluating processes and outcomes. Research in developing countries in 14 multivariate studies reported by Fuller (1987, pp. 259-72) finds that measures of simple inputs, especially those directly related to the instructional process, are consistently related to higher achievement. Student background and the assistance and encouragement provided by parents are important, of course (e.g., Coleman et al., 1966). But more recent research finds that this is less important in the developing countries where the parents have less to provide (see Heyneman's, Shuluka's, and Loxley's studies cited in Psacharopoulos and Woodhall, 1985, p. 217, that include Uganda, Kenya, Ghana, and Somalia for example). However, focusing on the 26 multivariate studies reviewed by Fuller (1987, pp. 257-73) that do control for prior achievement, and/or for inputs from the parents (using their social class as a proxy), the school inputs that are the most significant indicators of achievement are:

<u>Input Indicator</u>	<u>Number of Confirming Studies</u>
A. <u>Teacher quality</u> : Total years of schooling	12
B. <u>Teacher quality</u> : Years of college or in teacher training institutions	22
C. <u>Texts</u> and reading materials	16
D. <u>Library size</u> and activity	15
E. <u>School lunch programs</u> (reduced malnutrition and dropout)	5

Other input measures (apart from the process indicators considered below) do not appear to have effects on achievement that are as well established as those above. Attention therefore is focused on quantity, quality, and cost of the above inputs. Expenditures on "all other inputs" (some of which may be less

productive) will be included as a residual category, since total expenditure will also be collected and the input mix analyzed.

The list of specific statistical series on inputs suggested follows. These inputs include those above that research has established are effective, plus including some innovations that seem to have potential. A "(C)" following the description indicates that the data is probably already available on personal computer files, "(P)" indicates that its is probably available on paper worksheets or questionnaires, and "(N)" signifies that it is probably not yet available, at least without considerable work.

- 1) Number of teachers. Part-time teachers should be converted to full-time equivalents (FTE). This data should be by grade, and by sex, but to simplify could be at the primary level, secondary level, senior secondary level, senior secondary vocational, and college levels. The International Standard Classification of Education (ISCED) levels used by OECD, UNESCO, and many countries facilitate international comparisons, but can be created when data is maintained by grade (C).
- 2) Number of years of teachers' schooling. The average number of years of total formal schooling of persons teaching at each of the above levels (P).
- 3) Years of teachers' schooling that is at the post secondary level, or in teaching training institutions, at each level (P).
- 4) Average salary of teachers by qualifications, at each level (P).
- 5) Percent of teachers who are qualified vs. those underqualified (i.e., the percent possessing the academic and/or teacher training attainment appropriate to the assigned level, according to the Nation's standard at that level) (P).
- 6) Teacher shortages, or surpluses at each level. Supplementary data is often available from teacher placement offices and from those doing the planning in teacher training institutions. The urban-rural geographical breakdown is important (P).
- 7) Teacher specialization, especially the number of teachers at each level trained in mathematics and science. Overall surpluses of teachers can be accompanied by shortages that are acute in science and mathematics (P).

Sources of Data on Teachers: Those Ministries or Provincial offices that pay school teachers, have data on teacher pay scales, numbers of teachers, gender, and schooling levels. The percent qualified, and standards for qualifications are also normally there, and in research units in the Colleges of Education.

Rationale. Teachers are the major input in the process, and their qualifications are related to achievement. Most government pay systems reward higher levels of attainment, since higher levels of attainment give rise to better instruction and student achievement. The number of female teachers in the primary schools is very important to the retention of young girls in school, and to the utilization of bright young women for the country's development, so gender does need to be reported. To be efficient means that the marginal cost of the rewards for higher attainment qualifications must be offset by the increased marginal learning that occurs in the classrooms. If the rewards are insufficient, or excessive, teachers' qualifications are not being rewarded in relation to their productivity. These false pay-level signals lead to wasteful choices of occupation and uses of time by the teachers.

This input data will also allow the establishment of trends (e.g., in teacher schooling, especially at the critical primary school levels), and for international comparisons (e.g., of teachers' salaries relative to the nation's per capita GNP).

There are many other teacher-related indicators, e.g., attrition, turnover, and age (as a proxy for experience), ethnic/nationality, but their significance is less clear when the concern is with efficiency. Many cut both ways, are not of established significance, or are picked up by other indicators.

The above indicators must serve as proxies for the teachers' subject mastery, and the teachers' verbal communication ability, which are the characteristics that are critically important to student achievement. Anything that reduces the pool of bright young women qualified and wishing to enter teaching (e.g., few female teachers in the primary schools, as in Pakistan and Nepal for example, few women completing secondary schooling and low pay for teachers) adversely affects the verbal ability and subject mastery of the new entrants, and hence can adversely affect the efficiency (or ratio of effectiveness to costs) of the educational system.

Other very important inputs include the numbers and prior background of students, the quantity and quality of textbooks, and innovative instructional materials. More specifically:

- *8) **Number of Students in Average Daily Attendance (ADA).** This is a critical element as a basis for computing efficiency measures, for

monitoring the system, and for use in the financial transfer mechanism (or school aid formula providing for grants from the Central Government to the schools). It is essential because this is what provides incentives to the local schools to require attendance and follow up on absenteeism and dropouts. Initial school-year enrollments can be very misleading, and must be supplemented with attendance records. Mid-year attendance, and attendance records for some time late in the school year are needed at a minimum, from which an average attendance can be computed. This attendance data normally exists within every school, but attendance for a few sample days must be collected by the school inspectors, or other independent source, for use in allocating Central Government resources among schools (P).

- 9) Pupil background, measured in terms of the educational attainment of the parents (i.e., of adults age 20-35) in urban and rural areas. This is normally available from the Census data or from the National Labor Force Survey data tapes.

The inputs of the parents before and during school are important, and perhaps the educational attainment of the parents is the best proxy available. It is important to control for this prior achievement or at-home assistance. It is meaningless, for example, to hold that better financed urban schools produce better graduates than do low cost rural schools when the concern is with cost effectiveness. There must be controls for the beginning achievement level of the students and at least the potential help from the parent's education so that the focus can be on the "value-added" by the school in relation to its cost (C).

- 10) Numbers of textbooks available in local schools at each grade level. This matter of textbook availability (and textbook quality) is well established by research as a key determinant of educational effectiveness, and hence a key indicator (see Fuller, 1987) (P).
- 11) Quality of textbooks, difficult to measure without an assessment team. Suggested indicators are the teams' evaluation of the major reading, social studies, and mathematics textbooks used in each grade. Those responsible for securing textbooks can report: 1) when the texts were last revised, and 2) the annual level of donor plus government support for textbook adaptation and development (N).
- 12) Number of Books in the School Libraries. Some schools have no library, so the number will be zero. But this measure is appropriate for primary, secondary, and college level libraries and an aggregate of

the number of books at each level should be available from those responsible for the libraries (C).

- 13) Number of books and journals purchased for the libraries, since 1965. This is frequently an item cut back when financing becomes stringent, in spite of the fact that an up-to-date library is a vital instructional support and research support service. This should be a good indicator, obtainable at the above source (N).
- 14) Library Use. Number of students and/or faculty using each library. Since the pattern for many countries is for students and faculty to study in and use books in the library rather than to charge books out, data, where it exists, on the number of persons entering and using the libraries would be better than circulation data (N).
- 15) Innovations in Instructional Materials and Methods. Number of students reached through programmed instruction, since this is often a substitute when teacher qualifications are inadequate. Where there are other educational innovations, such as radio instruction, again an estimate needs to be made of the students actually reached in significant ways. Computerized instruction, television, and video cassettes are other examples. The best equipment is likely to be found in the wealthier urban areas. Education indicators based on use of novel equipment in isolated locations without a careful sample design are not likely to be very meaningful (N).
- 16) Number of children served by school lunch programs at primary, secondary, and college levels, especially in rural areas. Malnutrition is a serious cause of dropouts at the primary school level, and distances to and from school are large in rural areas. School lunch programs therefore can be viewed as a means of reducing this wastage. Also it is difficult for small children to travel longer distances (e.g., home for lunch), so school lunches are also a means of obtaining a somewhat longer school day, which is productive of greater educational achievement. Although justifiable at the primary and lower secondary levels, free or highly subsidized meals which are common at the college and university level are not productive. Subsidies at this level forego the opportunities for resource recovery from the few who can best afford to pay, and are very wasteful of scarce tax dollars (N).
- 17) Number of schools at each level, from which school size (number of students in ADA per school) can be computed. The relation between school size and cost effectiveness is very complex. Larger size makes possible greater specialization and division of labor among teachers,

leading to better quality outputs and economies of scale. But smaller size reduces travel distances for pupils, which are a problem in countries where there are fewer buses or other transportation alternatives in rural areas. Either bussing or smaller local schools are needed to reduce the implicit costs to students and parents and hence the dropout rates (C).

- 18) Number of desks, from which students per desk can be computed. This does appear to have a significant relation to achievement (e.g., Fuller, 1987, p. 260), even though most capital expenditures on school buildings cannot be shown to be related to achievement (N).
- 19) Number of classrooms, from which students per classroom can be computed. This data on schools, desks, and classrooms for each year, and the number added, can be used to monitor capital outlays (C).
- 20) Educational attainment of the school administrator, measured as the number of years of schooling of primary and secondary school headmasters and of college administrators. Administrative competence is important in determining the performance of the best and worst schools (a conclusion reached in separate studies by Paul, IEES, and by Glasman cited by Windham, 1988, p. 43). But it is hard to measure directly. Years of administrative skills and planning are also relevant to competence, but are not available on any consistent basis (P).
- 21) Current public operating expenditures for Education at public and at private institutions and at primary, junior secondary, senior secondary general, senior secondary vocational, and tertiary levels. This essential cost data should include both budgeted and actual (realized) outlays, by the Central government, outlays by the Provinces, and outlays by the local governments. The data for private schools is also important, but often is not available unless collected on a sample basis. Data on room and board subsidies to college students (which are significant in some countries at the secondary level) also needs to be collected and studied (C).
- 22) Private expenditures by parents on education at primary, secondary, and tertiary levels on tuition and fees, books, uniforms, and lunch. These fees and tuition contributions are a vitally important element in doing a logically coherent cost/effectiveness or cost/benefit analysis. Foregone earnings costs are also important and can be calculated from the earnings in the National Labor Force surveys described below in item #35. The most feasible way to calculate these costs is to do it on

a per student basis, for each of the levels of education indicated, as well as for urban/rural differences (N).

- 23) Capital expenditures by the government at public and private institutions. Data on capital expenditures separating buildings and equipment can be obtained, some of which are available from World Bank sources. This data needs to be broken down by level (primary, lower secondary, senior secondary, and higher education), as well as by Province and for urban/rural differences. The evidence that physical facilities have any significant connection to educational achievement is very limited, so fewer indicators are warranted (P).

There are many other measures of inputs that could be collected concerning facilities (e.g., labs), equipment (e.g., vocational/ technical metal and woodworking machines), and administrative capacities (e.g., number of secretaries). But they are less important than those listed above, meaning that they are less closely related to achievement and also it is less likely that they will be used in policy research.

X. Statistical Indicators of Effectiveness in Processes

From the extensive research on wastage and repetition carried out by UNESCO as summarized by Haddad (1979), it is evident that the problem of wastage and repetition is serious. High dropout rates after fifth grade, and moderately high repetition rates constitute serious sources of internal inefficiency. The higher education system in many developing countries is quite inefficient, since it often takes the average student 6.5 to 10 years to complete a 4-year bachelors degree, when tuition and fees are highly subsidized. There is normally little use made of teaching or research assistants, and the high subsidies usually go to students from high income families (see McMahon, 1988, and McMahon, Millot, and Eng, 1986). The result is that higher education cost per student is very expensive.

A device that can be used to estimate wastage is a flow chart that shows the progression rate between grades. With data on enrollment in each grade (e.g., grades 1 through 16), the enrollment in grade 6, for example, can be expressed as a percent of the enrollment in grade 1 six years earlier. The percent who did not make it to sixth grade have either dropped out, or are still repeating intermediate grades, constituting wastage and internal inefficiency.

The process indicators and other statistical data needed to support them are:

- 24) Dropout rates, especially for grades 1 through 12, from 1965. See also #26 (C).
- 25) Repetition rates, but see #26 (C).
- 26) Enrollment in grades 1 through 16, separately for general and vocational/technical schools, male and female, and at public and private institutions. This can be used to calculate progression rates, as described above. Since dropout and repetition rates are unlikely to be available, these progression rates are the best substitute. This should be compared to ADA (see indicator #8 above) (C).
- 27) Number of school days per year, not including holidays. When this is excessive, it can lead to much lost time (C).
- 28) Number of hours in the school day. Both of these are related to the length of the instructional program and student time-on-task. Research surveyed by Fuller (1987, p. 260) indicates this is very significantly related to achievement (P).
- 29) Number of years taken to complete the course by graduates, primary, secondary, and Bachelors Degree levels. This is a very important index of efficiency, or lack thereof, and is needed to compute cycle costs. It is available from tracer studies of students after graduation who are asked how long it took them to finish, and/or from studies of school records (C).

Homework frequency. It is unlikely that data on this over time can be found, and therefore it is not included in the list of indicators. But it is related to learning effectiveness (Fuller, op. cit., p. 260), and special studies are warranted.

There are many other process indicators that would be useful, but on which data is not normally collected by schools, preventing their inclusion. They incorporate a) involvement by administrators of parents in the educational process, b) pupil total time-on-task, c) teachers' expectations of pupil performance, d) teachers' time spent in class preparation, and e) teacher absenteeism, among others. In the absence of data on these processes, the assumption usually is that input measures such as the quality of the teachers and average daily attendance (ADA) can serve to some extent as proxies for these hard-to-measure processes (over time, and nationwide) that are related to achievement.

XI. Output Indicators

Input and process indicators, even though carefully chosen to be the items most clearly related to accountability and to effectiveness are still only lower level partial measures of the overall efficiency of the educational services delivered. The logic of any framework seeking cost effectiveness and efficiency requires that there also be measures of outputs, including 1) years of schooling attained, 2) achievement effects, 3) attitudinal effects, and 4) equity effects, as well as measures of the more ultimate outcomes. At this point the costs of the inputs, calculated from the input indicators, can be related to what the schools and colleges actually produce. The results are much more powerful efficiency indicators that employ economic criteria for monitoring the cost/effectiveness and cost/benefits of the system. This in turn results in a larger potential contribution made to individual and societal development for the amount the country invests in human capital formation.

Output indicators that need to be collected include:

- 30) Number of graduates, at primary, secondary, bachelors, and higher levels, male and female, at public schools and colleges. Progression rates based on enrollment also measure attainment, but they are under the heading of "process indicators" because of their use in measuring wastage. But the number graduating from primary, junior secondary, senior secondary, and college levels can differ from the number enrolled (C).
- 31) Number graduates of private schools, at each of the above levels (C).
- 32) Test scores on nationwide standardized tests, by school. These exam scores are often available at the primary level in the Education Office in each Province, and the junior secondary and senior secondary exam scores are available in the national Testing Center. Although these school-leaving exams are not perfect measures of knowledge or achievement, they are a very useful indicator. So long as they are not used as the sole basis for evaluation, achievement test results are a vital element in improving the quality and cost effectiveness of local schools. It is therefore important that the increments to these examination scores be calculated at each level, and related to the costs at each level (P).

- 33) Equality of Educational Opportunity: The Distribution of Expenditure Per Pupil Among Levels of Education, By Type of Education, Among Provinces and Among Schools. A Gini coefficient measuring the degree of inequality (see Windham, 1988, pp. 175-6) is the best summary measure and could be reported over time as an equality of educational opportunity indicator. It can be calculated later if the data collected shows the number of pupils attending schools in each quintile of expenditure (i.e., expenditure per pupil divided into five equal amounts). (C, but must be computed.)
- 34) Equity: The Distribution of Achievement Levels Among Pupils. Again the Gini coefficient of inequality is probably the best single measure. It can be calculated later if the data shows the number of pupils within each range of test scores. (P, but must be computed.)

XII. Ultimate Outcome Indicators

Although there are influences other than education that affect ultimate outcomes such as earnings, many of these influences such as pure chance net out when averages are computed. A preponderance of the 16 more recent research studies surveyed by McMahon (in McMahon and Geske, 1982, pp. 181-2) find that the proportion of earnings differences due to education (the alpha coefficient), after controlling for ability and averaging out various other factors, is overall about 90 percent, and even closer to 100 percent if the primary level is taken alone.

The time lags in the process that connects education now to employment and earnings later is clear evidence that the direction of causation flows from education to earnings, not the other way around. It is simultaneously true however that larger earnings by parents later result in a larger investment in the education of their children, which is a feedback through the "social demand" for education.

As a final step, the ultimate outcomes of employment, earnings, and better health are a major part of increased productivity where averages of groups of individuals are involved. The connection between educational investment and productivity growth--skipping intermediate issues about earnings--has been found to be highly significant for farmers (see M. Lockheed in Psacharopoulos, 1987) and for investment in education in Africa (see McMahon, 1987, p. 189). The contribution of education to productivity undoubtedly would be greater however if the internal and external efficiency of the educational system could be improved.

Within this framework, the measures of final outcomes needed are as follows:

- 35) Earnings, by Education Level, by Age, by Sex, available in most countries from the National Labor Force survey data tapes from the Central Bureau of Statistics, established with the assistance of the ILO (C).
- 36) Employment, by Education Level, by Age, by Sex, *ibid.* (C).
- 37) Unemployment, by Education Level and Type, by Age, *ibid.* (C).
- 38) Underemployment, by Education Level, by Age, *ibid.* (C).
- 39) Number of children, by Education Level of the Mother, *ibid.* (C).

The data tapes normally contain many thousands of individuals, and the data can be broken down by Province, and by urban/rural, but not by local school.

There are other measures of outcomes that are sometimes used, such as admission to and achievement in higher levels of education. But as pointed out by Windham (1988, pp. 80-81) there are major possibilities for error if these data are reported. The decision to continue into postsecondary levels is more dependent on the parents' income than anything else, for example, and can be a very misleading indicator of a school's effectiveness. It is better to have data on what happens to all persons after they leave school or college (as in #35-#39 above). Subsequent education as an indicator of educational outcomes will therefore be omitted.

Similarly, there are various effects of education on attitudes, as well as external spillover benefits to the society. The latter can be either monetary or nonmonetary, but they should not be confused with nonmonetary private satisfactions received by the individual. The distinguishing characteristic about externalities is that they are not and cannot be captured by the individual. Research on externalities reviewed by McMahon in "Externalities in Education" in Psacharopoulos ed. (1988, pp. 133-7) indicate many types, among which three are of particular relevance. It therefore is desirable to include these three among the output indicators. They are:

- 40) Expenditure on research relevant to solving the Nation's problems, done at higher education institutions. This problem-solving research generates externalities that aid development, but it also leads to benefits that are not fully captured within the pay scales of graduates,

or during the lifetime of individual researchers. Yet this is a major output of higher educational institutions that must not be ignored.

To measure this it is suggested that attention be confined to the financing of user driven research at the higher educational institution(s). By user-driven research is meant grants and contracts for the solution of clearly defined problems made by the central government, by donors, and by private firms to faculty at higher education institutions. Nonuser-driven research is less likely to be relevant to the nation's development needs. It is useful in keeping faculty up-to-date, but it is much harder to separate out from other operational expenditures. The data needed here cover:

- a) Grant/contract research expenditures, since 1965 from the director of Higher Education (P).
 - b) Number of full-time-equivalent research workers supported by these funds, from the same source (P).
- 41) Enhanced productivity. Here growth in real Gross National Product per capita (World Bank 1992), Gross Domestic Investment in physical capital as a percent of GNP (ibid.), and total investment in education (i.e., human capital formation) as a percent of GNP are particularly meaningful indicators for international comparisons. These time series for 1965 onward can also be analyzed via cross section analysis across nations by regression methods (N).
- 42) Development of political democracy. As Jefferson pointed out, the education of farmers is a critical element for the maintenance of an intelligent electorate and effective democracy. There is no good single indicator for democratization. However sometimes data exists on:
- a) The number of locally elected school boards, or school committees (N).
 - b) Courses in the secondary schools on government (N).
 - c) Community service, such as participation of graduates on citizen boards and commissions appointed by local governments, or graduates elected to office (N).

XIII. Institutionalization and Data Sources

Apart from data collection, an important objective continues to be institution building. This requires selection and development of the capacities of the staff to analyze the data, including the regular computation of education indicators for use in monitoring the cost effectiveness of the system. The staff should also be able to do studies that formulate policies on a contingency basis designed to maintain and improve efficiency.

For this purpose, the EMIS system needs to have the clear support of the Minister, and of the Provincial Government, to collect and organize the data, and to cooperate with other units to analyze the results and to recommend policies on a continuing basis. This is much better than in some countries where the task of developing education indicators and policy studies has been delegated to a separate office or person responsible for "relating to donors." This latter arrangement is quite hopeless for developing a continuing Efficiency-Based Management Information System or for developing and implementing policies designed to improve efficiency.

The data bank on which an Efficiency-Based MIS System draws uses data from standard statistical sources as well as data already computerized within branches of the Education Ministry. The data bank should seek to include and supplement data from the World Development Report (1992), National economic data, International Monetary fund data on Government Finances, and the World Bank's Social Indicators of Development (1987), pp. 3-10). UNESCO publications are also widely available. In particular, there is UNESCO's (1991) World Education 1991, which is a compilation of the UNESCO Statistical Division's work with over 100 countries, and there are often USAID and World Bank Education Sector Reviews that provide a base. But these data need to be continually updated and supplemented with internal data by the EMIS System.

For example, within the Ministry of Education, those responsible for administering the educational grants to localities (i.e., the financial transfer mechanism or school aid formula) must have data on average daily attendance, local financial resources, per pupil unit costs, and total financial support available that is continually updated. For another example, the data external to the education system on employment and earnings must be for individuals (not for enterprises) and must be obtained annually from the National Labor Force Survey and from new and continuing waves of social surveys conducted by others. The nation's National Household Income and Expenditure Survey normally contains no information about individual earnings, but it does contain family consumption expenditures, private expenditures on education, and employment.

XIV. Selection and Training of Personnel

For the purpose of building a longer run institutional capability for analyzing the data collected, for monitoring the system, and for recommending policies, it is desirable that some of the persons collecting the data have advanced formal training in the economics of education. Others can be trained in survey research methods, educational statistical analysis, and educational finance, and integrated over time. Some with good potential can be sent for advanced training (with bilateral, multi-lateral, or other donor support) in Efficiency-Based Management Information Systems, in the Economics of Education, and in Educational Planning and Policy Studies at the Masters and Ph.D. levels. The combination of the charge to analyze the data and use it effectively, together with some encouragement and potential for longer term training and advancement, should help significantly in building stronger institutional capability.

X.V. Effectiveness Indicators

The measures of educational inputs, processes, outputs, and outcomes defined and discussed above are essentially raw descriptive data. They cover such things as the number of pupils, teachers, schools, and costs, or the outputs of degrees, measures of amounts learned given by test scores, and earnings and employability after graduation.

To move to indicators of educational effectiveness, efficiency, and equity for purposes of monitoring the system, it is necessary to compute strategic increments as well as simple ratios of effectiveness to costs. These measures of efficiency then can be compared over time as an Education Indicator, as well as among nations to secure guidelines on where the education system is working well and where it is in need of improvement.

Considering education outputs and incremental outcomes, a couple of measures of effectiveness might be suggested by way of illustration. Educational effectiveness is reflected in test scores and in increments to mean earnings, for example:

Sample Effectiveness Indicators

Level of School Completed	Test Scores Reading ; Math ; Science ; Comprehensive	Net Earnings Differentials
<u>EXAMPLES:</u>		
Primary		Year 6-0
Jr. Secondary	EBTINAS	Year 9-6
High School	College Entrance Exam	Year 12-9
Bachelors	Graduate Record Exam	Year 16-12
Masters, etc.	N.A.	Year 18-16

These test scores in reading, math, science, and comprehensive scores can be compared over time among groups (e.g., urban/rural), among provinces, or even among schools to monitor effectiveness. However increments to test scores must be computed, subtracting the score at entry (perhaps using a different exam, with a conversion formula) from the score at the time the student leaves that level in order to compute the "value added" by that level of schooling. Anything that simply measures the achievements of graduates of a particular school without controlling for the achievement test scores of the students admitted reflects primarily the wealth of the parents (or the quality of the prior schooling) and hence is largely meaningless in determining the effectiveness, much less the cost effectiveness, of any particular school.

For international comparisons, the Cambridge Exam scores are comparable across ex-British colonies, the Bachelaurate exam scores across ex-French colonies, and the Stockholm test score center might be able to aid with conversions of EBTINAS scores and other kinds of international comparisons.

XVI. Efficiency Indicators

Cost effectiveness, cost/benefit, and rate of return indicators are a crucial part of the indicator set in an Efficiency-Based Management Information System because these are the only indicators that monitor efficiency. Other indicators in the set monitor inputs, processes, or effectiveness (e.g., average daily attendance, or time-on-task) to achieve accountability without which there cannot be efficiency.

But indicators of accountability are not ratios of outcomes to costs, and are therefore only components of efficiency. Cost/ effectiveness, cost/benefit, and rates of return are ratios of outcomes or returns to costs, and are therefore higher level indicators of efficiency. We therefore will regard these (and Equity indicators) as part of the basic indicator set and discuss other interpretive analyses that can be performed with this indicator set in Sections IV through VII below.

Efficiency indicators require the calculation of the ratios of effectiveness to costs. For example:

Cost/Effectiveness Measures:

- * Mean test score increments/unit costs per pupil
- * Degrees granted/cycle costs

Cost/Benefit Measures:

- * Present value of mean net earnings differential/
total cost of completing the level in question
- * Primary rates of return (discussed below)
- * Social rates of return (discussed below)
- * Increments to quality/cost of improving quality

XVII. Equity Indicators

To monitor the degree of equality of educational opportunity among pupils, several indicators can be suggested:

- *Expenditure per pupil, urban vs. rural, and by school districts (perhaps grouped by deciles). This is needed in decentralized educational systems, since local expenditures per pupil reflects primarily local wealth. Other refinements to measure horizontal and vertical equity among pupils are possible, but they quickly become so complex that they are not easily understandable to the public.
- *Books per pupil, by schools, or districts, grouped by decile.
- *Pupils per teacher, by schools, or by districts, grouped by decile. This is needed in centralized education systems, since teachers often are able to transfer out of the underserved areas.

XVIII. Analysis of Trends

The analyses actually performed can depend on preliminary judgments about where the largest gains in efficiency and equity are likely to be achieved. There follow a few suggestions about several possible types of analyses.

Growth in Trends in the Quantities of Public Education Provided in Relation to the Growth of Expenditure. Measures such as the number of pupils (in ADA), number of teachers (FTE), and number of textbooks per pupil can be expressed relative to the real expenditure on each. This can help to establish trends over time, permit international comparisons, and facilitate monitoring. Much of the analysis needs to be on a per pupil in ADA basis, and to thereby take into account the effects of population growth.

Recent research finds that it is only after the education of females gets beyond eighth or ninth grade, so that they have options available other than work in agriculture, that fertility rates start to fall. Before that level, the converse is true; as women get a small additional amount of education, the health of their children and survival rates improve but fertility is unaffected, so that population

growth rises. Indonesia, for example, is at a very fortunate stage in relation to most developing countries in Africa, Latin America, and South Asia in that it has now achieved virtually universal primary education of women. But trends of falling expenditure per pupil in some developing countries (and deteriorating quality), can sometimes be due to continuing rapid population growth.

Financing arrangements often encourage great inefficiency and wastage. For example, if education grants by the Central Government to local schools are not on the basis of the number of children in average daily attendance, but instead pay teachers' salaries directly, the incentive to maintain attendance is weak. One study in each developing country should focus on the relationship between the financing formula currently used and inefficiency due to high drop out rates and high cycle costs.

XIX. Improving Cost/Effectiveness

Studies of cost/effectiveness across provinces and over time need to be the subject of short policy papers. Cost effectiveness analyses go beyond the steps to improve effectiveness based on the indicators in Part I above by adding considerations of educational costs, and relating these to the output measures. The result is a much more powerful tool for improving efficiency.

Data on costs, taken in isolation, are largely meaningless. Some activities that are high cost may be very cost/effective, and activities that are low cost can also be quite cost ineffective and wasteful. The primary purpose of cost analysis is to produce cost figures for use with effectiveness and various benefit measures. The result is a set of indicators of educational efficiency. For recent surveys of the literature, see Tsang (1988) and Haddad, et al. (1991). Teacher cost per student, cost for achieving a given level of knowledge as indicated by test scores, or cost per graduate can be very revealing when compared across schools at a given level if the schools are in comparable situations.

X X. Analyses Using Indicators of Efficiency

The social rate of return relates the cycle-cost of the education at any given level to the earnings outcomes. This is a more refined type of benefit/cost analysis. It takes the life cycle into account and discounts future returns back to their present value. By applying the Statistical Package for the Social Sciences (SPSS), the necessary breakdowns of mean earnings can be obtained from National Labor Force survey data for individuals with different levels of education. What is needed is a breakdown of earnings, by age, by sex, by industry (or occupation including farm/nonfarm).

The earnings data for ten year age intervals at each education level then can be inserted in a data diskette available from the author and used with LOTUS to compute all of the relevant cost/benefit ratios. These social rates of return serve as relatively sophisticated efficiency indicators.

The method of calculation is described in detail in McMahon, Millot, and Eng (1986, pp. 214-233). Care must be used both to sort the data, controlling for various sources of bias, and in interpreting the results. Rural earnings are not good measures of the contribution of education to agricultural productivity, for example, since farm prices often are artificially depressed by governments and since many farmers grow their own food. However, persons living in rural areas can be sorted out in the data and considered separately. There are other surveys of the contribution of education to agricultural productivity (using physical measures of farm output) that find social rates of return to education to be in the range of 27-29 percent in agriculture. (See the recent survey of the research findings by M. Lockheed in Psacharopoulos, ed., 1988, pp. 110-116).

If used with discretion and thoughtfulness, these rates of return can be compared over time, across countries, and related to achieving more efficient investment strategies designed to attain faster economic growth. For example, extensive analyses of the rates of return to the different levels and types of education in Indonesia have been completed for 1982, 1986, 1987, 1988, and 1989 for the nation and by Provinces by McMahon and Boediono (1992a, 1992b). They suggest the high returns in relation to the costs available from the new goal of "Universal Basic Education" as well as the advisability of expanding secondary vocational education somewhat more slowly. Manpower requirements planning approaches in Indonesia draw on this same data base, but since manpower planning does not consider the costs of the various alternatives, or the prospective returns throughout later ages in the life cycle, it is not an efficiency measure and needs fine tuning by use of cost benefit analysis (ibid., 1992b).

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XXI. Production Function Studies

A fourth type of analysis that can be done using these data series is the estimation of education production functions which relate inputs (e.g., of teacher time, student time-on-task, textbooks, financial resources invested) to outputs (e.g., numbers of graduates, achievement test scores) and/or to ultimate outcomes (e.g., to earnings and employment). There are three levels at which these input/output relationships can be analyzed, those relevant to internal efficiency, to external efficiency, and to efficient investment strategies. A few suggestions relevant to each follow.

First, the relationship is quite complex since factors related to the students' background such as ability and the amount of educational assistance contributed by the parents is very important. If the purpose is to evaluate the effectiveness with which individual schools or school districts use resources, such production function studies should not be conducted unless measures have been obtained during the data collection process on the initial ability level of the students in the school and/or the educational/economic capacities of the parents. Then the "value added" (e.g., the increment to achievement test scores, indicator #32) can be made the dependent variable, and/or the parents' education level (indicator #9) or socioeconomic status can be inserted in the production function to control for the influence of this factor. See Psacharopoulos and Woodhall (1985, pp. 215-224) for further discussion, and Fuller (1987) for some excellent examples. Where nationwide production functions are used to explain productivity growth, as in McMahon's (1987) study of 30 Anglophone and Francophone African countries, these controls for differences in parental inputs are not necessary, but controls for investment in physical capital in particular as well as for the shorter run impacts of recessions emphatically are necessary. No production function studies without these controls are worthy of policy attention.

Second, there must be a large enough number of observations to meet the requirements of sampling theory. For this reason, the key variables to be used must cover the entire period from 1960 through the present. The cross section and time series data sometimes can be pooled to increase the number of observations, but there are also some costs of doing this.

Third, internal production functions relevant to interval efficiency can then express outputs (such as numbers of graduates or achievement levels which reflect education services delivered) as a function of teachers, the education level of teachers, textbook availability, and other inputs while controlling for the students' prior achievement levels and the parents' education.

Fourth, a derivative of the rate of return formula can use the log of earnings as a measure of one ultimate outcome and express this as a function of the number of years of schooling, experience, experience times schooling, experience squared (using age to measure this), and weeks worked. This is a Mincer earnings function, and is an alternative method of estimating the rate of return to investment in education from the microeconomic data.

Finally, an aggregate production function can be estimated where the dependent variable is the rate of growth of real gross domestic product. The explanatory variables then would be investment in physical capital as a percent of GDP (indicator #41), investment in primary, secondary, and higher education separately, all as a percent of GDP (from indicator #21 above), and employment (from the World Development Report (1988, p. 282)). This method is described further by McMahan (1987). It gets at the crucial net contribution of investment in education at each level to per capita economic growth.

Other kinds of analyses can be designed to improve the efficiency with which financial resources are used to produce effective educational outcomes. Excessive subsidies to students in higher education can be associated with excessively long times taken to complete standard degree programs, for example. Low tuition also increases the number of students seeking admission, and the number of college graduates who may remain unemployed.

There is a great opportunity in use of an EMIS system to improve the efficiency of the human resource development system in developing countries. However, the research and policy staff must have the interest, the background, and the support for a longer term commitment. Then an Efficiency-Based Management Information System (EMIS) can be institutionalized, and can continue to be effective in steadily improving the efficiency and equity of the educational system.

XXII. Criteria for Adaptation to Local Conditions

In collecting, maintaining, and analyzing the 25 Indicators from the list for the Provincial-level EMIS, or the 42 Indicators for the Central Government EMIS, the availability of data and the reliability of that data will be a limiting factor.

It is suggested, for example, that the goal be to collect all data series back to 1965 and up through the present in order to provide a long enough time span of comparable data for meaningful analysis. But this will not be possible for some of the series, which then should start as soon after 1965 as is possible given what is available.

Key Substantive Criteria

Certain data series will be more difficult to obtain, but warrant a much larger effort because of their strategic significance. These include:

*Output/Outcome Measures:

Earnings, by education level, by age (#35)

Test scores by education level (#32)

Distribution of test scores by urban/rural, and by per capita income of the district (#34)

*Process Measures:

Average Daily Attendance, ADA, by grade (#8)

Number of years taken to complete each school level or degree (#29)

*Input Measures:

Operating expenditure per pupil (#21)

Distribution of expenditure per pupil by decile, and by urban/rural (#33)

Private expenditures by parents for children's education (#22)

From these measures, key ratios, or indicators of effectiveness, efficiency, and equality of educational opportunity can be computed and published as a basic means of monitoring the accountability and efficiency of the system.

Data Sources and Related Criteria

Other criteria for adaptation to Province and Kabupaton levels are less strategic than the effort applied to obtaining and using the above indicators. Most sources and related criteria are of a relatively practical nature:

- *Many indicators are available from easily-accessed international publications (e.g., International Monetary Fund (1991) Government Statistics, World Bank (1992) World Development Report, etc.
- *Essential data on earnings of individuals and unemployment, by education level, need to be obtained on data tapes or diskettes from the Central Statistical Office National Labor Force Survey, and Central Bank Household Expenditures Survey (for the Consumer Price Index). The latter will also be useful for obtaining parents' expenditure on tuition, fees, books, and uniforms.
- *Most of the remaining data can be assembled from within the Ministry of Education and Provincial offices. Its reliability must be carefully monitored.
- *Data on average daily attendance (ADA) must be obtained through unannounced visits by the school inspectors to local schools, from the teachers directly, on a sample basis (e.g., selected days).
- *Test scores and other outcome measures are often available from the national testing center.
- *Cost data are extremely important. They often will require some special study and one person designated to collect and maintain them. Budgeted expenditure per pupil needs to be compared to the amounts actually spent.
- *Special survey-research data should be saved in machine readable form together with the file descriptions as part of the data bank.

XXIII. The Central EMIS and Provincial/Local Models

The model for a Province or Kabupaten consists only of those 25 indicators from the list in the following section (Part III) that are marked with an asterisk as the most essential. The major aspect of adaptation, and the main one governing the size of the task, is the decision regarding the degree of disaggregation. Data on earnings, unemployment, and test scores must be for individuals, which is why it is essential to get the data tapes, and not use published tables. But this is the way the data are collected and normally available (with some effort) from the Central Statistical Office and National Testing Centers.

It is obviously desirable to have most of the other education data available by school. But it is better to start with national totals, over time (1965 to the present, annually), and then get this broken down by Province, by urban/rural, and in other dimensions. The micro data on individual schools will require more effort. Most Provinces and some localities should now have personal computers. They need persons trained for the EMIS system in the use of SPSS-PC, LOTUS, SAS, or similar and complementary software packages (as been done by EPP at the pilot sites). Personal computers with hard disks that have considerable storage space should be sufficient for the Smaller Country Prototype EMIS system. Larger countries need to plan to secure a mainframe computer, if they do not already have one in operation in the Education Ministry for the Larger Country Prototype EMIS system.

XXIV. Input Indicators Subset (*)

Following each indicator, its most likely location in the Ministry of Education's data, or elsewhere, is again indicated by the following symbols:

- (C) = Probably on a personal computer already.
- (P) = Paper records not yet tabulated on the computer. School level data is often in this form. Attendance records are kept at the local school level, for example, but they often have not been sampled for the purpose of collecting consistent attendance data.
- (N) = Not available, except perhaps in preliminary form in Education Sector Assessments.

Asterisks designate the subset of indicators for the Province/sub-province Prototype model:

- *1. Number of teachers (C)
- *2. Number of years of teachers' schooling (P)
- *3. Number of years of teachers' schooling that is either in teacher training institutions or post secondary (P)
- *4. Average salary of teachers by qualifications (N)
5. Percent of teachers who are "qualified" (P)
- *6. Teacher shortages (or surpluses) (in the demand-supply model)
7. Teachers specializing in math or science (P)
- *8. Number of students in ADA per school (P)
- *9. Educational attainment of the parents in each school (C)
- *10. Numbers of textbooks, and their urban/rural distribution (P)
11. Quality of textbooks (N)
12. Number of books in the school (college) library (C)
13. Number of books purchased for the library (N)
- *14. Library use--number of persons (N)
15. Innovations in instructional materials (N)
- *16. Number of children served by school lunch programs (N)
17. Number of schools (based on special studies of particular types of schools) (C)
18. Number of desks (N)
19. Number of classrooms (C)
20. Number of years of schooling of the school administrator (P)
- *21. Current public operating expenditures for education at each level at public and at private institutions (public institutions only) (C)
- *22. Private expenditures by parents on education (N)
- *23. Capital expenditures by government on buildings and on equipment can be obtained (P)

XX V. Process Indicators Subset (*)

- *24. Dropout rates (C)
- *25. Repetition rates (C)
- *26. Enrollment in all grades, public and private schools, male and female (or else gender ratios) (C)
- *27. Number of school days per year (C)
- 28. Number of hours in the school day (school regulations) (P)
- *29. Number of years taken to complete primary, secondary, and college (bachelors) levels (C)

XXVI. Output Indicators Subset (*)

- *30. Number of graduates at primary, secondary, and higher levels, public (C)
- *31. Number of graduates at each level, private (C)
- *32. Test scores on national examinations (P)
- *33. Distribution of expenditure per pupil, including urban/rural (C)
- *34. Distribution of achievement levels among pupils (can be computed from the raw data on test scores above) by urban/rural, and by per capita income of the school district (P)

XXVII. Ultimate Outcome Indicators Subset (*)

- *35. Earnings by education level by age, sex, and urban/rural (C), National Labor Force surveys, Central Bureau of Statistics
- 36. Employment by education level (C) *ibid.*
- 37. Unemployment (C) *ibid.*
- *38. Underemployment by age and by level of education from 0 through 16 (C), *ibid.*
- 39. Number of children by education level of the mother (C) can be computed from these national averages.
- 40. Research grants and contracts in higher education (P)
- 41. GDP and Gross domestic investment (in physical capital) (C)

42. Number of locally elected school boards Kabupaten Councils, or committees with the power to allocate funds to the schools, or set a local property tax (N)

XXVIII. Efficiency and Equity Indicators

The following can be compared over time, by level and type of school, geographically by school, urban/rural, or province, or internationally to monitor the efficiency and equity of the education system:

43. Cost/Effectiveness Indicators of processes, outputs, or outcomes
44. Cost/Benefit Indicators of ultimate outcomes
45. Equity Indicators of the equality of educational opportunity and distributive justice

In summary, adaptation to conditions at the Province and sub-province levels requires a clear eye on what measures and what education indicators are most important. The limited resources available then can be used to measure these more strategic features of the system first. Then the degree of disaggregation of the data to be maintained must be decided upon. This decision can vastly complicate the task unless great care is used. It also depends upon the size of the computer facilities available to the EMIS system, the number of trained staff, and the amount of support from the top administration for building and improving the EMIS system. Given these priorities and adaptations, the data series for the Provincial or the Central Government Prototype models to be collected, maintained, and used to produce published Education Indicators for monitoring efficiency or equity then are suggested.

XXIX. Conclusions

To monitor the effectiveness, efficiency, and equity of Indonesia's education system, and to formulate policies for its continuing improvement, an effective Management Information System, including a set of published Education Indicators that focus attention on critical issues, is an essential element.

This chapter does not talk vaguely about indicator systems in general, but instead presents the rationale and a design for a specific Efficiency-Based Management Information System. This EMIS seeks to avoid the wasteful

inclusion of data in excessive detail that will see little use. It instead focuses on offering guidance in developing a well conceived set of indicators useful for monitoring accountability and educational effectiveness at the most basic level. It stresses the importance of a design that permits the construction of ratios of effectiveness and outcomes to costs that monitor efficiency at a more significant level. By this means, meaningful Education Indicators can be constructed, made available to decision makers, and published that enable the efficiency and the equality of educational opportunity within the education system to be improved.

This chapter offers guidance on strategic data series to be collected and maintained, on data sources, and also on the major types of analyses to be performed. The latter include the construction of

- *Effectiveness Indicators,
- *Efficiency Indicators, and
- *Equity Indicators.

They also include rate of return computational methods, that take the discounted present value of the future returns to education into account, as well as multivariate production function type studies both within the education system, and including the contributions of education and the embodiment of new technologies as human capital is formed to per capita economic growth and development.

Methods of adaptation of a good EMIS system to Provincial and sub-provincial levels are discussed. They include appraising the resources available, and then adapting the scope of the data to be collected, maintained, and analyzed as described in the Provincial/sub-provincial Prototype model and the MOEC, Jakarta, Pusat Informatika Prototype model.

In conclusion, the objective of an effective EMIS system is to improve the effectiveness and efficiency of the entire education system. This in turn increases the effectiveness of the contribution that human resource development through education makes to per capita standards of living later, as productivity is increased, as well as to other types of improvement in the quality of human life and distributive justice. Given the acute needs for economic development, and greater intergenerational equity, it is hoped that this chapter, and an increasingly effective Efficiency-Based Management Information System, can make a significant contribution.

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Suggestions for Further Reading (*)
and References

- Balitbang, Dikbud/IEES (1986). Education and Human Resources Sector Review, esp. Chapter 2, "Economic and Financial Analysis," by McMahon, Millot, and Eng, April 1986, pp. 557.
- Center for Educational Research and Planning (1991). International Education Indicators; Conceptual and Theoretical Aspects, Six Working Papers, CERI/INES (91), 1-6, Organization for Economic Cooperation and Development, Paris.
- *Chapman, David (1990). "The Role of Educational Management Information Systems in Improving Educational Quality," in D. Chapman and C. Carrier, eds., Improving Educational Quality: A Global Perspective, Greenwood Press, New York, pp. 217-242.
- Cobbe, James (1988). "Education Indicators for Policy Purposes in Indonesia," Balitbang Dikbud IEES/EPP Working Paper, December 20, 1988.
- Coleman, James, Campbell, Hobson, McPartland, Mood, Weinfeld, and York (1966). Equality of Educational Opportunity, U.S. Department of Health, Education, and Welfare, Washington, DC.
- *Fuller, Bruce (1987). "What School Factors Raise Achievement in the Third World," Review of Educational Research (Fall), Vol. 57, No. 3, pp. 225-92.
- Haddad, Wadi (1979). Educational and Economic Effects of Promotion and Repetition Practices, World Bank Staff Working Paper No. 319, Washington, DC.
- *Haddad, Wadi, et al. (1991). Education and Development, World Bank Staff Paper, Washington, DC.
- International Monetary Fund (1991). Government Financial Statistics, Washington, DC.
- Korean Educational Development Institute (1987). Educational Indicators in Korea, Educational Information Material, 87-2, KEDI, Seoul, Korea, 349 pp.
- *Mingat, Alain, and J. P. Tan (1988). Analytical Tools for Sector Work in Education, Johns Hopkins University Press, Baltimore, MD.

- McMahon, Walter W. (1988). "Potential Resource Recovery in Higher Education in the Developing Countries and the Parents' Expected Contribution," Economics of Education Review, Vol. 7, No. 1, pp. 135-52.
- McMahon, Walter W. (1988b). "A Framework for Collecting and Analyzing Data on the Provision of Public Education in Africa," Working Paper, Prepared for the World Bank (Mark Gallagher, Africa Division), September 1988.
- *McMahon, Walter W. (1987). "The Relation of Education to Productivity Growth in the Developing Countries of Africa," Economics of Education Review, Vol. 6, No. 2, pp. 183-94.
- *McMahon and Boediono (1992a). "Universal Basic Education: An Overall Strategy of Investment Priorities for Economic Growth," Economics of Education Review, 1991, No. 3.
- *McMahon and Boediono (1992b). "Market Signals and Labor Market Analysis: A New View of Manpower Planning, Ch. III in Education and the Economy, McMahon and Boediono, eds., IEES/EPP/MOEC, Jakarta and Tallahassee, 1992.
- *McMahon, W. and Terry Geske (1982). Financing Education: Overcoming Inefficiency and Inequity, University of Illinois Press, Urbana, Chicago, and London.
- *McMahon, Walter W., Benoit Millot, and Gweneth Eng (1986). Economic and Financial Analysis of Human Resource Development in Indonesia, Chapter 2 (409 pp.) in Volume 1, Education and Human Resources Sector Review, Improving the Efficiency of Educational Systems, 204 Dodd Hall, Florida State University, Tallahassee (904)-644-5442.
- Miles, Ian (1985). Social Indicators for Human Development, Frances Printer Publishers, London.
- Nuttall, Desmond L. (1990). "Proposal for a National System of Assessment in England and Wales," International Journal of Educational Research, 14(4), pp. 373-82.
- Oakes, J. (1986). Educational Indicators: A Guide for Policymakers, Rutgers University Center for Policy Research in Education, New Brunswick, NJ.
- Odden, Alan (1990). "Educational Indicators in the United States: The Need for Analysis," Educational Researcher, (June-July), pp. 24-9.

- *Psacharopoulos and Woodhall (1985). "Internal Efficiency and Educational Quality," Chapter 8 in Education for Development, Psacharopoulos & Woodhall, published for the World Bank, Oxford University Press, NY, Oxford, London.
- *Psacharopoulos, George (1987). Economics of Education: Research and Studies, Pergamon Press, Oxford and New York.
- *Ross, Kenneth and Lars Mähick (1990). Planning and the Quality of Education, UNESCO, International Institute for Educational Planning, Pergamon Press, Oxford.
- Tsang, Mun C. (1988). "Cost Analysis for Educational Policy Making: A Review of Cost Studies in Education in Developing Countries," Review of Educational Research, Vol. 58, No. 2, pp. 181-230.
- UNESCO (1991). World Education, 1991, United Nations Education, Social, and Cultural Organization, Paris.
- U.S. National Center for Educational Statistics (1990). Guide to Improving the National Education Data System, Executive Summary, U.S. Department of Education, Washington, DC (March 1991).
- U.S. National Center for Educational Statistics (1991). Education Counts, U.S. Department of Education, Washington, DC.
- *Windham, Douglas M. (1988). Indicators of Educational Effectiveness and Efficiency, IEES, Learning Systems Institute, Florida State University, Tallahassee, FL.
- *Windham, Douglas M. (1989). "The Cost of Effective Schools," in Fundamental Studies in Educational Research, Paul Vedder, ed., Swets and Zeitlinger, Amsterdam, Rockland, MA and Berwyn, PA, pp. 35-57.
- Windham, Douglas M. (1992a). Toward an "Education for All" Indicators Model: A Proposed Framework and Implementation Plan, Working Paper, SUNY, Albany, NY, 91 pp.
- *Windham, Douglas M. (1992b). "Education for All" Indicators Manual, Draft of May 15, 1992 (for UNICEF), SUNY, Albany, NY, 107 pp.
- World Bank (1992). World Development Report, 1991 and earlier issues, World Bank Publications, Washington, DC.

World Bank (1987). Social Indicators of Development, World Bank Publications, Washington, DC.

World Bank (1987). Education in Sub-Saharan Africa; A World Bank Policy Study, Washington, DC, 185 pp.

World Bank (1983). Rapid Population Growth in Sub-Saharan Africa, Staff working Paper #559 by R. Farugee and R. Gulhati, Washington, DC, 100 pp.

ABSTRACT

Chapter III

Sources for Improvement in Quality and Efficiency in Education

Don Adams, Boediono, Ace Suryadi

Educational quality and efficiency are often described as opposing educational goals. In practice, however, policy makers, planners and educational managers seek to develop in educational systems and institutions the capacity for quality within an acceptable range of cost effectiveness. The provision of high quality, cost effective education typically must stand a test of equity.

This chapter of briefly reviews the international research on educational quality and effectiveness, considers Indonesian educational innovations within this context, and analyses problem associated with the process of implementing educational improvements. Suggested policy directions include :

(1) a focus on the interaction and relationship of teachers, instruction and school management;

(2) more attention to cost-effectiveness and cost utility of the innovations under consideration;

(3) careful implementation planning and analysis to anticipate obstacles and conflicts in improving quality and efficiency; and

(4) incremental development over 25 years of "self- improving" education with ongoing processes of planning, monitoring and evaluation with EMIS support

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Chapter III
SOURCES FOR IMPROVEMENT IN QUALITY AND EFFICIENCY
IN EDUCATION

Don Adams, Boediono and Ace Suryadi

One of the striking characteristics of the 1990s is the International attention to educational quality. To some extent plans and policies calling for higher quality schooling now supplement or even replace earlier attention given to such priorities as access and expansion. The universal assumption seems to be that current education is inadequate to cope with the social and economic transformations underway or to which people aspire.

However, the idea of quality is elusive, and the meaning often unclear. Note its following characteristics :

- * it has multiple meanings
- * as a educational goal it may be in conflict with other goals
- * any definition may be socially and politically sensitive
- * a concern for quality is usually associated with criticism of the past
- * a concern for quality may be highly specific to the community or school
- * quality, at least for some segment of the population is never as good as it should be
- * qualitative targets are less tangible, often more difficult to achieve than quantitative targets
- * the interaction of changes in quality, efficiency and equity are controversial.

The last characteristic on the list above is of fundamental significance in the development of educational policy and the educational change. Planners and policy makers must recognize those aspects of quality, equity, and efficiency which are mutually supporting and reconcile the possible conflicts among the goals involving each. This paper undertakes three tasks: (1) an examination of the interrelationships between quality, equity and efficiency; (2) a brief summary of international and Indonesian research on educational quality; (3) a consideration of quality improvement strategies. Particular attention is given to those innovations which research or experience suggests to be cost/effective.

Defining Educational Quality and its Relationship with Equity and Efficiency

Educational quality is usually defined as outputs, inputs or process characteristics of formal or nonformal education. Typical output measures include student achievement (or such proxies as completion rates and various forms of certification), literacy, and practical skills. Common input measures include selected characteristics of the teachers, pupils, facilities, curriculum, and fiscal resources. Process refers to the dynamics of interaction of teachers, students and administrators within the school or learning context.

Persistent questions surround any choice of definition of quality: Quality for whom? Or, quality according to whom? Who decides on the measure? How can the differences between the focus from the "top" e.g. the central ministry, and that from the "bottom" e.g. community leaders or teachers? Can a valid measuring instrument for quality, however defined, be developed? To what extent can generalizations be made across nations, communities or even schools? The situation is further complicated. What should be the

priorities among student learning ? Is passing an entrance exam to the next level a satisfactory objective to the students ? Parents? Community? Should students be expected to develop skills of critical analysis? How about skills and values of cooperative organization in the solution of problems? The development of civic responsibility?

Decisions regarding quality politically, economically and socially are linked to, and constrained by, considerations of efficiency and equity. The Indonesian national plans and the country's fundamental ethos -Pancasila- emphasize an efficient and equitable educational system. Efficiency (see chapter X) may be defined simply as a ratio between inputs and outputs. Inputs refer to material and nonmaterial resources, including teachers' characteristics, instructional practices and organizational structure i.e., basically roles and relationships. Outputs are those changes in knowledge, attitudes, or behaviors of the students attributable to educational experiences.

The net improvement in literacy, skills, etc., thus becomes the "value added" by the educational process. Efficiency is typically seen by planners as a requisite of institutions in order to maximize the usage and avoid wasting human and other resources. Equity is usually defined in terms of opportunities, distribution or consequences. The questions raised above with respect to quality are also relevant to equity. These questions are sometimes ignored in efficiency discussions. Thus, if distributions, opportunities or consequences vary across policies "efficient" policies may need to be supplemented by other policies to achieve acceptable equity. Equity as the goal of equality of educational opportunity (in access, expenditures, quality of teachers, facilities etc.) is viewed as a basic right of all Indonesians to be protected by law and in practice. Unequal educational opportunities present both

cultural and economic loss to the nation.

There are serious efficiency, quality and equity problems in Indonesian education. Indonesia has long recognized the need to improve the quality and efficiency of primary education. This need was reflected, for example, in the Curriculum Reform 1975, the Education Sector Review, 1986, and in Repelita V. Improved educational quality also may be assumed to be fundamental ingredient in the development of the "New Indonesian Man" as called for in the Guidelines of State Policy (GBHN) and is emphasized in the 25 Year Educational Plan (1993-2018).

One of the potential problems in rapidly expanding educational systems is that a choice to protect or encourage quality, for example, by giving special resources to selective institution, may be detrimental to equality considerations. In many countries equal educational opportunity, in terms of access or program, has been a victim of unequal economic capability. Comparatively richer communities or families can provide better facilities, equipment and learning materials. Disparities may be not only among schools but also within schools as well- an example is a tracking system which early on separates out the perceived talented students for special consideration. Moreover, there may be subtle aspects in a school culture, e.g. teacher attitudes, content of textbooks, which conspire to deny equal learning opportunities.

However, realistic policies of quality usually incorporate the concept and test of efficiency, the improved use of available resources. Improvement in quality this may also be a key to increased efficiency. Recent dropout rates in Indonesian primary schools, affected by the abolition of fees and greater access were reduced and now are not a typical of those

found in many developing countries. Nevertheless over 1 million students each year drop out and fail to become literate. Moreover, grade repetition rates remain high, over 15% in grade one. Drop out and survival rates are influenced by the quality of teachers, curriculum, facilities, instruction and management as well as environmental variables. Automatic promotion will also reduce repetition rates but only when coupled more effective schools will this policy be meaningful. Indeed, automatic promotion (for which there are many good arguments) in low quality schools may actually lower the potential learning of the students.

Educational quality or effectiveness may be defined in terms of an exclusive measure of educational inputs, process or outputs, some combination of inputs, outputs and processes or some set of values and needs which cannot be fully expressed in such language. Moreover, the concept of quality may be dynamic, changing as interpretations of values and needs change. A concept of equity, like efficiency, may be, increasingly in most countries is assumed to be, an integral part of the definition of quality. As will be discussed subsequently, to understand the rhetoric of quality its source must be determined. That is, it is not enough to choose only an abstract definition on educational quality or effectiveness. The educational decision making process, which results in quality in practice, must itself be assessed on criteria of quality, equity and efficiency.

The following two sections consider conditions and processes which contribute to quality and strategies for improving quality. The implications for efficiency and equity are integrated when possible.

Research on Educational Quality

If the term research is used broadly the research literature on educational quality and educational effectiveness is vast. The published reviews of research may run into several dozens and the authors of this paper easily generated a bibliography of over 600 references to educational quality or effectiveness.

International research on educational quality and effectiveness does not subscribe to a single definition (See Table 1). The most common conceptualization has been instructional effectiveness and the most popular measure has been standardized test scores. Less frequently measures have included not only cognitive skills but also values and attitudes and such process characteristics as classroom climate, or other evidence of "positive" teacher-student interaction. The Education for All Conference in Jomtien, Thailand in March 1991 described effective schools as those that "facilitate acquisition of subject knowledge, cognitive skills, values and attitudes relative to the needs of the individual and his or her community through active and participatory approaches". Although the notion of needs is somewhat vague the Jomtien statement encompasses both multiple output measures and process i.e., "active", "participatory", measures.

Table 1. Examples of Effectiveness Measures

Program Objective	Measure of Effectiveness
Program completions	Number of students completing program
Reducing dropouts	Number of potential dropouts who graduate
Employment of graduates	Number of graduates placed in appropriate jobs
Student learning	Test scores in appropriate domains utilizing appropriate test instruments
Student satisfaction	Student assessment of program on appropriate instrument to measure satisfaction
Physical performance	Evaluation of student physical condition and physical skills
College placement	Number of students placed in colleges of particular types
Advance college placement	Number of courses and units received by students in advance placement, by subject

H. Levin (1983) "Cost - Effectiveness : A Primer", Beverly Hills, Safe.

Limitations of Methodology

The conceptual frameworks for the study of educational quality re effectiveness have been categorized in a number of different ways (see Table 2). Clear distinctions between these categories is not possible. Research which could be labelled input-output or production function studies at least until recently was widely assumed to yield contrasting results in less developed countries and industrialized countries. The interpretation

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generally given to the former was that pupils' background influences, including socio-economic status, are less important as determinants of student achievement than school and classroom variables. Research conducted in industrialized countries has tended to show that demographic variables such as family background and socioeconomic status are much more powerful

Table 2. Categorizing the Frameworks for Studying School Effectiveness.

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Averch et al. (1974)¹ * input-output approach

* Process approach

* Organizational approach

* evaluation approach

* experiential approach

Cuttance (1985)²

* input-output framework

* organizational framework

* institutional framework

* exemplary schools framework

Purkey & Smith (1983)³

* outlier studies

* case studies

* program evaluation studies

* other studies

Aitkin & Zuzovsky (1992)⁴ * input-output framework

* process product framework

* organizational framework

* multilevel interaction framework

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than school inputs in determining achievement scores. The popular proposition put forth by researchers and international agencies was that the poorer the country the more powerful the influence of the schools.

The more recent effective schools research in the U.S. has suggested that a potential of significant improvement of student achievement was possible through changes at the school and classroom levels. Nevertheless, the basic thesis of the strength of student background factors in explaining the level of achievement generally has not been rejected. The most current research in developing countries, however, using new statistical approaches has begun to mount a challenge to the methodology and the conclusions of earlier studies. Preliminary results from using multilevel statistical models in studying school effectiveness suggests that the influence on background factors on student achievement in developing countries may not be very different from that found in the U.S. studies ⁵.

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The input-output models offered educators and planners little room to maneuver. Presumably powerful variables such as family background are nearly immune to manipulation by policy makers. Moreover, as Reynolds⁶ noted: "authors were able to claim school influence to be minimal even though in many cases the school was never measured or accessed..." Studies focusing on process variables move beyond the study of relatively static characteristics on educational environments to an examination of the much more complex and dynamic processes found in schools and classrooms. Focus of investigation has also shifted from searching for prediction of student outcomes by mainly economic factors to looking for better explanations of the patterns of differences in the effects of schooling "in terms of the social processes and educational practices." The dozens of successive school effectiveness studies that "teachers can make a difference", "schools can make a difference" and "schools can foster good behavior and attainments, even in disadvantaged areas".

There are not only problems inherent in many of the statistical techniques used in educational quality research but also the use of quantitative techniques has been faulted as not appropriate for studying the complex processes of schooling and instruction. Qualitative and ethnographic methods are increasingly being used in school effectiveness research because statistical procedures have been demonstrably inadequate to describe fully the exemplary practices and complex interrelationships and interactions between and among school-related variables and background variables. Although some studies have relied exclusively on naturalistic, qualitative techniques, including interviews, observations, record analysis, and ethnographic methods to obtain data on characteristics of effective schools⁷, other studies tend to use a combination of qualitative and quantitative analysis⁸.

"What gets measured gets done." Most school effectiveness studies define "effectiveness" narrowly in terms of student achievement in basic skills areas as measured by standardized achievement tests. Such a measure of effectiveness remains as an important limitation of effectiveness research as it ignores other areas of intellectual and social growth which can be affected by schools. The implicit underlying assumption of the quality as achievement view is that schools have short term instructional goals and objectives and their performance toward attainment of these legitimately can be judged by mean achievement scores. In reality, schools have multiple goals and measurement of any set of school outcomes is difficult and usually controversial.

Effective school research provides little insight into the question of causal ordering of variables. Because such relationships have highly uncertain temporal and causal orderings, identified relationships between school level factors and achievement outcomes may be described, at best, as "associations" between two or more variables. The direction of relationships between variables and the linkages between characteristics of effective schools and achievement outcomes either are assumed or are inferred indirectly⁹. For example, research on teacher effectiveness has conceptualized teachers as the "dominant source of influence" and students as "reactive" to teachers. Student influence on teacher behavior has been neglected in most cases. Although the reported direction of assumed casual relationship is from teacher behavior to student reaction, some empirical evidence suggests that the causality may be reversed.

Teachers and Their Development

The interpretations of research on educational quality in Indonesia which have interspersed with international research findings, unless otherwise specified, are taken from Ace Suryadi, *Improving Educational Quality of Primary Schools*, MOEC Jakarta 1989. This source offers preliminary findings on research in three provinces which attempted to explain the impact of a number of environment, school input and process factors. Output was measured in terms of student achievement in grade 6 in national language, mathematics and science. For a fuller description of the study, its objectives, methodology and findings the source should be consulted.

Most recent international research has demonstrated the importance of teachers and their work in influencing learning. Teachers, after all are the "active agency through which most learning takes place and they serve as the basic resource for knowledge"¹⁰. However, the simple statement, "educational change depends on what teachers do and think." hides a deceptive complexity. Neither "teacher thinking" nor the process of changing teacher thinking is well understood. A typical model for illustrating relationships in teaching is suggested in figure 1. The factors identified are among the most frequently mentioned in international research as influencing learning. Precisely how these variables interact and coalesce with each other is not fully known.

1. Teachers' expectations. Teachers' achievement expectations for students are associated with student actual achievement. This also appears to work in the reverse—students' expectations appear to influence the quality of instruction. Such interactive relationships have been demonstrated in a number of southeast Asian countries, including

the Philippines and Malaysia.

2. Teachers general and specialized education. Teachers with higher quality and more advanced education tend to be more effective than their colleagues.

3. Inservice training programs . Inservice training programs which focus directly on the knowledge and instructional needs of the teachers, has involved teachers in the planning, and offers acceptable incentives --- can be highly cost effective.

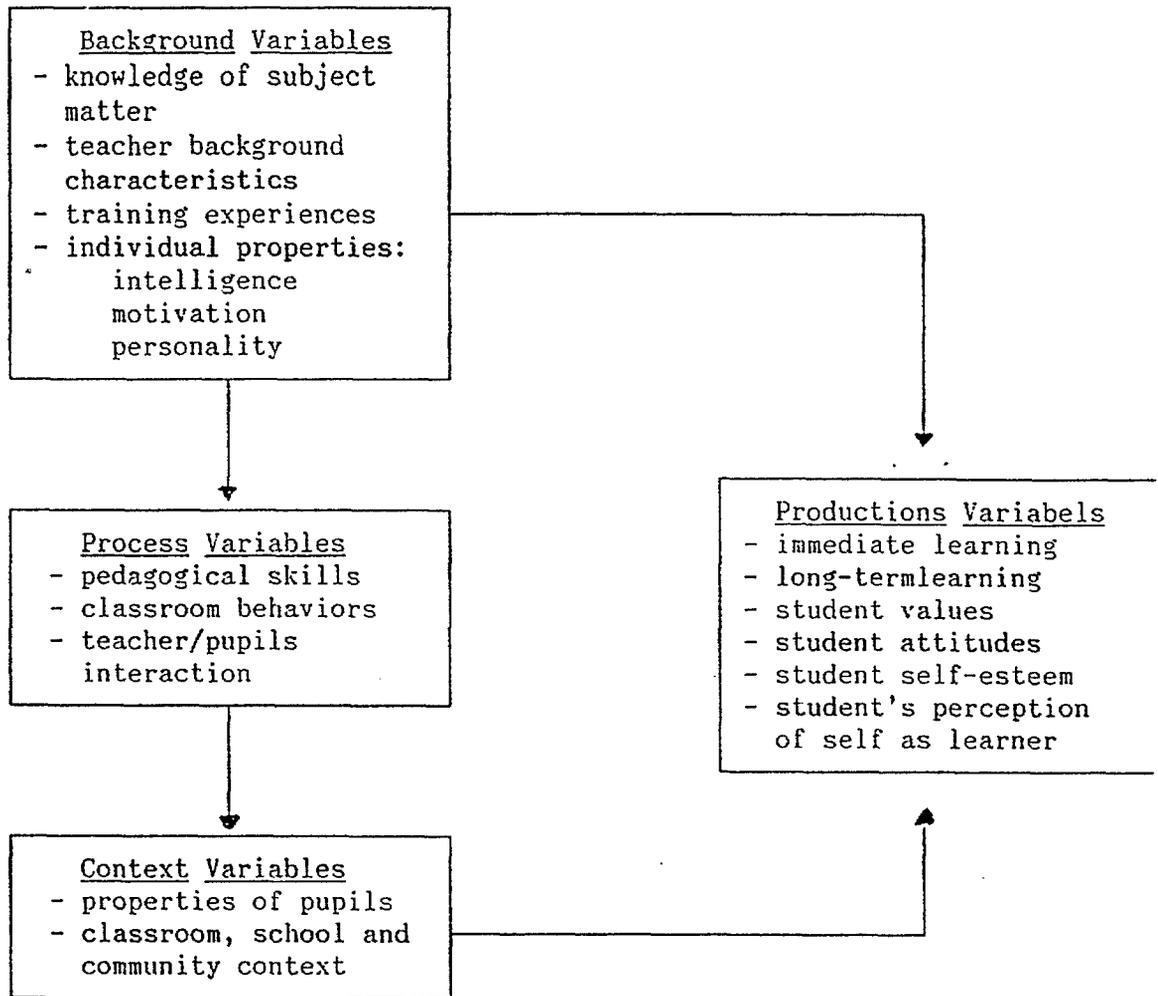
Research on teachers is sometimes contradictory. Typically, research supports the argument that a teacher career satisfaction contributes to improved student learnings.

Chapman et.al, however, found in Bostwana that "the level of incentives teachers received was meaningfully related to teachers career satisfaction, but was not related to teachers classroom teaching practice... The more satisfied the teachers are, the less likely they will want to change."

In the Indonesian IEQ study teacher quality was conceptualized as a function of professional capacity,

Figure 1

Version of a Model for Research on Teaching*



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professional effort, time allocation and attitudes toward teaching. The variables measured included subject matter mastery, seniority, income and teaching load. Teachers quality was found to be a relatively good predictor of mathematics achievement better than student characteristics or management variables. The teacher's knowledge of subject matter had the strongest influence on student achievement of all school variables.

Indonesian primary school teachers often do not fit the profile of the effective teacher as depicted in international research. Deficiencies nearly cover the whole range of favorable teacher attributes including inadequate general and subject matter knowledge, insufficient training in modern teaching methods, lack of experience, low expectations, and high teacher absenteeism. The presence of unqualified or underqualified teachers is a problem common to most developing countries, including Indonesia. The Indonesian Government, with varying involvement of the private sector, is seeking cost/effective ways of rapidly upgrading the professional education—practically defined in terms of credentials of large numbers of teachers. Of potential promise as an alternative to campus-based programs for the preparation of teachers are distance education programs utilizing some combination of self-instruction, radio, tv and face-to-face tutorial sessions. Nielson and Tatto,¹¹ as result of a comparative study of modest scale in Indonesia and Sri Lanka, conclude: "...there is a relatively inexpensive way for governments to increase the effectiveness of their teaching force. Distance teacher education programs, at least those in Sri Lanka and Indonesia, are cost-effective, especially those which combine self-instruction with tutor-supported small group learning; and particularly in subjects that are verbal and information-oriented, as opposed to math and skills-oriented".

Curriculum and Instruction

Curriculum and instruction are central to the activities of formal and nonformal learning arrangements. Most attempts to improve educational quality have examined the prospect of changes in curriculum and in the instructional process. Although this relationship is far from clear a significant body of research suggests the directions of worthwhile innovations. Here an attempt is made to identify key , practical ways for altering the curriculum and the teaching process to impact on student learning.

The influence of curriculum change on educational quality depends to some extent on the definition of curriculum. Curriculum may be a document , a body of subject matter, a plan of study, or a set of intended outcomes. The common phenomenon of mass education around the world has been accompanied by a remarkable standardization of curriculum as defined above. In effect, an international "modern" core curriculum has emerged for systems of basic education. The major emphases of this curriculum are language (with a goal of literacy), mathematics, and science.

Moral and religious education, art, and physical education typically receive less attention. However, the Indonesian government, recognizing cultural, linguistic, and economic diversity, has appropriately emphasized the role of primary education in national integration.. The motto "unity in diversity" (Bhinneka Tunggal Ika)indicates the commitment to the acceptance of diversity and 12% of the official curriculum is devoted to explicit instruction in values education. Additionally the ideas imbedded in Pancasila may influence other curriculum areas.

Vocational or pre-vocational education at the primary level, while more common in the developing countries than the industrialized countries, is in general declining in the percentage of time allocated - apparently due to the changing role of primary education as non-terminal education.

There have been some not very successful attempts to relate change in curriculum, defined as a set of subjects, to economic growth and various social changes. It has been pointed out that increasing time spent on science is positively associated with measures of economic growth- as is decreasing time spent on vocational courses. Because of the measurement and methodological difficulties these relationships by themselves probably should not be taken seriously in policy choices.

Although curriculum as a product may be converging internationally toward a common content, curriculum as process varies country to country. As process, curriculum becomes teacher knowledge and instructional practice within a particular organizational and environmental context. Defined in this manner curriculum and instruction are inseparable and fundamental to improvement of educational quality and effectiveness. The common pattern of instruction and classroom management , however, emphasizes such activities as lecturing , and "seatwork" and such behaviors as asking recall questions, responding to questions, offering explanations, and attending to procedural matters. Asking higher order questions or engaging in conceptual or critical thinking are uncommon classroom behaviors in most schools in most countries.

International educational quality research and the U.S. effective schools research tend to identify the following inputs and process variables as important contributors to increased

student learnings:

1. Time- on- task . Increasing the actual instructional time can be realized by better teacher planning, linking homework and parental assistance to work in school, and using such alternative instructional approaches as mastery learning

2. Instructional materials. The availability and use of textbooks, worksheets, homemade or programmed materials, and teacher guides, consistently have been among the more cost/effective ways to effect quality of learning.

3. Knowledge and method of teaching. Improved quality in terms of student achievement scores tends to be associated with increased competence in the subject matter, coupled, for example, with regular diagnosis of student difficulties and monitoring of student work . Variables in the Indonesian IEQ study most closely related to instruction were included within the teacher quality construct. These were: teacher activities e.g. use textbooks, classroom discussion, frequency of testing and time allocated to mathematics instruction. Time on task was found to have one of the strongest positive influences on student achievement. The other teaching activities also were associated with higher achievement scores.

In Indonesia there has been a tendency to neglect important educational inputs. With a decline in profits from oil the expenditures for instructional materials and laboratory equipment has been reduced, and maintenance needs have gone unamended. Indonesia has a lower per pupil expenditure than its neighboring countries. The diversity in ability of communities to contribute to the upkeep and operation of schools has led to significant inter community inequalities, distributional problems persist.

Fiscal Resources and Facilities

Educational policy makers have traditionally focussed on the availability of resources. Many international studies of educational quality reflect this emphasis on availability of resources. However, recent effective schools research in the United States and other industrialized countries have tended to de-emphasize school resources as an important determinant of school effectiveness. An international trend appears to have emerged for two reasons :

1. Between the late 1950s and the mid 1970s most educational improvement efforts were primarily focused on investment in fiscal resources and educational facilities. This was reflected in the educational plans and the projects of international donor agencies. Since the late 1970s diminishing resources for increased investment in education has shifted investment priorities into changes in educational processes within the existing systems. Interventions have focused more on changes within schools, in such areas as management, teacher development, classroom instruction, students' and parents' attitudes, etc. This new perspective has been well reflected in a series of research reports published by the BRIDGES project at Harvard University. Recent effectiveness research in both developing and developed countries is almost exclusively dominated by an interest in instructional and organizational processes rather than fiscal resources and facilities.

2. Differences in achievement outcomes cannot be satisfactorily explained by attributes of differences in resource inputs. The main conclusions on the role of resources reached after a review of the effective schools literature in the United States and some other developed countries reveals that; (a) differences in expenditures per pupil do not seem to account for

significant differences in student outcomes; and (b) quality of school facilities is not closely associated with student achievement¹² Although few other studies found a positive relationship between fiscal resources and student achievement¹³ there have been serious doubts about the magnitude of relationships and generalizability of findings.

In contrast to studies in the more industrialized countries, research in developing countries often suggests the importance of adequate physical facilities¹⁴, and water supply and sanitary facilities¹⁵ appear to show significant impact on student achievement and quality of teaching. For example, in Botswana, students in schools with sufficient classrooms, desks and seats significantly outperformed the students who did not have access to such facilities and equipments. Evidence from some other countries also supports the research findings of this study. A study of determinants of students performance in physics in Greece indicates that "school facilities" significantly affect student achievement¹⁶. A more convincing case due to strength of evidence drawn from a combination of quantitative data and on-site observations is presented by Vulliamy where the quality of teaching was positively affected by the quality of physical facilities and availability of science laboratory and access to duplicating equipment.

Despite the inconclusive findings from highly industrialized countries, present evidence from developing countries clearly indicates that some minimum level of funding and facilities are necessary for an effective educational system. Research suggests that advanced industrialized countries have typically attained such standards and incremental improvements may have little effect on school outcomes. In developing countries, however, even minimum adequacy has often not been achieved and given the often unqualified and

unmotivated teachers, acceptable facilities may be a necessary condition for children to attend, persist and enjoy schooling.

Educational Management

How schools are organized affect how and what children learn. At the school level the principal or headmaster by actions or inactions, helps to create the conditions for teaching and learning. He or she sets or interprets objectives, manages resources, develops organizational structures, i.e. roles and relationships, interfaces with the larger educational bureaucracy and the community, resists or supports innovations, and influences the organizational politics and culture within which the work of the school takes place.

Table 3 identify some recent reforms in educational management. The range is considerable, however, the number of reforms which focus at a local level probably reflects a major trend over the last decade or so. The major role change for educational managers is from managerial to instructional leadership. Traditional research on educational administration has emphasized the 'managerial' role of school principals. Analysts have identified many of the tasks associated with carrying out the policies of the district or higher bureaucratic levels such as personnel matters, student problems, transportation, building maintenance, supervision, evaluation etc. In the United States, for example, the position of building-level administrator is considered one of the most critical, demanding, challenging, stressful and time consuming in the educational profession.

Research on educational quality and school effectiveness has emphasized a different role, one more directly supportive of the core teaching -learning process. The argument is

made that strong instructional or most recently "transformational" leadership is crucial to improvements in student achievement and social growth. Instructional leadership implies that administrators are concerned about, and directly and indirectly involved in, the work of the teachers as they engage students. Administrative involvement appears to be important in all stages of innovations from their initiation to their evaluation. Case after case of research on effective schools in the U. S. has found the principal's leadership in instruction positively correlated with school success in raising achievement scores. Fullan¹⁷ notes: "It seems beyond question that the principal's interest in instructional matters and program and organizational planning is critical" (to the success of the innovation).

From a review of the role of the principal in educational change limited largely to North American cases Fullan concludes: [from] "what is known about the role and impact of the principal on change, four main conclusions can be stated. First, a large percentage of principals (at least one-half) operate mainly as administrators and as ad hoc crisis managers. These principals are not effective in helping to bring about changes in their schools. Second, those principals who do become involved in change do so either as direct instructional leaders or as facilitative instructional leaders. Both styles of leadership can be effective. It seems that the direct leader can be effective only if he or she is clear about the purpose of change and has (or can select) teachers who agree with the direction of change. Third, the principal cannot become an expert in all subject areas, and has great demands on his or her time, especially in larger schools. Being a facilitator or coordinator of change is probably the more effective role under these conditions. Fourth, none of this research says that change is impossible without the principal, or that the principal is always the most

important person. There are many instances of teacher leaders or project leaders having had a strong impact on implementation, but they usually had supportive principals; if they did not, the results of their initial efforts tended to disappear before long. "In almost every instance in which we studied a project that was near the end of its life or had ended, the principal decided what was to remain." Whether it is direct or indirect, the principal plays a fateful role in the implementation and continuance of any change proposal; the evidence is very strong on this point"¹⁸.

However, the concept and practice of instructional leadership have been criticized for focusing too much of the administrators' attention on "first-order" changes, that is, on improvement of the technical, instructional activities of the school through the close monitoring of the teachers' and students' classroom work. The term "transformational leadership" has been used to suggest that developing more effective schools often requires a restructuring of relationships among teachers administrators, students, and parents. The restructuring of schools may be seen as similar to the restructuring taking place in business organizations which resulted in a significant increase in participation in decision making. The reform within business typically grew out of a need for higher productivity. Applied to educational organizations the advocates of transformational leadership argue the benefits of both improved quality and increased social justice.

Transformational leadership recognizes that there may be organizational or contextual constraints to improving instructional activities in the classroom. New facilitative conditions may need to be developed, such as improved communication, a more participative and collaborative decision making process, and building a shared vision of the

future. Transformational leadership does not reject the necessity of administrative routines but assumes that this new type of leadership is "value added" - it provides incentives for teachers, students and staff to improve their practice. Leithwood¹⁹ argues, purportedly on the basis of empirical evidence, that transformational leaders are "more or less in continuous pursuit of three fundamental goals" : 1) helping staff members develop and maintain a collaborative, professional school culture; 2) fostering teacher development; and 3) helping them solve problems together more effectively".

Developing a collaborative culture implies learning to communicate and plan together. In this process administrators learn who teachers are and vice versa . Schooling becomes a collective responsibility of seeking continuous improvement in efficiency, equity and quality. Teachers, students, principals and other administrators teach one another how to improve their work.

Teacher and staff development programs tend to be more successful when they involve teachers and staff in creating and implementing the school's mission and objectives. The role of the educational leader is not only to facilitate training opportunities but also to help clarify and prioritize the school's tasks. Principals and other local administrators can further support teachers' development by encouraging teacher participation in non routine, important decisions.

Improving group planning and collective attempts at coping with problems extends the "ownership" of the educational endeavor. But this approach also extends the knowledge and perspective brought to bear on the problems. Teachers may work "harder" because of the collaborative culture of the school; but equally important, administrators will work

"smarter" by allowing multiple interpretations of collective problems and a range of perceptions of individual problems to be shared in the ongoing process of decision-making.

The Indonesian IEQ study's measures of school management included four "internal control management" variables and four "external management relations". The operational measures of management included characteristics of the principal, external supervision, frequency of meeting with teachers and frequency of meeting with students and parents. Suryadi²⁰ reports: "... higher academic performance is associated significantly and positively with higher degree of external relations (e.g. participation in PTA meetings, interaction with student and parents) continuous effort to improve the instructional process (e.g. supervision of work of teacher) and interaction with the school supervisor.

The role of management at the grass roots level in Indonesia best refers to the subdistrict including the school level. The school principal or head teacher, who may supervise 100 or more teachers, or in small schools may have teaching responsibilities, probably has had little training in administration, has little influence in teacher appointments, frequently supplements his income with other employment, and spends much of his time on routine administrative tasks. Typically, the school principals lack both the authority and the training for leadership in developing effective schools.

It has been estimated that primary school principals in Indonesia spend 70% of their time in routine administrative task. Moreover the supervisors who in average cover 26 schools, are also untrained to play a key leadership role in setting objectives, designing and evaluating new programs for improving educational quality.

Variables frequently mentioned in international research as aspects of effective management include:

1. Performing as instructional or transformational leader.
2. Supporting the professionalization of teachers, the conditions of teaching and the technologies of teaching and learning.
3. Demonstrating skills and commitment to interaction with the community and the bureaucracy.
4. Utilizing knowledge and skills related to the planning of educational change.

Table 3 is an attempt to summarize some of the trends in conceptualizing a more influential role in reform for educational management. Table 3 thus identifies the direction of professional thinking about school and local level educational management.

Table 3. Recent Instances of Management Reforms

Bangladesh, '80s	Supervisors	Lockheed & Verspoor, 1990
A group of Upazilla Education Officers were appointed to intensify supervision through both scheduled training sessions and surprise visits. Teacher absenteeism was significantly reduced.		
Colombia, mid-'70s	Escuela Nueva	Rojas & Castillo, 1975
The government developed a new multi-grade approach to basic education called Escuela Nueva which involved strong participation. A parent committee worked with the student council on joint projects to improve the school and curriculum. Escuela Nueva has led to significant increases in access, educational quality, and student self-esteem.		
Costa Rica, mid-'70s	Nuclearization	Olivera, 1983
To overcome the dismal state of rural schools, networks of five schools were linked in "nuclei" to share a library, teaching aides, workshops, and certain administrative services. Nuclearization helped to empower and motivate teachers, and resulted in a curriculum more relevant to local needs.		
India, '80s	Multi-level Planning	Mathus, 1983
With the sixth Five Year Development Plan (1981-86), India shifted major responsibilities for the planning and implementation of educational programs to the district level. The shortage of personnel and the separation of educational planning from that of other sectors have prevented the full benefits of this shift.		
Madagascar, late '70s	Regional Offices	Razafindrakoto, 1979
The 1975 Constitution recognized communities as the basic unit of government. Each community was expected to build a primary school and develop syllabi responsive to local needs. With the central government subsidies for school construction, significant increases in primary school enrollments were achieved.		
Malaysia, '80s	Training	Lockheed & Verspoor, 1990
The National Institute of Educational Management was established to improve the planning and management capabilities of school managers. The Institute was able to develop an inexpensive and popular set of courses that attracted far more applicants than originally anticipated.		
Mexico, '80s	Decentralization	McGinn & Street, 1986
An official program to transfer control of funds to the state level was found to have little impact on the actual operation of schools. The reform was introduced to strengthen the power of the new government vis-a-vis state educational officers, as a way to circumvent the entrenched bureaucracy.		
Nigeria, '80s	Community Schools	Okeye, 1986
Facing a rising demand for secondary education and declining revenues, the state acceded to community requests to build their own schools. The communities were able to build the schools at low cost through voluntary labor and donated materials. The outcome was a rapid but geographically uneven expansion of secondary education.		
Papua New Guinea, late '70s	Clusters	Bray, 1987
The primary responsibility for planning and construction of schools was shifted to the provincial level. Given significant variations in regional resources, this has heightened regional inequalities in access to education, and in quality.		
Peru, '70s	Micro-planning	Ruiz-Duran, 1983
In 1972 Peru was divided into Community Education Nuclei, (25 schools per nucleus), where important planning and administrative decisions were to be made. However, lack of power, funds, and appropriate training for staff disabled their ability to take on new responsibilities.		
Sri Lanka, '80s	Clusters Reorganization	Bray, 1987
Clusters of between 10 - 15 schools were established and cluster principals appointed to coordinate resource sharing, joint training, and inter-mural activities. The change improved student achievement in the weaker schools.		
Swaziland, '80s	Training	UNESCO, 1987
To improve the performance of a recently privatized system, a program of headmasters' training was established to improve school-based skills in financial and resource management, curriculum development, and evaluation.		
Tanzania, '70s	Integrated Planning	Mapuri, 1983
Integrated planning for all sectors, including education, incorporated inputs from a decentralized administrative structure to local village councils. To help carry out the plans, village councils were given power to raise revenues and recruit personnel. The reform had a positive impact on school enrollments, but suffered from a shortage of capable personnel and administrative ambiguities.		
Thailand, '80s	Training, EMIS	Wheeler et al., 1989
A selected group of "effective" principals developed an inservice training course for their peers which involved modules, videos, slides, and practical exercises. This course was administered at the district level to all school principals. Principals who failed a post-training test had to repeat it until they were successful. Principals were later monitored to see if they practiced the course objectives.		

TABLE 3
DIRECTIONS IN LOCAL EDUCATIONAL MANAGEMENT

	FROM	TO
G O A L S	<ul style="list-style-type: none"> . major goal-maintenance of administrative control, (manage the rules) . goals not integral part of planning 	<ul style="list-style-type: none"> . Multiple administrative and instructional goals . seeks to be instructional and transformational leader . goals used to build common sense of mission and equity in effort and reward
S T R A T E G I E S	<ul style="list-style-type: none"> . focus on administrative routines-avoidance of instructional and learning concerns . use and reliance on vested authority . avoidance of ambiguity, strives for certainty, and simplicity, . limited interaction between school and community . committed to principle that rules solve problem 	<ul style="list-style-type: none"> . uses variety of technical and interpersonal strategies . seeks to facilitate change . choices based on student and teacher needs . recognizes the inevitability of uncertainty and complexity . maximizes teacher influence over instruction . committed to the principle that knowledge and professional judgement allow coping with problems
D M E A C K I I S N I G O N	<ul style="list-style-type: none"> . Autocratic forms . relies on personal sources of information . decision processes reactive and often inconsistent . communicates selectively . rarely delegates 	<ul style="list-style-type: none"> . uses multiple forms . encourages participation . utilizes research and professional sources of information . develops process of regular assessment and feedback

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DETERMINING EFFICIENCY AND EFFECTIVENESS*

Although the literature on school effectiveness and educational quality is large the implications for policies based on criteria of efficiency or effectiveness are tenuous at best- for example, the direction, and in some cases the magnitude of influence of inputs and process variables on student learning are reasonably well documented. Moreover, accompanying cost data are rarely available of resulting in few possibilities for analyses of cost - effectiveness. The complexity of appropriate cost data is illustrated by Lockheed:²¹

Cost must be directly linked to the inputs identified in the effectiveness discussion. If attempts are made to describe inputs in great detail- perhaps linking process choices of teachers and the like- the costs must relate to providing inputs of such a description. This rapidly exceeds our abilities, because little is known about the supply of many of the inputs. For example, the supply of teachers with a given schooling and verbal ability level, with pedagogical style emphasizing student questioning, with a fluency in several languages, and so forth has never been systematically studied. Most cost estimates, therefore, are very general.

In the past a number of "better" instructional methods have proven not to be cost-effective. Cases in point are the wide experimentation with computer assisted instruction (CAI) and educational television in the United States and certain industrialized countries

*Important research is currently underway by a team of researchers (Ibrahim Musa, Jiyono, Dean Nielson, James Cobbe et al) on the cost-effectiveness of alternative teacher training programs related to the needs of basic education completion of this research is scheduled for late 1992.

in the 1960s and 1970s. Researchers found that CAI could quickly increase achievement in mathematics and several educators suggested this approach as a policy alternative. Levin²² points out that CAI use as specified "... would have required an increase in the school budget of at least 25 percent. In contrast it was found that teacher-based drill and practice could produce a similar learning effect for an increase of only six percent of the school budget.

Neither cost nor effectiveness data taken alone are satisfactory for making choices between alternatives. Much of the international research on effective schools and educational quality gives little attention to costs. Administrators on the other hand when considering innovations may only examine costs.

Lockheed has reviewed the studies in developing countries of the effects of three inputs on student achievement. She further examines six educational policies in terms of "efficiency" (or effectiveness-cost since the effect is measured by a unit size not cost). The very tentative conclusions from these studies suggest, for example, that radio education have effectiveness-cost ratios comparatively attractive. The policy implication remains unclear for supporting investment (in teacher training, instructional materials etc) might be necessary for full implementation of new textbooks or radio projects. What can be said about the relative cost-effectiveness of those teacher, instruction and management variables found (internationally and in Indonesia) to positively influence student learning.

1. Teachers

As has been indicated the international research suggests that a teacher's level of knowledge, experience and professional growth may have significant impact on learning;

however, with the exception of the previously mentioned study by Nielsen and Tatto cost effectiveness students on teachers and their training is non existent. The limited international research coupled with Indonesian cost data do suggest that resources may be best allocated when possible to in-service (rather than free-service) training. Teacher guides and other teacher support materials are relatively inexpensive ways of increasing the productivity of teachers.

2. Instruction

Teaching method, the use of learning materials, and interaction with students are difficult to examine as separate variables and distinguish either in terms of costs or effectiveness. Use of instructional materials, the classroom climate and the organization of the school reflect the training of the teacher and individual choice and may require little additional direct cost. In the long run these innovations could be highly cost/effective.

3. Management

Descriptions of effective school management usually relate to teacher support, i.e. instructional leadership, organizational climate. Again, the major cost for such managerial behavior, lies with the principals preparation and professional upgrading. However, commitment to the role of instructional leader "costs" the opportunity to focus on routine administrative tasks, a choice some administrators may be reluctant to make in a traditional educational bureaucracy which controls their professional future.

Although there is now a huge body of literature on the characteristic of effective schools, relatively few words have been written on how to get these changes adopted and fewer yet on how to implement them fully and plan for continued improvement of

educational quality. The few discussions on the adoption or implementation of changes in management, curriculum, teachers and teaching tend to be vague and unfocussed. Emphasized are the need for visionary and charismatic leadership, the will to act, building a central philosophy, and seeking a guiding spirit.

A case can be made that there is an imbalance in focus of the research on effectiveness and quality. Even if "quality" is an externally defined by scholars or bureaucrats, implementing actions and processes more warrant careful attention and study. If quality is contextually, community or school, defined the very process of defining may be inseparable from implementation. That is, inquiry and choice of reform are intertwined with issues of feasibility, the need for institutional modifications and requirements of individual responsibility.

Improving Educational Quality

Knowing which output, input, process or other variables define quality and knowing which variables cause a given measure of quality to increase does not comprise a strategy for change. The improvement of educational quality requires information, and knowledge about such processes as mobilizing support for the innovation, initiating, monitoring and evaluating the proposed change. What assistance can international research provide in analyzing how to move from a research generated knowledge base on educational quality and effectiveness to strategies and plans for improvement of educational systems? What has been learned about implementation from the several educational innovations in Indonesia?

Most international research on educational quality and effective schools pays little direct attention to strategy and implementation processes necessary for improving or attainment of higher quality. Discussions of the planning and implementation of educational change are often submerged under administrative considerations. From the rather limited available empirical analyses of improving educational quality, we have, however, acquired some insight into innovations which seem to persist and those which often have difficulty. For example,

(1) Accomplishing the difficult task of orienting schools and teachers toward serious, "sustained engagement in academic learning" is a major step toward qualitative improvement.

(2) Developing a functioning support network to allow teachers to assist one another in sharing resources, solving problems and developing a sense of identity contributes to educational quality.

(3) creating small islands of educational excellence or exemplary educational organizations or practice often appears attractive to centralized authorities and international agencies but such experiments frequently do not have the intended ripple effect and may be costly and difficult to defend in terms of criteria of equity.

(4) reforms often involve a range of many changes and although the "package" may be general failure there may be successes in a particular area. Each change may have its supporters but the overall support may be weak.

(5) Reform often calls for increased authority and "empowerment" of teachers as a requisite for success. Such authority may be crucial; however, the associated responsibility

i.e. responsibility to whom, frequently remains unclear.

(6) "Infrastructure" development in the form of organizational development and organizational memory are generally assumed to be important in improving educational quality; however, the type of necessary training and the meaning of capacity building often remain vague.

(7) Accountability, for efficient, equitable and effective education in the abstract has much political appeal; however, educational testing and grading do not necessarily mean accountability, but may result in differing interpretations pulling educational policies in conflicting directions.

Choice of Strategy

There are multiple strategies or approaches in increasing educational quality. Each strategy carries its own assumptions and suggests a different process of implementation. Three of several possible examples are described here.

Strategy 1: Technician Approach

Improving educational quality may require major institutional changes, new technologies and a transformation of teaching and learning. The technician approach seeks to use the available scientific knowledge for guidance in making such changes. Under this approach is schools, classrooms, management processes and the processes of planning and implementation of change should reflect the state of the art of research-based knowledge. Scientific knowledge tends to be interpreted as knowledge empirically verified by acceptable

standards and methods.

This approach assumes that for all important actions and relationships e.g. choice of curriculum, organization of school day, engagement of students in learning, scientific inquiry can give direction. In principle a single model of an effective school or high quality education provided in any format, could be chosen to best achieve the policy objectives. Input - output, production function and process-product models for seeking determinants of effectiveness typically fall within the technicist approach. Various system based models e.g. instructional systems, could also be included under the technicist model.

Translation of the scientific knowledge into reforms i.e. institutionalized changes typically follows a "rational" conceptualization of planning. Accepted knowledge is transmitted through bureaucratic channels to lower level administrators and teachers who by following prescribed rules and procedures implement the change. The key to successful implementation is the communication of clear instructions downward through downward through each level of the educational hierarchy. Control and compliance become the basic principles of administration.

Strategy 2: Professional Approach

This approach focuses on teachers and administrators who assume the "authority and responsibilities as professionals" There is a distinct overlap with the technicist model since "professionals" are committed to the use of scientific knowledge to the extent it exists. Yet teaching, like medicine and many occupations, is assumed to depend partly on scientific knowledge and partly on judgmental knowledge. Professional knowledge, then, may be

acquired through research but also through access to the body of insights resulting from educational experiences and reflective practice.

Under this approach "..... schools should be organized to approximate the conditions of a professional workplace..... a well defined occupational hierarchy based on knowledge and competence, collegial control of hiring and evaluation, regular access to the knowledge required to cultivate higher levels of competence in practice, and strong lateral ties to professional associations, rather than dependence on bureaucratic hierarchy for status."²⁴

The professional model identifies the teacher as the central person in the application of knowledge and also important in the creation of knowledge. The basic problem in restructuring education Elmore concludes is "how to create an organization in which teachers will assume responsibility for cultivating their own teaching practice of their peers"²⁵

Implementing reform based on the professional approach could be expected to be an expert driven process. Teachers and other educators would demand involvement and would resist the traditional top-down, linear bureaucratic approach to implementation unless their voices were permitted to influence major decisions. A truly grass roots, community control over the process of educational planning and implementation might be interpreted as infringement on professional authority and thus might also be rejected by teachers.

Strategy 3: Client or Community Based Approach

A community approach to educational reform is based on the assumptions that schooling should be designed to achieve the purposes set by the clients, i.e. parents, students and community at large. Teachers and administrators are expected to be responsive to the

preferences of clients and should be rewarded on that basis.

A community approach requires extensive autonomy from hierarchical educational bureaucracies. Important if not crucial is school-site management with good school-community relationships. In contrast to the other two models in the community model the role assigned to experts largely is instrumental: "The educators' expert knowledge lies in discerning what clients want, which of those wants can be accommodated within existing resource constraints, and which package of services will attract a clientele sufficient to support the organization on the scale at which it chooses to operate." The client approach thus has a supply side perspective on educational quality in contrast to the demand-side perspective exhibited in the other two approaches.

Implementation of client or community based educational reform can be expected to emphasize a political or consensual process. Some would argue that only this approach allows the full working of democracy.

These three approaches suggest the possibility of tensions and conflicts which may occur in improving educational effectiveness or efficiency. For example, who has and should have legitimate power can be at issue? The community approach empowers parents and citizens and in practice their claims of authority for decision will overlap with that of teachers. The willingness of teachers to compromise on areas of expertise may decide the potential for change.

Under conditions of mutual trust, communication and understanding an approach could evolve that would include use of scientific studies, respect professional roles and

reflect a commitment to local democratic decision making. To operationalize such an approach requires planners to "listen" to local teachers and administrators, schools to actively reach out to provide service to the community, bureaucracies to learn not to be threatened when routinized procedures are not useful, and parents to have access to relevant information.

Educational Innovations in Indonesia

Indonesia's significant experience directed toward educational improvement, include three well monitored innovations: Project Perintis Sekolah Pembangunan; Pendidikan Antara Masyarakat, Orang Tua Dan Guru; Student Active Learning Through Professional Support System. Shaeffer (1990) identified a number of continuing problems related to the implementation of these reforms growing out of the Indonesian educational and bureaucratic context. These include:

- The nature of the Indonesian educational bureaucracy. (Problems in stability in the upper levels and cultural inhibitions to collaboration across given levels of the bureaucracy).
- The life history of each innovation. (Shaeffer argues that "both {the student active learning project} and Pamong suffered because they were begun in one particular political and bureaucratic climate and ended in another."
- Disagreements over the meaning of the innovations. (In Indonesia, as elsewhere, disagreements persist over the meaning of educational quality and its implications for decision making between and among parents, teachers, politicians and academics).

- Indonesia's "heavy hands." (The large size of the educational system, its administrative dualism (particularly between the Ministry of Education and Culture and the Ministry of Home Affairs), and various cultural constraints makes any process of major innovation in Indonesia difficult.

The obstacles identified by Shaeffer are significant but not insurmountable. Indeed, much of merit has resulted from these innovations for example, the Student Active Learning Through Professional Support (SPP/CBSA). For over a decade MOEC has been developing research project designed to promote "action learning" and involving professional support to teachers. This project has generally been seen as successful and some Indonesian Educators have become highly enthusiastic about it.

The SPP/CBSA now includes a number of centers throughout the country which have been developing active learning classroom materials and training methods for teacher and principals. Ideas and practices from SPP/CBSA are partially reflected in national curriculum change and in various in service training programs for primary teachers. Many of the key assumptions of SPP/CBSA e.g. the focus on teacher capacity, instructional materials and the teaching-learning process are supported by the international research on educational effectiveness as shown in Table 3.

A comparison of the finding of effective schools research with the objectives of SPP/CBSA shows considerable similarity. The assumptions about teacher characteristic, instruction and school management appear to be roughly in agreement. An important area of possible difference lies the emphasis of SPP/CBSA on student activity and the emphasis

of effective schools on student engagement. The latter appears to refer to a somewhat structured, teacher-student interactive process which leads to identifiable student skills, understanding and attitudes. The precise meaning of student activity as used in the SPP/CBSA project is not fully clear.

At this time it is not possible to make cost effectiveness or cost-utility assessments of the SPP/CBSA project. For purposes of assessment also of value would be more insight into the "participatory" planning process, the formal and informal ways in which innovations associated with the project have been borrowed by other schools and the potential for replicability of each facet of the project in other contexts.

TABLE X

COMPARISONS OF "EFFECTIVE SCHOOLS" and CBSA

	Effective Schools Research	Objectives of CBSA
Teacher Characteristic	High general and professional knowledge Experienced (a few but not necessarily many years) Ability to organize program and manage time Frequent in-service training.	Understanding of "students thinking processes." Understanding of individual differences in learning. Ability to manage time Continual professional support through supervision, networking and in-service programs.
Instruction	Time on task Use of multiple teaching techniques Demonstration of high teacher and student expectations Engagement of students in critical analysis and problem solving	Active participation and experimentation of students Use of multiple teaching techniques Utilization of external environment Regular evaluation and use of feedback from students

School Management	Establishment of clear mission for school Instructional or transformational leadership Successful relations with community Maintenance of orderly, safe, school environment.	Teacher support direct and by facilitating networking or in service training Maintenance of discipline Successful relations with parents and parents representatives.
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Doing Action Planning for 25 Years and Beyond

Implementation is, at once, technical (e.g. building EMIS systems, conducting research), in the broad sense, political (e.g. involving negotiation, bargaining, exercising power), and consensual (e.g. seeking a "working level" of agreement through dialogue and mutual understanding). Educators typically work within a bureaucracy under conditions of imperfect communication with rules and regulations which frequently don't seem to cover all circumstances. Bureaucrats tend to define their responsibilities narrowly. Those who set the agenda for educational reform (establish goals, develop plans) may avoid any responsibility related to implementation. Those closer to the action who are charged with "implementation" are often excluded from any debate which led to an agenda for reform. Job specialization and bureaucratic compartmentalization naturally support such conditions. The important Indonesian institution Rakernas is necessary, but perhaps insufficient mechanism to bridge completely this gap.

Educational change efforts are long slow processes which often require attention to individuals, organizations and the organizational context (see figure 2). Major institutional change-nationally administrative adjustments-underline best conditions of resources and

expertise may take several years. For example the core technology of the teaching and learning process can't be reformed without consideration of the conditions of teachers work, and may require reforming existing occupational definitions. Changes in conditions and roles of teachers may be constrained by the governance and incentive structures, requiring the reforming of relationships between schools and their clients.

These and other reforms take place within the culture of the school or nonformal learning arrangement, the educational bureaucracy, the community, and the state. In developing local action planning, the initial pertinent questions to be asked include: Are the characteristics of, and need for, the change understood by teachers? administrators? the educational bureaucracy? the parents? Is there consensus?

The choice of innovation strategy depends on the type of change being initiated. Whether top down or bottom up the change must deeply involve the individual school. The chosen strategy should consider the structure of the decision making process. Some room to manoeuver, particularly to be more involved at the classroom and school levels, is important for teachers, local administrators, and community members. The teachers and administrators need to understand the scope of maneuverability and they need appropriate information upon which to make choices. They may also need to learn the skills of negotiating for extended opportunities to critically assess existing practices and participate in developing an agenda for the future. Children also need room to maneuver in making decisions if an important aspect of quality education is preparation for active participation in civic life.

If a criterion of quality decision making is extent of meaningful participation of

citizens and educational professionals, then community members also need "room to maneuver." However, a vicious circle of low educational opportunity, biased access (along grounds of gender, ethnic grouping or resources) leading to participation skewed by level of education may result in a decision making process of low quality. The extent of possible community involvement in decision making of course, depends not only on the educational level of the population but also on historical traditions and continuing perceptions as authority and responsibility. Increasing participation, at the local level not only makes the process more equitable (by allowing involvement of the various groups), but also more efficient through extending this responsibility for education and potentially thus increasing human and possibly material resources.

It must be recognized that meaningful participation may to some extent realign the conditions as educational control. Several questions need to be formally or informally addressed: Who has the right to participate? Who should be empowered? Who has something to contribute? What knowledge is acceptable? Who should provide answer to these two questions?

Deciding who shares in decisions also decides who does not. For long term continuing reform both quality and equity considerations suggest that the principle of exclusiveness is less appropriate than inclusiveness.

Continuing evaluation and feedback provide the potential for the incorporation of new information and research results into continued improvement. In this context evaluation is an activity of systematically collecting, analyzing, and reporting information useful for some purpose. "Systematic" implies that the evaluation is planned in order to

assist in answering specific questions. Evaluation should have technical credibility; that is, it should stand a reasonable test for methodological correctness. Perhaps more importantly it should be professionally credible and meaningful to those associated with improving educational quality. To achieve professional credibility and meaningfulness requires that the evaluation is demonstrably relevant to ongoing decisions - a condition which and may require direct involvement of local teachers, administrators, and parents.

Evaluation should be concerned with such initial questions as: Were the objectives of the innovation achieved? What worked? That is, which specific activities were successful? What were the critical features of the change? However evaluative concern for the intervention should extend to the individuals and the organization because as has been demonstrated in this paper both may be important in improving educational quality. One of the major findings of international and Indonesian research on school effectiveness suggests that the variables most closely associated with school and program successes are often organizational not programmatic. The changes that warrant most evaluation attention may be the behavioral and attitudinal changes in the teachers, administrators, and students within the changing culture of the school.

Adoption of a new program does not insure full implementation and successful current implementation doesn't guarantee future implementation. Organizational and external contextual conditions change. The quality of working conditions for teachers may decline, the support of administrators may wane, the educational bureaucracy may enter a period of benign neglect, and the community's attention may turn elsewhere. One of the

disturbing findings of international research on educational quality innovations is that many of the initially successful changes do not persist over time.

Adaptation or, "adaptive implementation," suggests a continuing process in examining and innovatively altering the structures and behavior patterns which define school organizations (Lotto, 1983). Adaptation is built on evaluation and can be "institutionalized" as an integral part of the decision making process.

Some Tentative Generalizations about the Process of Improving Educational Quality.

* Many disagreements about educational quality, effectiveness, efficiency or equity may not surface until implementation. General agreement for example, on the need for better educated teachers additional instructional materials etc may disappear when vested interest group consider the costs or choices of means of accomplishment.

* Planning (including implementing) educational change should be a continuous, participatory process. Plans may be written only at specified times, but decisions and choices cannot await formulation of a new plan. Process is one of the most important products of planning. Extended participation results in capacity building for those involved. However, if important educational changes are only transmitted downward through the bureaucracy then there can be no meaningful participation and no reason for middle and higher level bureaucrats to listen to local administrators and teachers.

* Although there appears to be growing agreement on the conditions and determinants of

educational quality multiple strategies present themselves. Strategy options might include, for example: an attempt to strongly control inputs, process and outputs, an emphasis on either inputs, process or outputs to the relative neglect of the others, a selective choice of a set of teacher behaviors expected to result in desired outcome, and/or a focus on role, relationships and working conditions. The last option is based on the assumption that differentials of power, authority, role and status must be reconciled before significant change can be implemented.

* Improving educational quality can also improve efficiency and equity. Efficiency and equity can be elements of in the continuing quest for higher quality. As a continuing, participatory inquiry process, improving quality by including, or variety of interest groups may "naturally" make efficiency part of the dialogue about choice for change. Both efficiency and equity are further supported because such a process which emphasizes open discussions, considers the full range of options and demands the full range of available information.

* The planning and administrative skills necessary to guide the improvement of quality are different from those which support the traditional focus on control and compliance. Although certain technical skills in the collection and analysis of data will be necessary, the focus of planning activity will be organizing, working with, listening to teachers, parents, community leaders. The planning role increasingly involves negotiating, facilitating, coordinating, and conflict resolution. Planning choices and decisions about educational change at the school and classroom levels rest on the accepted relevance of such changes by people involved in, or concerned about, education. Research and experience suggests that opportunities for real participation at the school and community levels should be

encouraged if reforms are going to be meaningful and have local professional and lay legitimacy. Communication may at times be more important than political power in creating lasting improvement.

In implementing educational change over the next 5 years or 25 years the crucial practical problems probably will not lie in conflicts between quality, efficiency and equity. The major challenge will be to develop in education. The capacity for quality within an acceptable lives of cost-effectiveness, create the ability to implement change equitably and generate among all involved a commitment to continued improvement.

The extent of appropriate participation is subject to debate; however, a strong case can be made for wide involvement in the serious choices surrounding the priorities in goals, the tradeoffs and balancing of equity, equality and efficiency concerns, the generation and allocation of resources, governance, curriculum, teacher welfare, and evaluation. Transforming the process of planning educational change from a technical-bureaucratic exercise to a more inclusive, contextualized, and self-critical process allows those involved to cope with the wide range of potential surprises which accompany attempts to develop higher quality educational systems. There are areas of educational change e.g., facilities improvement, financial analysis, that are subject to a significant level of administrative or planning control; however many major problems of educational change must be found in reflection on our practical experience, discovered through research and experimentation, evolved through criticism or created from our imagination.²⁶

REFERENCES

1. Averch, H.A, Carrol, S.J., Donaldson, J.S. Kiesling H.J. and Piricus J (1972).
 2. Cuttance, Peter (1985). "Frameworks for Research on the Effectiveness of Schooling." in David Reynolds (Ed.)
Studying School Effectiveness. Philadelphia: The Falmer Press.
 3. Purkey, S and Smith M. (1983). Effective Schools : A review *Elementary School Journal*, 83 (4), 427-52.
 4. Aitkin M. and Zuzovsky (1992).
 5. Rutter, M. (1983). School Effects on Pupil Progress : Research Findings and Policy Implications. In Shulman, L.S. and Sykes, G.(eds), Handbook of Teaching and Policy. New York : Longman.
 6. Reynolds, David (1985). "Introduction : Ten Years on-A Decade of Research and Activity in School Effectiveness Research Reviewed". in David Reynolds (Ed.) Studying School Effectiveness. Philadelphia : The Falmer Press.
 7. Behrman, J. and Birdsall N. (1983). The-quality of Schooling : Quantity alone is misleading. *American Economic Review*, 73, 928-946.
 8. Bickel, W.E. (1990). "The Effective Schools Literature : Implications for Research and Practice." In Handbook of School Psychology. New York, Wiley & Sons, 1990.
 9. Cohn, E. and Rossmiller, R. (1987). Research on effective schools : Implications for less developed countries. Comparative Education Review, 31(2), pp. 377-399.
 10. Schwille, J. et. al. (1986). Recognizing fostering and modeling the effectiveness of schools as organizations in third world countries. Michigan State University, (Prepared for Project BRIDGES).
 11. Nielson, D. and Tatto, M.T. (1991). The Cost-Effectiveness of Distance Education for Teacher Training, Harvad, BRIDGES.
 12. Clark, D.L. (1980). An Analysis of Research Development, and Evaluate Reports: On Exceptional Urban Elementary Schools. Phi Delta Kappan.
- Coleman, J.S. (1966). Equality of Educational Opportunity. U.S. Government Printing Office, Washington, D.C.

Coleman, J.S. (1966). Equality of Educational Opportunity. U.S. Government Printing Office, Washington, D.C.

Jencks, C. et. al. (1972). Inequality : A Reassessment of Family and Schooling in America. Basic Books, New York.

13. Brookover, W. et al. (1979). School Social System and Student Achievement : Schools Can Make a Difference. New York : Praeger.

14. Jamison D. (1982)

15. Armitage, et. al. (1986)

16. Kostakis, A. (1987). Differences among School Outputs and Educational Production Functions. Sociology of Education. 60, 232-241.

17. Fullan R. (1987). Educational Change, New York, Teachers College Press

18. Fuller, B. (1986). Is primary school quality eroding in the third world ? Comparative Education Review. 30(4), (pp.491-507), p. 38.

19. Leithwood, K. "The Move Toward Transformational Leadership", Educational Leadership, 1991.

20. Suryadi, A. (1989). Improving Educational Quality of Primary Schools, Jakarta. Ministry of Education and Culture, Office of Educational and Cultural Research and Development.

21. Lockheed, M and Hanushek, E. "Improving Educational Efficiency in Developing Countries" Compare vol 18 vol 1988, p. 27.

22. Levin, H. Cost-Effectiveness: A Primer, Beverly Hills, Sage.

23. This section draws significantly from R. Elmore, Restucturing Schools.

24. Ibid, p. 15

25. Ibid

26. The authors also a knowledge the contributions of Emin Karip, Judy Sylvester and Esther Gottlieb, University of Pittsburgh

Chapter IV

ABSTRACT

Methods of Computation of Efficiency Measures :

A Practical Guide

Walter W. McMahon and Prayitno

This chapter explains methods of calculation of cost effectiveness, cost benefit, and educational rate of return measures of educational efficiency. These are Educational Indicators that should be computed annually as part of an Efficiency-Based Management Information system as described in Chapter II above. They are also the methods used in most of the substantive chapters of this Volume analyzing Indonesian data and in some cases data from other countries.

The guide seeks to be practical and specific. It describes the use of a Lotus program for calculating cost/effectiveness ratios, and private and social rates of return. It also describes the method of calculating rates of return from Mincer earnings functions.

The use of the program is very straightforward and can easily be accomplished by any person with a modest familiarity with personal computers.

Comparison of rates of return calculated using the rate of return formula (the Direct Method) and using Mincer earnings functions with the same 1989 Indonesia data are shown here to produce substantially identical results. They also reveal that the interaction between the amount of formal schooling and learning on the job that results in productivity growth later is positive and highly significant.

Chapter IV

Methods of Computation of Efficiency Measures: A Practical Guide

Walter W. McMahon and Prayitno

This is a practical guide to the computation of efficiency measure in education.

The discussion that follows is limited to two measures of outputs or ultimate outcomes. They are increments to test scores as a measure of the immediate output of a given level of education, and increments to earnings over the individual's life cycle attributable to that level of education as a measure of the value of one particularly important ultimate outcome.

I. Collection and Processing of Data

For cost/effectiveness measures, it is first necessary to collect consistent data on scores on standardized tests at the age at which the student completes the level of education in question. These are usually available as reading, math, science, and comprehensive scores. The comprehensive score would of course be used if the objective is to evaluate the cost/effectiveness of the school level in question.

To evaluate the effectiveness of that level, the starting score at the beginning of that level must be subtracted. Otherwise the main thing that is being measured is the prior schooling (which reflects the parent's wealth determining the neighborhood school in which the child was located). This is less important when considering the primary level, since presumably the children start out more equally, but even

here controlling for the parents socioeconomic status (e.g., sorting the data by urban and rural) is desirable.

The costs of the education at that level in this case are normally taken to be the direct costs, or total operating expenditure per pupil. This suggests one reason why it is so important to have good cost analyses and data on educational costs per student as part of the EMIS system.

Ratios of effectiveness to costs, and percentage changes in effectiveness relative to percentage changes in costs then can be easily calculated using MACRO formulas underlying each cell on a Lotus worksheet.

For cost/benefit measures, increments to earnings are normally taken as the measure of the values of one major ultimate outcome of a given level of education. To avoid the necessity of assuming a specific social discount rate in order to discount future earnings back to their present value (and thereby get the total "benefits" of education for use in a benefit/cost ratio), it is advantageous to compute a pure internal rate of return which is that rate that discounts the net increments to the stream of future earnings over the life cycle back to their present value, and sets them equal to the investment cost. This can be done easily using the Lotus present value calculation, which is set up by education level underlying the cells on the rate of return diskette.¹

Using microeconomic data based on surveys of individuals in households (e.g., the standard National Labor Force surveys such as SAKERNAS which must include data on the individual's earnings and education level to be useful), it is first necessary to get a breakdown

of mean earnings by age and education level. Specifically, using the Statistical Package for the Social Sciences (SPSS) and the "Mean's" program, the breakdown should be given for Mean Earnings by urban/rural by sex by Education level by age group. (The variable age needs to be recoded first to age groups = 15-20, 21-30, 31-40, 41-50, 51-60, and 61-65). It is then necessary to obtain the direct (institutional) costs per student for the year in question at each education level. This data can be inserted in the Lotus file on the diskette overwriting the relevant cells with the new data as explained below. A Lotus function key then will calculate all of the net earnings differentials at each age, the rates of return by sex at each education level, and produce a summary table.

II. Which Controls Are Appropriate, and Which Are Not?

The question of which controls are appropriate raises many issues. There is a reasonable solution to each. But there are so many that it is not appropriate to discuss all of them, or their many complexities, here.

Some controls have already been suggested:

First, it is desirable to sort the data by urban/rural. In the case of cost/effectiveness analysis of an immediate output, this is a partial control at least for the difference in test scores at the time of entry into the level of schooling in question. In the case of cost/benefit or rate of return analysis, earnings are not a good measure of a farmer's productivity because there is home produced and consumed food, other family members contribute to the farm's output, and the price of agricultural products often are distorted due to government

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policies that depress agriculture prices (in some countries in the developing world) or raise farm incomes through subsidy (in France and Germany).

Second, it is desirable to sort the data by sex, male and female, since the conditions surrounding each, their entry into the labor force, and their respective opportunity costs are different.

Third, it is necessary to sort by education level. Earnings of school leavers at the next lower education level will be subtracted later by the Lotus program to remove the interdependence with those next lower levels from the computation and permit computation of a marginal rate of return to the last level of education.

Fourth, with respect to controls for self-selection by the more able students of higher levels of education which involves controls for innate ability, the opinion of the authors is that it is better not to control for ability. Using the error ridden measures of ability that exist introduces bias into the estimates of the rates of return. This is the professional opinion of most economists who work in this field (see, for example, Rosen, 1987; Griliches and Masen, 1988; Psacharopoulos, 1981; Knight and Sabot, 1990, p. 39; and others). It is not, however, a unanimous opinion (most notably, Jere Behrman¹⁹⁸⁸). The reasons more specifically for ^{fe}preparing to omit controls for "ability" and/or parents SES are as follows:

*When using a Mincer earnings function, the schooling variable "s" is also measured with error, ^{(See Part IV below).} This in isolation causes a downward bias in the estimates of the rates of return, since "s" measures the quantity of schooling and does not take returns to the quality of

schooling adequately into account. Measures of pure "innate ability" do not exist, and proxies for ability, no matter what kind of an IQ test is used, reflect prior schooling (and hence the parents' SES). To use this as a control would further bias the estimate of the rate of return downward. So if it is omitted, any upward bias from the omission (due to differences in true innate ability) in the opinion of Griliches and Mason (1988) approximately offsets the downward bias due to the omission of quality from measurement of schooling ("s"). It is this as well as his own studies of this problem of self-selection bias that leads Rosen (1987, p. 299) to say "Corrections for bias arising from the correlation between years of school completed and measured ability suggest that a relatively small correction is needed. Comparisons across realized observations are a good first order approximation to the rate of return to schooling."

*When estimating rates of return by direct computation using the rate of return present value formula, controls for "ability" again, in our opinion, introduce more bias and distortion into the result than they correct. The variable years of schooling is controlled for (by sorting the data) as it is in the Mincer earnings function. But investment in education includes the total direct cycle costs, or institutional expenditures per child for the number of years the child is in school, which does include investment in the quality of the schooling, as well as reflect ^{the} internal efficiency of the school. However downward bias in the estimate after correcting for ability would exist both because the data is cross section data, and therefore does not include a rate of growth in annual earnings due to

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technical change or the role of education in disseminating and using the new technologies, as well as due to the fact that test score measures of ability are "error ridden" in that they reflect prior schooling. Again without a control for true IQ the resulting upward bias and the downward bias from the lack of an adjustment for a technological growth factor act as offsets. For these reasons, we feel it is better to avoid the additional bias that sorting the data by measures of ability which are error-ridden or by occupation would introduce.

Finally,
^A controls for age, or age group are absolutely necessary, as suggested above. Earnings on the first job can be very misleading, since age-earnings profiles for those with more education sometimes start lower, but always are much more peaked than those for persons with less education.

Finally,
^A Other types of controls depend upon the objective of the analysis. If the objective, for example, is to compute a rate of return to the total human capital formed both by investment in the school and by the investment by the parents as is probably desirable when considering social policy, then it is not appropriate to control for the parents socioeconomic status, which does have a large impact on the amount invested. If, however, the objective is to study the cost effectiveness of a particular school, then controlling for the quality of the students who enter and for other nonschool inputs is important.

III. A Practical Guide to Making Direct Rate of Return Calculations

The sequence of steps that follow, using the data on mean earnings and on institutional costs described above involve simple, easy to follow instructions and then automatic calculation of the pure internal rates of return using the Lotus program on a personal computer.

1. Boot up Lotus version 2.01 or later.
2. On Lotus use the slash key (/) to get the menu, and select File, Retrieve, and then retrieve an "INDON" file from the diskette obtained from the authors or from Tallahassee.
3. Scroll all the way up to the top of the file. (Please do not reproduce the diskette, or use these directions and the program in published work without normal citation). The data on this file is for Indonesia, but variants have been prepared for Pakistan, the U.S., and several other developing countries where the age groups and/or education levels differ slightly. Rename INDON as INDON (new date) for your use as a Master.
4. To enter the data on Mean Earnings at each education level, merely overwrite the original data in each row labeled "Costs and Earnings" for each age group. That is:

		<u>15-20</u>	<u>21-30</u>	<u>31-40</u>	<u>41-50</u>	<u>51-60</u>	<u>61-65</u>
No School	M	NA	NA	NA	NA	NA	NA
	F	NA	NA	NA	NA	NA	NA
Some Primary	M			Enter	Mean	Earnings	
	F			"			
Primary	M			"			
	F			"			
Jr. High School	M			"			
	F			"			
Sr. High School	M			"			
	F			"			
Senior High School (Gen)	M			"			
	F			"			
Senior High School (Voc)	M			"			
	F			"			
College 1-3 (Academy)	M			"			
	F			"			
University	M			"			
	F			"			

5. Ignore the lines labeled "Net Earnings Differential from the last level." These will be computed automatically.

6. Next enter the data for Direct Costs (Col. D) per year per student at each education level. This must be obtained from a study of institutional costs from the Ministry of Education, ^{updated to the current year with the Consumer Price Ind} The number entered must be multiplied by the number of years it takes to complete each level to obtain cycle costs (as shown in the formula underlying each cell). This is done automatically, unless you wish to change it.

7. Do not enter Foregone Earnings Costs (Col. C). These will be computed automatically by the program based on the mean earnings by sex at the respective prior level. They will also be multiplied by .75 to reduce foregone earnings costs by the months each year not in school, ^{multiplied} and by the number of years it takes to complete each level.

8. After checking your entries and refining the assumptions to be sure they are appropriate to the situation being considered (e.g., earnings for "no school" are normally available so that a rate of return to grades 1-6 can be computed, but sometimes the data is insufficient), press the Function Key "F-9" and wait.

The net earnings differentials and rates of return will be computed all at once, with the net earnings differentials spread out for each year of age on Table 2 in the Lotus printout.

9. The solution to the nonlinear equation that is involved often will not be found on the first pass. The program will print "ERR" when there is no convergence in the relevant cell. Ninety-nine percent of the time the cause is either that:

(a) Your initial GUESS at the bottom of Table 2 is bad. Change it to something that looks more realistic by visual inspection of the total costs and net earnings differentials. *OK,*

(b) There is not a smooth increase in earnings over age groups followed by contraction of the net earnings differential, as is normal. Instead there are inflections, or dips. This sets up a highly nonlinear equation to be solved, and it is difficult to get the iteration process to converge, even if the initial guess is very close. There are reasonable ways to eliminate this problem:

(1) First, look at the raw data. An "outlier" in the mean earnings stream in Table 1 will often be found that is based on a very small number of observations.

The remedy is to increase the sample size by computing a new average using the mean earnings in the two age groups that appear in the adjacent cells.

- (2) Second, press key "F-9" to recompute, and see if the "ERR" is eliminated. The Present Value cell (PV) is a check statistic, since at the correct rate of return, the present value should be zero.
 - (3) Repeat the above procedure to eliminate any second or third blips in the data. It is not always necessary to eliminate all of the inflection points to obtain convergence.
10. Save your results. On the Lotus Menu: F for File, S for Save, enter your new file name. There may not be enough additional room on the source diskette.
 11. Print your results. P for Print, P for Printer, R for Range (enter A1 .. U189), G for Go. Allow the Printer to run until it stops. There is a blank page or two that it will skip over.
 12. Study the formulas used to compute direct and indirect costs to be sure they are appropriate to your specific situation.

To see the formulas, on the menu, select Worksheet, Format, Other. Once you convert the screen to the formulas, you cannot convert it back to the data. So be sure you have saved your new data file on a diskette first as recommended in Step #10 above! After converting to the formulas, they can be printed out.

13. To compute social rates of return, the costs are the full social costs (including the full tax costs included in the direct costs), and the returns are mean total earnings before taxes.
14. To compute private rates of return, the direct costs would include only private costs, and the earnings entered in Table 1 should be net of taxes.
15. Finally, in developing countries especially earnings from second and third jobs are important. Earnings from the first job only will tend to understate the true rates of return.
16. Good luck!

IV. Rates of Return Using Mincer Earnings Functions

A calculation of rates of return using 1989 SAKERNAS data is shown below using Mincer earnings functions. The results are compared to those using the direct method for the same year as described above.

The Mincer earnings function is a ^apragmatic regression equation widely used for estimating rates of return. It can be derived mathematically from the "pure" internal rate of return formula whose direct use is described above. But this can only be done by imposing a number of assumptions. Some of these assumptions are debatable, as indicated by Blinder (1977), Rosenzweig (1977). But the issues are numerous and complex, and therefore will not be debated here. A good survey is available in Willis (1986).

Table 1 below shows the regression results using four different specifications of a Mincer earnings function. Here

$\ln Y$ = log of earnings

s = number of years of schooling

x = number of years of experience, using as a proxy the current age less the school leaving age

The t--statistics are shown below the estimates for each coefficient.

Equations (4) and (5) are the preferred specification since all coefficients are highly significant, all have the expected sign, and the total variation in log earnings that is explained by schooling and experience is the highest ($R^2 = .39$). As expected, earnings grow more rapidly at higher levels of education ($\beta_2 > 0$), ^{in Eq. 5} and flatten out or decline at older ages ($\beta_5 < 0$). Of particular interest is the interaction between schooling and experience (sx). This term is positive and highly significant whenever it is introduced, which indicates that more formal schooling in Indonesia contributes positively to the amount of learning that occurs on the job and to earnings-productivity later.

Table 2 below compares the rates of return estimated using these Mincer earnings functions with the rates of return obtained by the direct method of instruction using the rate of return formula discussed in Section III above.

The method of estimating the rate of return (r^*) is as follows:

For equation (1):

$$r^* = \frac{\delta \ln Y}{\delta S} = \beta_1 + 2\beta_2 s$$

Table 1

Mincer Earnings Functions

Estimated for Indonesia, 1989 SAKERNAS Data

(1)	$\ln Y =$	β_0	+	$\beta_1 s$	+	$\beta_2 s^2,$		$R^2 = .26$					
		12.8		.0786		.0015							
	t =	(1129)		(25.7)		(8.15)							
(2)	$\ln Y =$	β_0	+	$\beta_1 s$	+	$\beta_2 s^2$	+	$\beta_3 x,$	$R^2 = .34$				
		11.9		.156		-.0017		.0199					
	t =	(726.0)		(50.3)		(-9.6)		(70.0)					
(3)	$\ln Y =$	β_0	+	$\beta_1 s$	+	$\beta_2 s^2$	+	$\beta_3 x$	+	$\beta_4 sx,$	$R^2 = .37$		
		12.7		.003		.0026		-.0003		.0029			
	t =	(518.2)		(.694)		(12.9)		(-.54)		(44.88)			
(4)	$\ln Y =$	β_0	+	$\beta_1 s$	+	$\beta_2 sx$	+	$\beta_3 x$	+	$\beta_4 x^2,$	$R^2 = .39$		
		11.7		.095		.001		.053		-.0006			
	t =	(437.9)		(45.9)		(13.8)		(36.27)		(-35.7)			
(5)	$\ln Y =$	β_0	+	$\beta_1 s$	+	$\beta_2 s^2$	+	$\beta_3 sx$	+	$\beta_4 x$	+	$\beta_5 x^2,$	$R^2 = .39$
		11.93		.065		.0014		.0013		.049		-.0006	
	t =	(342.3)		(13.4)		(6.91)		(15.49)		(31.78)		(-33.9)	

Table 2

Comparison of Rates of Return Estimated Using
Mincer Earnings Functions and By The Direct Method

<u>Education Level</u>	<u>Using Mincer Earnings Functions</u>					<u>Using the</u>
	(1)	(2)	(3)	(4)	(5)	<u>Direct</u>
						<u>Method</u>
s = 6 yrs. & under						5%
s = 4 yrs.	9.1%	14.16%	4.7%	(10.3%)	8.6%	--
s = 6 yrs.	9.7%	13.34%	5.7%	(10.3%)	9.2%	--
s = 9 yrs.	10.6%	12.36%	7.3%	(10.3%)	10.1%	11%
s = 12 yrs.	11.5%	11.28%	8.9%	(10.3%)	11%	12%
s = 15 yrs.			9.4%	(10.3%)	15.4%	8%

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For equations (2-5):

$$r^* = \frac{\delta \ln Y}{\delta s} = \beta_1 = 2\beta_2 s + 8\beta_3,$$

where x is held constant at the overtaking age of 8 years.

Since Eq. (4) has no s^2 , the marginal rate of return is constant and equal to the average rate of return.

The results shown in Table 2 reveal that estimates using the preferred Mincer earnings functions (Eqs. 4 & 5) are very similar to estimates made by the direct method. For example, for:

	<u>Mincer</u>		<u>Direct</u>
	(4)	(5)	
Junior Secondary (s = 9 yrs)	10.3%	10.1%	11%
Senior Secondary (s = 12 yrs)	10.3%	11%	12%
University (s = 16 yrs)	10.3%	15.4%	8%

The difference in the estimate for the university level is due to the fact that by the direct method, we calculated cycle costs based on taking 6½ years to finish, as is typical currently, whereas the calculation using the Mincer earnings function assumed 4 years to complete the degree. The 8 percent rate of return obtained by the direct method therefore is more accurate.

V. Conclusions

This chapter has sought to offer a practical guide to calculation of cost/effectiveness ratios useful in monitoring the efficiency of different intermediate processes and immediate educational outputs, and

of social rates of return that evaluate major ultimate outcomes of total public and family investment in human capital formation through education. These techniques may be useful within the Central Government's Efficiency-Based Management Information System for computing Education Indicators of efficiency, and also as more persons at the provincial and local levels and in the universities and IKIP's become involved.

Calculations of rate of return using Mincer earnings functions and the direct method with the same data (1989) reveal that the results obtained by using the two methods are substantially the same. They also show that there is positive interaction between the amount of formal schooling (which is largely general education rather than VOTEC) and the amount of learning and productivity increase that occurs on the job.

Footnote

¹This diskette for computing rates of return to education is a Lotus file for use on any PC with Lotus. It is available on request from the authors, or from Learning Systems Institute, Florida State University, Tallahassee.

References

- Behrman, Jere and Anil Deolalikar (1988). "The Impact of Schooling on Indonesian Wages and Hours Worked: Does Control for Household and Community Fixed Effects Make A Difference?" D.S.P. Research Memo #44.
- Blinder, Alan (1977). "On Dogmatism in Human Capital Theory," Journal of Human Resources, Vol. XI, No. 1, pp. 8-21.
- Griliches, Zvi and W. H. Mason (1988). "Education, Income, and Ability" in Zvi Griliches, Technology, Education, and Productivity, Basil Blackwell, New York, pp. 182-212.
- Knight, J. B. and R. H. Sabot (1990). Education, Productivity, and Inequality, Oxford University Press (for the World Bank), Oxford.
- Psacharopoulos, George (1987). "Returns to Education: An Updated International Comparison," Comparative Education, 17 (3): pp. 321-41.

Rosen, Sherwin (1987). "Self Selection and Education" in the Economics of Education: Research and Studies, George Psacharopoulos, Ed., Pergamon Press, Oxford, pp. 298-9.

Rosenzweig, Mark (1977). "Nonlinear Earnings Functions, Age, and Experience: A Nondogmatic Reply and Some Additional Evidence," The Journal of Human Resources, Vol. XI, No. 1, pp. 23-27.

Willis, Robert J. (1986). "Wage Determinants: A Survey and Reinterpretation of Human Capital Earnings Functions, in Ashenfelter and Layard, Handbook of Labor Economics, Vol. 1, Elsevier.

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Chapter V

Vocational and Technical Education in Development Theoretical Analysis of Strategic Effects on Rates of Return

Walter W. McMahon, Jin Hwa Jung, and Boediono*

ABSTRACT

This paper develops a theoretical analysis and sensitivity tests of three strategic effects on the rates of return to VOTEC. The three effects considered are (1) the availability of complementary inputs such as general education, (2) the capacity of VOTEC to teach continuing adaptation to technical change, and (3) economies of scale that can be realized in VOTEC.

The direction and potential magnitude of each effect, evaluated by sensitivity tests, serve as a diagnostic device to improve the quality and economic effectiveness of VOTEC.

*Note : This chapter was published in the Economics of Education Review, Vol. 11, No. 3, 1992. The authors express their appreciation to the Central Bureau of Statistics, Jakarta, for the use of National Labor Force Survey Data. They are also indebted to Adrian Zidemann at the World Bank and two anonymous referees for useful comments on the manuscript.

HWM35-30

Vocational and Technical Education in Development: Theoretical Analysis of Strategic Effects on Rates of Return

Walter W. McMahon, Jin Hwa Jung and Boediono

Introduction

This paper develops a theoretical analysis and sensitivity tests of three strategic effects on the rates of return to vocational and technical education (VOTEC). The effects considered can be changed by means of appropriate policies. The theoretical analysis of the direction of each effect and its potential magnitude taken together with empirical rates of return estimated for each region, in this case for Indonesia, are suggested as a diagnostic device in ways that are illustrated in the latter part of the paper to improve the quality and economic effectiveness of VOTEC and of the educational system in general.

The three effects considered are (1) the availability of complementary inputs such as general education where the elasticity of substitution between VOTEC and general education is low, (2) the capacity of VOTEC to teach continuing adaptation to technical change in the future, and (3) economies of scale that can be realized by schools that reach the 1 - 3,000 pupil size and/or by combining low enrollment curricula.

Econometric estimates of the relevant production functions involved are not the objective of this paper. This would not be possible in applications in different localities in developing countries given the complex data requirements and highly non-linear functions that are involved. But standard rate of return calculations often are available, or can be made. Those offered here for Indonesia illustrate how the potential effects described above can be used as a diagnostic tool to isolate the source of the effectiveness or lack thereof in each locality. Steps then can be taken to raise the cost effectiveness in those localities where it is low, and to replicate practices found in those places where VOTEC's rate of return is high. This would increase the contribution of VOTEC, and of education in general, to economic growth and development.

Prior work has developed the effect of a low elasticity of substitution between VOTEC and general education on rates of return to VOTEC, and the relevance of this to achieving the

"optimum degree of vocationalization" of the curriculum (see McMahon, 1988, p. 174). The new element developed here in Part I is the extension of this to a nested constant-elasticity-of-substitution production function (nested-CES) context where the elasticities of substitution among the inputs can differ. This permits analysis of the more realistic case where VOTEC, general education, and physical capital are complementary with one another but all three substitute against raw unimproved labor.

This nested-CES framework in Part I also extends the earlier analysis by considering the effects of technical progress on rates of return to VOTEC and to general education, and the effects of economies of scale. Prior work relevant to the significance of technical change includes that by Bartel and Lichtenberg (1987) who find that workers that have learned the new technology and are able to implement it have a comparative advantage in the job market. In a developing country context, technical change that occurs abroad can also affect the comparative advantage of specific industries and of workers in these industries. It can displace workers in specific industries who are further along in their life cycle if they have not been trained to continue to adapt, or if they have narrowly defined putty-clay types of skills. The effects of economies of scale which are also developed in Part I are known to be important to achieving cost effectiveness in VOTEC programs as a result of other prior work (see Moura-Castro, 1987, p. 607).

Sensitivity tests of all three effects appear in Part II. They seek to appraise the potential quantitative importance of each. This is combined with observation of new empirical rates of return for VOTEC and for general education to illustrate the use of these combined elements as a diagnostic tool to improve the efficiency of education. The rates of return are calculated by standard methods using a pure internal rate of return formula. This is because the objective is not to estimate the parameters of the underlying production function but instead to use knowledge of the theoretical effects together with standard rate of return calculations which are

available in most developing countries as a diagnostic tool to isolate ways of improving and raising the cost effectiveness of VOTEC. The social rates of return are disaggregated by urban-rural and by sex, as well as by region, to control for extraneous effects. Part III summarizes the conclusions.

I Theoretical Analysis of Rates of Return Derived from a Nested-CES Function

In developing countries there are several problems in the planning of education that involve VOTEC. They include the need to achieve an appropriate balance between the rate of expansion of vocation-specific curricula (which are very frequently in separately-tracked VOTEC schools) relative to the rate of expansion of general education. This is the problem of the optimum "mix" (McMahon, 1988), the need to keep the VOTEC curricula technologically progressive, which involves additional costs, and the need to maintain VOTEC's cost effectiveness in part by achieving economies of scale to reduce unit costs.

To achieve an efficient "mix" in the curriculum is particularly important in developing countries, where underdeveloped human resources are often plentiful, other economic resources are scarce, and the need to use the latter as effectively as possible to raise living standards is great. The problem is that often quantitative planning techniques are used to serve industry that ignore the relative costs, neglect rural areas even though the net returns may be higher there, and focus on the first job neglecting the effects of technical change and career changes later. Also rate of return concepts are not widely understood, and hence are often misunderstood and misinterpreted, with the result that the basic economic criteria necessary in this inter-temporal context are not applied, and greater economic efficiency is not achieved.

Complements or Substitutes ?

The main point here that requires going to a nested-CES production function is that VOTEC and general education are complements, rather than close substitutes for each other, whereas both these forms of human capital together with physical capital tend to substitute for raw unimproved labor (e.g., Griliches, 1969; Fallon and Layard, 1975). VOTEC embodies occupation-specific skills and the new technology that are readily applicable to the future job. On the other hand, general education is more broad and basic in nature, enhancing individuals' ability to learn on the job, to receive and benefit from further on-the-job training, and therefore to adapt to future career changes and technical change.¹ Occupation-specific skills obtained from VOTEC and basic skills obtained from general education are in this sense complementary in that both types of skills are useful for success in the labor market and both are needed. Occupation-specific skills are immediately useful at work and thus are generally associated with higher initial earnings and lower initial unemployment. Therefore, a complete program of general courses usually means a sacrifice of initial earnings and somewhat longer average job search at the entry level, but an age-earnings profile that peaks higher at a later age. However, vocational skills have large effects on productivity only when there is a correspondence between one's vocational skills and one's job, as Bishop (1989b) points out. Accordingly, too much specialization in vocational courses involves a risk of not being profitable in the future job should worldwide technologies which impact developing countries change. On the other hand, the 3 R's are important in every type of job, although their immediate effects on productivity may be smaller than occupation-specific skills. Furthermore, while still in school, basic skills enhance the ability to learn vocational skills, and vocational courses showing the relevance of basic skills can feed back and improve learning in general education courses. So there is complementarity both in learning and later in use of the more general and the more applied concepts and skills.

This complementarity between VOTEC and general education explored in McMahon (1988) has also been empirically supported for the non-college-bound high school students in work by Kang and Bishop (1989). In their work, returns are found to be decreasing from excessive specialization, indicating that VOTEC and general education reinforce each other. This implies that a proper balance between these two types of education is needed to be effective, that is, the educational curriculum should provide both VOTEC and general education to gain the largest benefits from educational investment.

These complementarity/substitutability relationships among production inputs also have been explored in line with the "capital-skill complementarity hypothesis", the hypothesis that both kinds of skilled (educated) labor are more complementary with physical capital than they are with unskilled labor. Earlier empirical studies along this line generally support the hypothesis, as shown in the review article by Hamermesh and Grant (1979). The nested-CES production function, originally introduced by Sato (1967), has been used to test this by Fallon and Layard (1975), whose results support the hypothesis and also Griliches' (1969) earlier finding, both in an international cross-section of countries, and within their subsample of less developed countries respectively. In a more recent series of Dutch studies, Broer and Jansen (1988) report that the elasticity of substitution is very high (1.3) between physical capital and raw labor (primary school), while there is a high degree of complementarity between physical capital and highly educated labor (college education). McMahon (1992) found somewhat lower substitution elasticities, but in the same pattern, from the U.S. time-series data. The elasticities of substitution are lowest between the different forms of human and physical capital ($\sigma = 0.22$) and higher between this nest of total capital (human capital and physical capital) and raw labor ($\sigma = 0.43$). Ritzen (1987, 1989) also finds for both the United States and the Netherlands, using a slightly different nesting pattern, that the elasticity of substitution between less educated labor and physical capital is around 0.6, whereas the elasticity between

highly educated labor and the other types of inputs is around 0.2.

Although the precise values of the coefficients differ somewhat depending on the nesting pattern, on whether the human capital inputs are measured as human capital stocks or as worker-hour flows, and as between industrialized and developing countries, this pattern of complementarity among forms of human capital and physical capital, and substitutability of all types of capital for the uneducated labor may almost come close to a stylized fact.

Incorporating Technical Progress and Economies of Scale

To explore analytically the effects of this complementarity between VOTEC, general education, and physical capital, the nested-CES production function shown in Eqs. (1) and (2) below allows for a lower elasticity of substitution among these three forms of human and physical capital, and a higher elasticity of substitution between total capital and raw labor. Technical progress and economies of scale, two other effects of strategic importance in developing countries, are also incorporated in this same nested-CES production function.

$$Y = A[\alpha_1 Z^{-\rho} + \alpha_2 (e^{a_N} N)^{-\rho}]^{-\frac{1}{\rho}}, \quad (1)$$

$$Z = B[\beta_1 (e^{a_V} V)^{-\rho_Z} + \beta_2 (e^{a_G} G)^{-\rho_Z} + \beta_3 (e^{a_K} K)^{-\rho_Z}]^{-\frac{1}{\rho_Z}}, \quad (2)$$

$$\alpha_1 + \alpha_2 > 1, \quad \beta_1 + \beta_2 + \beta_3 > 1$$

where Y stands for the total output (or earnings) and Z for the intermediate product. N denotes the quantity of raw labor, V and G, respectively, denote the stock of human capital, measured as is physical capital at cumulated depreciated original cost in real terms covering the skills created by VOTEC and skills created by general education, and K denotes physical capital.

The complementarity between VOTEC, general education, and physical capital in contrast

to a high substitutability between total capital and raw labor implies:

$$\sigma_z = \frac{1}{1 + \rho_z} < \sigma = \frac{1}{1 + \rho}, \quad (3)$$

where σ_z is the smaller elasticity of substitution within the total capital nest and σ the higher substitution against unimproved labor reflecting the empirical work surveyed above.

Technical knowledge is embodied in human capital at exponential rates (e^{*v} and e^{*c}) by formal education and by learning on the job later. It is embodied in physical capital as well (e^{*k}) whether this physical capital is imported into the developing country or produced domestically and placed in service. The possibility of there being additional disembodied technical progress is allowed for in the rate e^{*n} and treated as raw labor-augmenting in Eq. (1). In most cases technical progress is likely to differ in its effect on each type of input, and thus be non-neutral. This is provided for in the nested-CES in that the exponential rates of technical progress, a_v , a_G , a_K , and a_N are not necessarily equal to one another, nor are they constants since we are not concerned here with steady state solutions. Certain VOTEC skills are useful in implementing and in adapting to new technology, and certain general education skills are useful in this regard such as curricula that teaches the 3 R's and rational thought, as distinguished from the memorization of catechisms or Koran scriptures that can leave students illiterate, as has been developed so forcefully by Easterlin (1981, p. 62). These students have an advantage on the job market, and higher earnings, according to Bartel and Lichtenberg (1987) and Godfrey (1987).

Another impetus to economic growth comes from economies of scale. These occur when the distribution parameters in the nested-CES above add to more than unity, in $\beta_1 + \beta_2 + \beta_3 > 1$ and/or in $\alpha_1 + \alpha_2 > 1$, so that there are increasing returns. Within VOTEC curricula, economies of scale are a major source of lower costs as indicated earlier (e.g.,

Moura-Castro, 1987). If these scale economies are achieved there by raising VOTEC curricula to an efficient scale (schools of 1 - 3,000 pupils), or by combining high cost low enrollment curricula, then the distribution parameter applying to VOTEC (β_1) would be larger.

The Effect of a Sub-Optimum Mix, of Technical Progress, and of Economies of Scale on Rates of Return

To derive rates of return from the nested-CES production structure, first, Eqs. (1) and (2) can be combined to obtain:

$$Y = [\alpha_1 \{ \beta_1 (e^{a_V} V)^{-\rho_z} + \beta_2 (e^{a_G} G)^{-\rho_z} + \beta_3 (e^{a_K} K)^{-\rho_z} \}^{\frac{\rho}{\rho_z}} + \alpha_2 N^{-\rho}]^{-\frac{1}{\rho}}. \quad (4)$$

Note that efficiency parameters A and B are assumed to be unity for simplicity. Taking the total derivative of Eq. (4) with respect to time t, we have

$$\begin{aligned} \frac{dY}{dt} &= \frac{\partial Y}{\partial V} \frac{\partial V}{\partial t} + \frac{\partial Y}{\partial G} \frac{\partial G}{\partial t} + \frac{\partial Y}{\partial K} \frac{\partial K}{\partial t} + \frac{\partial Y}{\partial N} \frac{\partial N}{\partial t} \\ &= \alpha_1 \beta_1 (e^{a_V})^{-\rho_z} \left(\frac{Y}{Z} \right)^{\rho+1} \left(\frac{Z}{V} \right)^{\rho_z+1} \frac{\partial V}{\partial t} + \alpha_1 \beta_2 (e^{a_G})^{-\rho_z} \left(\frac{Y}{Z} \right)^{\rho+1} \left(\frac{Z}{G} \right)^{\rho_z+1} \frac{\partial G}{\partial t} \\ &\quad + \alpha_1 \beta_3 (e^{a_K})^{-\rho_z} \left(\frac{Y}{Z} \right)^{\rho+1} \left(\frac{Z}{K} \right)^{\rho_z+1} + \alpha_2 \left(\frac{Y}{N} \right)^{\rho+1} \frac{\partial N}{\partial t}. \end{aligned} \quad (5)$$

Then, the real rate of return to VOTEC, r_v , is obtained from:

$$\int_{t=0}^T (\alpha_1 \beta_1 (e^{a_V})^{-\rho_z} \left(\frac{Y}{Z} \right)_t^{\rho+1} \left(\frac{Z}{V} \right)_t^{\rho_z+1} - C_{Vt}) e^{-r_v t} dt = 0, \quad (6)$$

where the term in parenthesis is the marginal productivity of human capital formed through VOTEC net of the costs of VOTEC C_{vt} . The rate of return to general education, r_G , is obtained from:

$$\int_{t=0}^T (\alpha_1 \beta_2 (e^{a_G})^{-\rho_z} \left(\frac{Y}{Z} \right)_t^{\rho+1} \left(\frac{Z}{G} \right)_t^{\rho_z+1} - C_{Gt}) e^{-r_G t} dt = 0, \quad (7)$$

which is the rate at which the stream of future marginal products is discounted to their present value and set equal to the costs of general education C_G . Note that the rates of return to each type of education are now determined by the substitution elasticities which depend on ρ and ρ_z , the rates of embodied technical progress a_v and a_G , and the distribution parameters β_1 and β_2 .

Interpretation of Each Effect

The lower elasticity of substitution between VOTEC and general education (with $\rho_z > \rho$) implies that an underexpansion of V in Eq. (6) will raise its rate of return, and an underexpansion of G in Eq. (7) will raise its rate of return, vice versa. This is because the marginal product of VOTEC rises if V in the denominator becomes small, and the same for G . Therefore, it is suggested that a balanced expansion of VOTEC, general education, and physical capital is necessary to maintain efficiency in production. This is illustrated in Figure 1. The optimum VOTEC-general education curriculum mix is represented by point $B(G_1, V_1)$ in Figure 1. There the rates of return to both are equal given the budget constraint $(I_1 I_1)$. At point A , general education is overexpanded, resulting in lower returns (represented by the lower returns to education at the same costs, C_v and C_G , on a lower isoquant). Conversely, at point C , VOTEC is overexpanded, again at the same level of costs C_v and C_G , with a low rate of return to VOTEC and a relatively high rate of return to general education. Movement from C to B raises the returns to education from Z_0 to Z_1 while reducing the stock of vocational skills from OV_2 to OV_1 . From Eq. (1), the increase in Z causes output to grow, other things being equal. It follows from Eqs. (6) to (7) that the rate of return to VOTEC rises, and to general education falls. The efficient expansion path as economic growth occurs is thus given by the line OBE on which the most efficient balance between the two types of education is maintained.

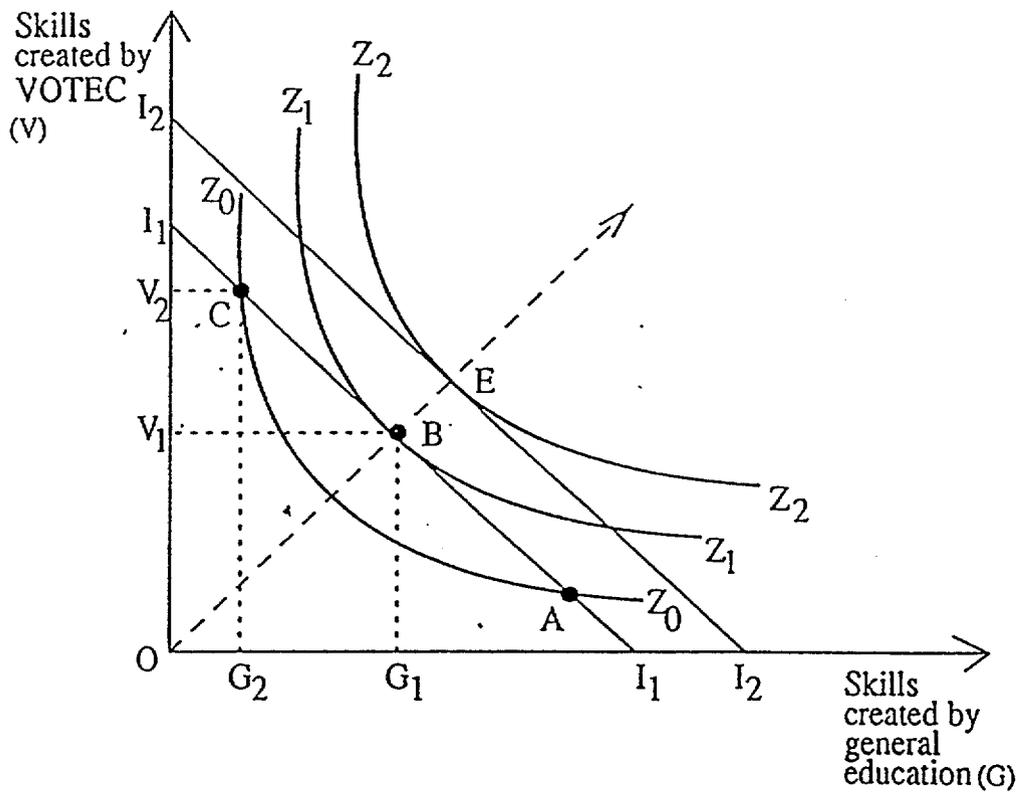


Figure 1. The optimum VOTEC-general education mix

The effect on the optimum VOTEC-general education mix of the different types of technical progress is illustrated in Figure 2. If technical progress applies equally to vocational and technical skills and skills created by general education (i.e., $a_v = a_G$), the isoquants are shifted in such a way that the returns to both are increased but the MRTS is not altered for any given factor intensity ratio, and the expansion path is still along the vector Ok_1 . Accordingly, neutral technical progress does not change the optimum rates of expansion of VOTEC and general education.

On the other hand, if technical progress gives an advantage to basic skills that facilitates learning the new technologies now and later on the job, then the derived demand for general education will increase relative to the derived demand for VOTEC. The resulting optimum curriculum mix puts more emphasis on general education, shifting the factor intensity and optimum expansion path to Ok_2 . Technical progress which is embodied in up-to-date vocational skills raises the derived demand for VOTEC compared to general education, especially if the new technology is not a passing fad, and thus shifts the optimum factor intensity and expansion path to Ok_3 .

Some VOTEC is not always technologically progressive, however. In Indonesia, for example, VOTEC often involves learning simple wood carving, metal working, and weaving skills in separate schools and factories without development of adequate literacy and numeracy. For these types of VOTEC, the potential change in the rate of return from technical progress is very low or negative (i.e., $a_v \leq 0$). Vocational skills are often of the putty-clay type, so that once the technology in a specific field is embodied, the individual is more inflexible and unable to adapt to other fields or new technologies. The Indonesian government has made the wise

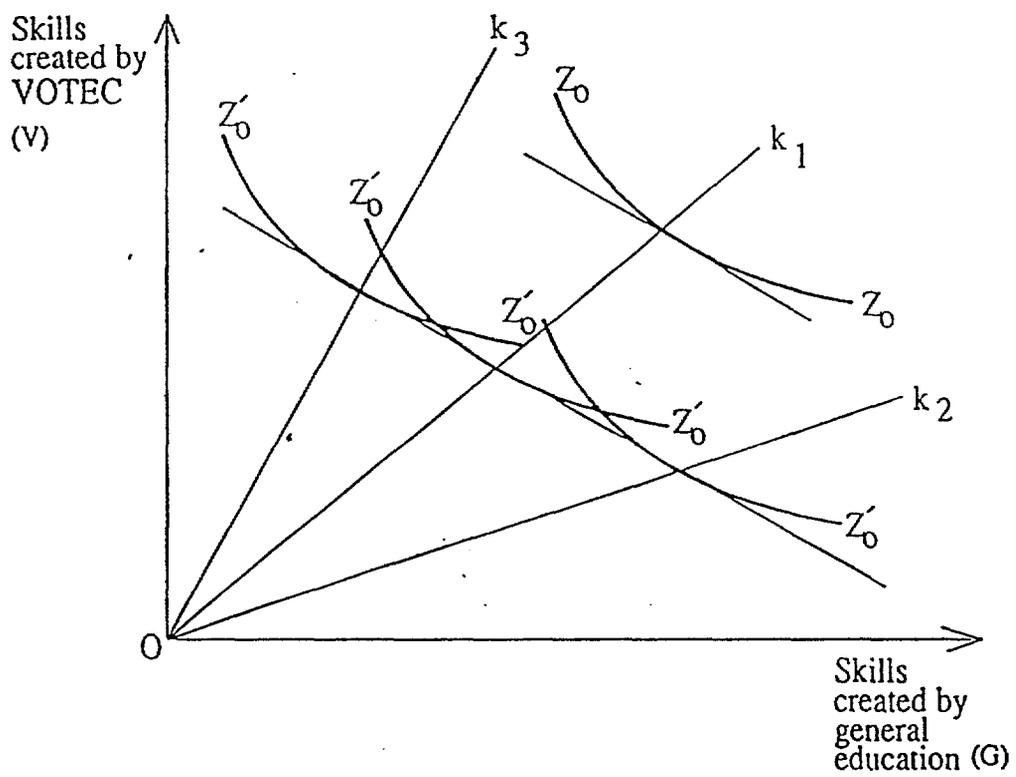


Figure 2. Different types of technical progress

decision to phase out this type of junior secondary VOTEC training by 1993 and work toward embodiment of the newer scientific technologies in the curriculum so that in the future its school leavers should be less vulnerable to being technologically displaced. If the direction of technical progress is not known clearly, and if general education conveys the capacity to adapt better later, then $e^{*g} > e^{*v}$ and the rate of return will be higher for general education.

Economies of scale in VOTEC would be reflected in Eq. (6) if β_1 were larger producing increasing returns at a given cost of inputs (C_v). In this case the rate of return to VOTEC would be larger. Alternatively, this could be viewed as yielding the same return, but at less costs (C_v smaller). In either event, the gap between the returns and the costs is increased, raising the rate of return that would satisfy the equation.

II. Sensitivity Tests and Empirical Evidence on Rates of Return

We now turn to sensitivity analyses of the effect of each of these threetypes of changes on rates of return, employing standard calculations of pure internal rates of return. This is followed by new empirical evidence on rates of return to investment in secondary VOTEC and secondary general education for each area in Indonesia in 1986. Rates are also broken down by sex in order to control for differences in employment patterns by sex.

The combination of these elements, i.e., the logic of each type of change explored theoretically, its approximate potential magnitude in combination with the differences in rates of return at different locations observed empirically, is suggested as a diagnostic device useful in improving the quality and effectiveness of secondary education. That is, if VOTEC rates of return are found to be low in a particular location, it may be that (a) VOTEC may have been expanded too far in that location in relation to general education, given a low elasticity of substitution, (b) the curriculum does not emphasize learning later or up-to-date technology, (c)

an excessive number of specialized courses are offered and need to be consolidated if economies of scale are to be realized, or (d) some combination of all of the above. Conversely, if VOTEC rates of return are high it should be expanded further in that location, and there may be successful properties developed there responsible for high rates of return that could be replicated nationwide.

But before turning to an empirical appraisal of effectiveness, there are a couple of issues concerning the use of earnings of VOTEC graduates that need to be addressed.

First, qualitative improvements may have occurred in VOTEC in recent years in Indonesia that have not yet been reflected in the calculation of empirical rates of return. These may not have only improved the quality of the curricula, which should increase the earnings of graduates, but some localities have consolidated some of the curricula which lowers the costs.

These possibilities need to be taken into account in practical applications. First, were similar improvements made at about the same time in other curricula? Only if they were not would the relative return be significantly affected. Second, rates of return to VOTEC and to general education should be recomputed annually as each new set of SAKERNIS data comes out as has been stressed by McMahon and Boediono (1992a). This will start to reflect the improvements as they begin to affect earnings. Third, the cost estimates should be updated each year as well with the same effect, and finally, it is possible to look at the real earnings of recent graduates covering the first few years of the age-earnings profiles to see if they have changed significantly as the result of improvements in the quality of the VOTEC curricula.

A second problem often raised about looking at the earnings of VOTEC graduates over their earnings profiles is that VOTEC can draw students who are less able than those that select the college preparatory general track. In this case one would expect the general education graduates to earn more later. The problem with this is that those general education graduates that go on to a college are not included in the computation of rates of return at the second level.

It is only the school leavers who do not go on that included. They are likely to be the less able and much more comparable to the VOTEC graduates in their average level of ability.

Furthermore, a series of the more recent studies that have sought to detect the proportion of earnings differences due to education relative to the proportion due to ability find that differences in ability (as is usually measured by test scores) counts for an almost insignificant portion of the differences in earnings when education is taken into account. It therefore is probably best not to impose still further controls for ability, which then introduces a bias in the other direction.²

Sensitivity Analysis of Rates of Return to VOTEC

The derivation of the rates of return to VOTEC and to general education in Eqs. (6) and (7) above contains several parameters from the production function. However, although rates of return can normally be computed (and many are already available worldwide), it is not normally possible to produce econometric estimates of production functions for each locality. The data on regional GDP and all of the inputs is very hard to come by, and the estimation of highly non-linear nested-CES function is complex. Therefore, using Eqs. (6) and (7), sensitivity tests are needed simulating alternative possible education policies to trace the effects of (1) a relative expansion of investment in secondary general education, or alternatively, a relative expansion in VOTEC, (2) an investment in modernizing the technology taught in the VOTEC curriculum, and (3) cost reductions in VOTEC through consolidating the many specialized curricula to realize economies of scale.

1. When general education and VOTEC are complementary, the expansion of general education without a corresponding expansion of VOTEC will lower V (relative to G) in Eq. (6) and raise the rate of return to VOTEC. The elasticity of substitution which depends on ρ_z in

Eq. (6) is assumed to be low, based partly on the estimate of 0.32 for substitution among all forms of human and physical capital found for Indonesia by Bishry (1990) in relation to the 0.63 he found for substitution elasticities between total capital and raw labor. In this event, underinvestment in VOTEC represented by smaller values of V in Eq. (6) will raise the lifetime earnings of VOTEC graduates. For an increase of 10 %, the effect is traced on the rate of return to VOTEC in Simulation (1) in Tables 1 and 2.

2. The typical flatter age-earnings profiles of VOTEC graduates (compared to graduates of general education) may to a large extent be due to the failure of past VOTEC curricula to teach continuing adaptation to new technical change. If VOTEC is more technologically progressive than at present, the students will be able to adapt to technical change better, and their age-earnings profiles should be more "peaked". But to improve the curricula raising e^v in Eq. (6) requires *apprenticeship* of buying new equipment which raise the costs. If the actual earnings profiles of VOTEC graduates are raised 10 % in each successive period, and direct costs are also raised by 10 % by this policy, the effect on the rate of return to VOTEC is traced in Simulation (2) in Tables 1 and 2.

3. Economies of scale can be realized, lowering costs, if the VOTEC curricula is consolidated to the point that each curricula reaches a critical mass. There are an enormous number of specialized VOTEC curricula in Indonesia. We assume that as the result of merging or dropping underutilized curricula, the institutional costs of VOTEC are lowered by 10 %. Because of economies of scale, the lifetime earnings of VOTEC graduates are also assumed to rise by 10 %. The effect is traced on the rate of return to VOTEC in Simulation (3) in Tables 1 and 2.

Tables 1 and 2 present these simulation results for junior secondary schools and for senior secondary schools, respectively. Before the sensitivity tests, as Table 1 shows, the social rate of return is higher for general education (11 % for males and 16 % for females) than for VOTEC (9 % for males and 15 % for females) at the junior secondary school level in Central Java. If additional changes should occur, raising lifetime earnings of VOTEC graduates (cases 1 and 2) or lowering the costs of VOTEC (case 3), the rate of return to VOTEC should be raised.

In Simulation (1), as a result of the relatively faster expansion of secondary general education, the lifetime earnings of VOTEC graduates are raised by 10 %. This is similar to the expansion that will take place during Repelita VI as junior secondary education becomes universal. The effect of the simulated expansion of junior secondary general education as shown in Table 1 raises the net social rate of return to junior secondary VOTEC by 4 percentage points for males, and 5 percentage points for females to the point where it is no longer below the social rate of return to junior secondary general education. At the senior secondary level, where both costs and earnings are higher, a similar expansion of senior secondary general education raises the social rates of return for both males and females in the VOTEC schools by 2 percentage points.

In Simulation (2), it is assumed that the VOTEC curriculum is modernized to reflect the new technology using the newest equipment. If this raises the costs per student of the VOTEC program by 10 %, and also leads to a 10 % increase in their earnings, in view of the findings by Bartel and Lichtenberg (1987) that those able to implement the new technology command a premium in the job market, then this raises the rate of return at the junior secondary level by 3

Table 1. Social rates of return to junior secondary vocational vs. junior secondary general schools (Central Java, 1986): Sensitivity tests

	Males		Females	
	General	Vocational/technical	General	Vocational/technical
Actual rates of return	11 %	9 %	16 %	15 %
Simulation (1)	11 %	13 %	16 %	20 %
Simulation (2)	11 %	12 %	16 %	18 %
Simulation (3)	11 %	14 %	16 %	22 %

Table 2. Social rates of return to senior secondary vocational vs. junior secondary general schools (Central Java, 1986): Sensitivity tests

	Males		Females	
	General	Vocational/technical	General	Vocational/technical
Actual rates of return	12 %	14 %	22 %	18 %
Simulation (1)	12 %	16 %	22 %	20 %
Simulation (2)	12 %	15 %	22 %	19 %
Simulation (3)	12 %	16 %	22 %	21 %

percentage points both for males and females (Table 2). (It also raises some questions, e.g., electronic looms.) At the senior secondary level this modernization raises rates of return to VOTEC by 1 percentage point for both males and females, even though the rates of return for males in a VOTEC high school in Central Java is already higher (14 %) than it is for a general education.

In Simulation (3), it is assumed that the unit of VOTEC can be lowered by 10 % as a result of consolidating the very large number of VOTEC curricula that currently exist so that it is possible to realize economies of scale in the remaining curricula. It is also assumed that the earnings of these new VOTEC graduates rise 10 % as a result of curricula that have greater visibility, better content, and better placement support. These changes raise the rate of return at the senior secondary level where this type of a consolidation is more relevant by 2 percentage points for males and 3 percentage points for females, as shown in Table 2.

Use of Rates of Return to Improve VOTEC's Cost Effectiveness

To improve the social rates of return to VOTEC and to secondary education in developing countries, empirical rates of return such as those estimated for Indonesia at different locations as illustrated in Tables 3 to 4 below can be used together with the theoretical insights offered above as a diagnostic device. Where VOTEC's rates of return are high, it should be possible to diagnose what is being done that makes them high and what could be done in the other provinces. Steps then can be taken to improve the cost effectiveness of the educational system where the rates of return are low. It is likely that, in the localities where VOTEC's rates of return are high, as in Simulation (1) either VOTEC has been underexpanded relative to the local job market for VOTEC graduates, or as in Simulation (2) the VOTEC is technologically progressive or as in Simulation (3) economies of scale are being realized. There may be other reasons, but each of these involves policy options that could be implemented in the low rate of

return locations, depending on the source of the low rates of return diagnosed there.

The data are from the 1986 SAKERMAS nation-wide labor force survey covering individuals conducted by the Central Bureau of Statistics. It was sorted to remove rural farmers, since some of the returns to farmers are in kind, numerous individuals with different levels of education work on each farm, farm prices are sometimes distorted, and there are other factors of production such as the number of water buffalo used or hectares farmed that are involved. Although farm income cannot be used to reflect the returns to education in agriculture, this should not be misinterpreted to lead to underallocation of funds to rural education, since based on other kinds of production function studies, the rates of return to rural education tend to be very high (see M.E. Lockheed (1987) and the other sources cited there). The remaining data on urban residents were sorted by the education level and types (retaining the unemployed), by age, sex, and province. The resulting age-earnings profiles were used to compute the net earnings differentials at each age. The discount rates r_v and r_G were then found that discount the net returns back to their present values and equate them to separate estimates of the institutional costs of each type of education plus the appropriate foregone earnings costs.³ That is, Eqs. (6) and (7) are implemented by this rate of return calculation except that the net returns given by the first term inside the parenthesis are the actual net earnings differential in each location rather than the amount predicted by econometric estimates of this first term within each equation.

To consider first the overall empirical results for 1986, and how they compare to earlier years and to the other developing countries, the social rates of return to general education at the senior secondary level is in general about 3 % to 4 % higher than the rates of return to VOTEC. The rates of return to both however are relatively high, and to VOTEC are still 6-7 % above the real rates of interest in most years, which reflects an overall average of real rates of return to investment in physical capital.

Indonesia has had nearly universal primary education for some time for both males and females, in contrast to many other developing countries, but a relatively small percentage of the labor force has completed the junior secondary or the senior secondary level. Although there are long search times for senior secondary school graduates in part because of the government pay scales that tend to favor this level (see Clark, 1983), the rates of return to both senior secondary general and VOTEC are nevertheless relatively high in relation to the real rate of interest, as well as in relation to other countries. This is likely due in part to the relatively small number of graduates now at this level in the labor force. In comparison to results from the 1982 SUSENAS data which do include earnings from the second and other jobs, the social rates of return were an even higher 23 % for senior secondary general and 19 % for VOTEC (McMahon, Millot, and Eng, 1986). For 1986, earnings from the second job were not available, but the nation-wide average rate of return was 16 % for senior secondary general and 15 % for senior secondary vocational education for males (McMahon and Boediono, 1991). For comparison to the developing countries as a whole, Psacharopoulos (1985) estimated the social rate of return to general education as 16 % and the rate of return to VOTEC as 12 %. The relatively lower returns to VOTEC are explained by the flatter age-earnings profiles for VOTEC in both years and by higher costs. As shown by the preceding analysis, this difference in the age-earnings profile can be explained in part by the lower capacity of those with VOTEC skills to adapt to technical change and to learn new skills on the job in relation to the general education graduate who takes longer to find a first job but receives more flexible and adaptable basic skills.

Tables 3 and 4 show a more detailed picture of the rates of return to general and VOTEC education at the junior secondary and senior secondary levels. At the junior secondary level in Table 3, the overall social rates of return are also relatively high for both males and females, and particularly in the Other Islands. For males they are higher for general education than for

Table 3. Social rates of return to junior secondary vocational vs. junior secondary general schools, 1986 (Number of cases in parentheses)

Province	Males		Females	
	General	Vocational/technical	General	Vocational/technical
Jakarta	5 % (303)	7 % (21)	14 % (34)	NA (3)
West Java	9 % (140)	14 % (38)	12 % (39)	26 % (11)
Central Java	11 % (170)	9 % (39)	16 % (52)	15 % (5)
Yogjakarta	11 % (44)	NA (6)	25 % (13)	NA (0)
East Java	18 % (85)	10 % (30)	16 % (31)	13 % (7)
Sumatra	11 % (255)	9 % (50)	14 % (59)	16 % (15)
Kalimantan	11 % (157)	8 % (22)	12 % (18)	NA (3)
Sulawesi	15 % (132)	10 % (13)	11 % (19)	NA (2)
Other Islands	22 % (134)	13 % (33)	22 % (18)	12 % (15)

Note. NA: not available

VOTEC in all of the regions except Jakarta and West Java. This pattern also persists for females, many of whom are trained to do weaving and remain largely illiterate although the junior secondary VOTEC sample of females in many of the provinces is too small for this to reach a very high level of significance. The government of Indonesia has decided to phase out junior secondary VOTEC, and move all VOTEC to the senior secondary level, so less attention needs to be given to this problem. Given the large cultural and first language differences among the islands, the mobility of human capital at this junior secondary level is low, and therefore the geographical differences for junior secondary general schools are likely to persist unless something is done.

The social rates of return to each type of education at the senior secondary level are given in Table 4. The pattern here is similar to the one that emerges from Table 3. The overall social rates of return are relatively high. For males, VOTEC yields higher returns than general education in two provinces: West Java and Central Java. In Jakarta, the rate of return is the same 14 % for VOTEC and for general education. In the remaining regions, general education yields higher returns than VOTEC. For females, on the other hand, VOTEC does not yield significantly higher returns than general education in West Java, as it did at the junior secondary level. But this senior secondary VOTEC for females, which includes teacher training and commercial education does have very high rates of return of from 18 to 29 % in Jakarta, Central Java, Sumatra, Sulawesi, and the Other Islands. However, the returns to senior secondary general education for females are higher than for VOTEC in West Java, Central Java, East Java, and Kalimantan.

Table 4. Social rates of return to senior secondary vocational vs. senior secondary general schools, 1986 (Number of cases in parentheses)

Province	Males		Females	
	General Vocational/technical		General Vocational/technical	
Jakarta	14 % (412)	14 % (158)	24 % (69)	25 % (62)
West Java	9 % (177)	24 % (217)	17 % (71)	11 % (123)
Central Java	12 % (199)	14 % (153)	22 % (60)	18 % (94)
Yogjakarta	15 % (58)	NA (49)	NA (14)	10 % (25)
East Java	11 % (75)	8 % (108)	15 % (23)	10 % (59)
Sumatra	11 % (347)	10 % (258)	17 % (82)	18 % (170)
Kalimantan	13 % (154)	11 % (132)	21 % (28)	9 % (63)
Sulawesi	14 % (210)	11 % (138)	12 % (74)	19 % (97)
Other Islands	19 % (164)	8 % (253)	22 % (60)	29 % (127)

Note. NA: not available

As for the case at the junior secondary level, females mostly receive larger benefits from both types of education at the senior secondary level. This does not include various non-monetary effects such as the contribution the education of females beyond 9th grade makes to lower population growth rates. This also reduces the strain on the financing of basic education produced by a rapidly expanding school age population and increases the capacity to improve its quality.

The results presented here can be used together with the theory presented earlier to diagnose the source of the regional differences and improve the cost effectiveness of VOTEC where it is low. Some of the provinces have not expanded their senior secondary VOTEC schools sufficiently in relation to their industrial and commercial opportunities and/or have technologically better or most cost effective programs (e.g., West Java for males, and the Other Islands for females). The reasons for their cost effectiveness should be used to raise the cost effectiveness of VOTEC schools, e.g., in the Other Islands for males, and Kalimantan for females. Other provinces have economically quite efficient junior secondary general schools (e.g., Yoguakarta, East Java, and the Other Islands) or senior secondary general schools (e.g., Jakarta, Kalimantan, and the Other Islands) which should be expanded more rapidly.

The variation in the pattern of returns among provinces suggests a somewhat different strategy in each province toward attainment of the optimum curriculum mix. This could include seeking improvements in the internal efficiency as well as the external efficiency (as school leavers enter the job markets in these provinces and for those types of schools where the rates of return are low), while expanding investment faster in those places where rates of return

are highest. In a number of the cases, it may be noted that expansion that promotes efficiency (i.e., where rates of return are highest) also would promote greater equity among the regions (see the high rates of return in the Other Islands which are also the poorest).

In West Java, the social rate of return to VOTEC exceeds the rate of return to general education at both the junior and senior secondary level for males. This is in spite of the fact that the costs of VOTEC are higher there. It means that the benefits of VOTEC and its technological progressiveness are sufficiently high to cover the higher costs of investment compared to general education in that area. Thus, for an efficient growth strategy, VOTEC needs to be expanded faster in this area. In the other regions, the social rate of return to general education usually exceeds the rate of return to VOTEC. For them, it may be wise to expand secondary general education somewhat more rapidly, while giving attention to the current and future capacities of VOTEC graduates to adapt to continuing technical change.

Summary of Policy Simulations

The three types of policies explored in the sensitivity tests, and their implications for use in relation to the differences in rates of return among the provinces are summarized in Table 5. Primary attention is given to the senior secondary level because only about 1.2 % of the junior secondary students are in vocational schools and because the decision has been made by the Indonesian Government to phase these schools out. However as junior secondary education becomes universal, the possibility is being actively explored of seeking help from industry in offering selected job-oriented courses within the junior secondary general schools for those who leave school after ninth grade.

Table 5 simulations predict that the rates of return (r^*) to senior secondary VOTEC will fall relatively following its relatively more rapid expansion (as in fact has occurred in Indonesia in 1986 through 1989 as VOTEC expanded). But Table 5 also suggests a very high profitability

Table 5. Summary of effects of simulations of alternative policies:
Vocational/technical education

<u>Policy change</u>	Net percentage-point effect on rates of return			
	<u>Junior Sec. VOTEC</u>		<u>Senior Sec. VOTEC</u>	
	<u>M</u>	<u>F</u>	<u>M</u>	<u>F</u>
(1) Expand (Given $\sigma_2 = .32$, $\sigma = .63$)				
Gen. Ed.-only: 10 % incr. in VOTEC earnings	+4	+5	+2	+2
VOTEC only: 10% decr. in VOTEC earnings			-2	-2
(2) Technology modernization				
10 % incr. in VOTEC costs, and 10 % incr. in VOTEC earnings	+3	+3	+1	+1
(3) Consolidate VOTEC curricula				
Economies of scale lowers costs 10 %, and raises earnings 10 %			+2	+3
<u>Policy location</u>	<u>Province</u>	<u>Social rate of return</u>		
(4) Expand VOTEC fastest (VOTEC r^* high)	Other Islands		29 % (F)	
	West Java	24 % (M)		
	Central Java	14 % (M)	18 % (F)	
	Jakarta	14 % (M)	25 % (F)	
(5) Expand Gen. Ed. fast (Gen Ed. r^* high)	Other Islands	19 % (M)	22 % (F)	
	Kalimantan	13 % (M)	22 % (F)	
	Jakarta	14 % (M)	24 % (F)	
	Yogukarta	15 % (M)		
(6) Modernize and/or consolidate VOTEC curricula (VOTEC r^* low)	East Java	8 % (M)	10 % (F)	
	Other Islands	8 % (M)		
	Kalimantan		9 % (F)	

of VOTEC expansion in the Other Islands and Jakarta (for females) and in West Java (for males). The average nationwide returns would be higher, however, if the relative rates of expansion of senior secondary general investments were as high or higher than that for VOTEC in the Other Islands, Kalimantan, Jakarta, and Yogyakarta. The data also suggest that the contribution of education to economic growth would be enhanced by looking into the possibility of modernizing and/or consolidating the VOTEC curriculum both in the industrial schools and in the commercial high schools in East Java, the Other Islands, and Kalimantan where the most recent provincial level rates of return that have been computed (as of the time of publication) are the lowest.

III. Summary

This paper has developed the theory of the direction of the effects, and policy simulations of three types of policies to upgrade the effectiveness of VOTEC using a nested-CES framework. First considered is the optimum mix of VOTEC and general education, and the effects on cost effectiveness if one or the other is overexpanded under the conditions that VOTEC and general education are complementary. Second, the theory of the capacity of VOTEC to inculcate continuing adaptation to technical change is developed, and its effects are traced on the rates of return to VOTEC. Third, the theory of economies of scale to be realized in VOTEC is developed, and the approximate effects of combining curricula are traced on the rates of return.

Beyond what is hopefully a useful theoretical contribution, the way it can be used to diagnose sources of high (and low) cost effectiveness for comparing different locations and to select policies to raise the cost effectiveness of VOTEC curricular where it is low are illustrated. This is done by revealing the wide variation that exists in the rates of return as between VOTEC and general education among the provinces, as well as between males and

females at the senior secondary and junior secondary levels in Indonesia.

Moving to expand senior secondary general education somewhat more rapidly in some provinces, and VOTEC more rapidly in others, while investing in modernizing and consolidating senior secondary commercial and STM curricula (perhaps in cooperation with industry) in those localities where VOTEC rates of return are low should help to raise the overall cost effectiveness of VOTEC and increase its already significant contribution to economic growth in Indonesia and elsewhere.

NOTES

1. A strong positive correlation of general schooling and the amount of on-the-job training has been demonstrated in Mincer (1989). It has also been observed that graduates of general programs tend to have slightly higher rates of productivity growth from training than vocational program graduates (Bishop, 1989a).
2. Test scores are the only practical measure of "ability". But they tend to measure achievement, which is highly correlated with the quality and quantity of education received. This is an effect that one does not wish to measure, or control for, when trying to measure the return to the entire investment in education that has been made. Put another way, "ability" as measured by test scores is very highly correlated with the parents' income. This in turn influences the school district in which the student lives, the quality of the schooling provided, and increases the probability that the student will go on to the academy or university.
3. For the details on the methods of computation and breakdowns by industry, see McMahon, Millot, and Eng (1986).

APPENDIX

Computation Methods of Rates of Return

The social rates of return (pure internal rate of return) are calculated for each level and type of education, using the LOTUS program.

The total investment costs of education are composed of foregone earnings and direct costs. Foregone earnings at each education level are estimated from the earnings of school leavers at the next lower level, multiplied by 0.75 (since 3/4 of a year is spent in school), multiplied by the average number of years it takes to complete the education level in question in Indonesia, multiplied by the percent of school leavers at that level that are employed. Foregone earnings are assumed to be zero up through 5th grade. Direct costs are obtained by multiplying the total government expenditure on schools at each level by the number of years it takes to complete each level. The net earnings differential (or return) is obtained by subtracting the earnings of school leavers at the next lower level from the earnings of those who finished the next higher level.

Then, the LOTUS program solves the non-linear equation to compute the pure internal rate of return using the standard formula. After an initial guess is inserted, the program performs iterations to yield a rate that equates the net present value of the costs to the discounted present value of the stream of returns.

Fallon, P. R. and Layard, P. R. G. (1975) Capital-skill complementarity, income distribution, and output accounting. *J. Polit. Econ.* 83, 279-301.

Godfrey, M. (1987) Planning for education, training, and employment in Indonesia. Summary report, Manpower Dept., UNDP/ILO.

Griliches, Z. (1969) Capital-skill complementarity. *Rev. Econ. Statist.* 51, 465-468.

Hamermesh, D. S. and Grant, J. (1979) Econometric studies of labor-labor substitution and their implications for policy. *J. Hum. Resour.* 14, 518-542.

Kang, S. and Bishop, J. (1989) Vocational and academic education in high school: complements or substitutes? *Econ. Educ. Rev.* 8, 133-148.

Lockheed, N. E. (1987) Farmers' Education and Economic Performance. in G. Psacharopoulos, ed., *Economics of Education*, Pergamon 110-116.

McMahon, W. W. (1988) The economics of vocational and technical education: do the benefits outweigh the costs? *Int. Rev. Educ.* 34, 173-194.

McMahon, W. W. (1992). The contribution of higher education to R & D and productivity growth. in W. M. E. Becker and Lewis, eds., *Higher Education and Growth*, Boston and London: Kluwer Publishers.

McMahon, W. W. and Boediono (1992) Universal basic education: an overall strategy of investment priorities for economic growth. *Econ. Edu. Rev.*, Vol. 11, No. 2.

REFERENCES

- Bartel, A.P. and Lichtenberg, F.R. (1987) The comparative advantage of educated workers in implementing new technology. *Rev. Econ. Statist.* 69, 1-11.
- Bishop, J. (1989a) On-the-job training of new hires. Presented at the LaFollette Symposium on Market Failure in Training. University of Wisconsin.
- Bishop, J. (1989b) Occupational training in high school: when does it pay off? *Econ. Educ. Rev.* 8, 1-15.
- Bishry, R. (1990) High level manpower development in Indonesia: Rates of return and technical change. Unpublished Ph.D. dissertation, University of Illinois, Urbana.
- Broer, D. P. and Jansen, W. J. (1988) Employment, schooling, and productivity growth. Discussion paper series, 8710/G. Institute for Economic Research, Erasmus university. Rotterdam, the Netherlands.
- Clark, D. (1983) How secondary school graduates perform in the labor market. Working paper, 615. The World Bank. Washington, D.C.
- Dougherty, C. (1989) The cost effectiveness of national training systems in developing countries. Working paper, The World Bank. Washington, D.C.
- Easterlin, R. A. (1981) Why isn't the whole world developed? *J. Econ. History*, 1-19, *XLI*, No 1.

McMahon, W. W. and Boediono (1991) Planning human resource development in Indonesia: strategies supportive of economic development. Ch. 4, *Education and the Economy, External Efficiency*, MOEC, Indonesia, and IEES/Learning Systems Institute, Tallahassee.

McMahon, W. W., Millot, B. and Eng, G. (1986) Economic and financial analysis of human resource development. *Indonesian Education and Human Resources Sector Review*. Indonesian Ministry of Education and USAID, IEES, Learning Systems Institute, Tallahassee.

Mincer, J. (1989) Labor market effects of human capital and of its adjustment to technological change. Presented at the LaFollette Symposium on Market Failure in Training. University of Wisconsin.

Moura-Castro, C. (1987) Is vocational education really that bad? *Int. Labor Rev.* 126, 603-10.

Psacharopoulos, G. (1985) Returns to education: a further international update and implications. *J. Hum. Resour.* 20, 584-604.

Ritzen, J. M. M. (1987) Human capital and economic cycles. *Econ. Educ. Rev.* 6, 151-160.

Ritzen, J. M. M. (1989) The elasticities of substitution between labor with different levels of education in the USA. Working paper, LaFollette / Department of Economics, University of Wisconsin.

Sato, K. (1967) A two-level constant-elasticity-of substitution production function. *Rev. Econ. Stud.* 34, 201-218.

Solow, R. M. (1963) *Capital Theory and the Rate of Return*. Amsterdam: North Holland
Publicity Co.

Chapter VI

ABSTRACT

Managing and Implementing Educational Plans

Don Adams and Boediono

Developing and implementing the 25 year educational plan for Indonesia represents an attempt, through comprehensive change in the educational system, to influence the quality of life of the Indonesian people well into the 21st Century. However, there is a high level of uncertainty in the process and outcomes of long range planning. This study (1) briefly examines the nature of long range planning, (2) considers common problems associated with implementation, (3) suggests the general conditions for management or administration of the 25 year plan and (4) offers guidelines for a successful implementing process.

"Managing" the reforms and policies found or implied in the 25 year plan requires implementation plans which specify "who" does what, when, and through what organizations and processes. Consideration particularly must be given to the deconcentration of educational administration and devolution of responsibilities currently being planned.

Implementation is not synonymous with administration or traditional definitions of management. Some of the obstacles to the complex, dynamic process of implementing the 25 year plan may be anticipated through a critique of proposed policies compared against a model of factors of successful implementation.

Chapter VII

Improving the Quality of Higher Education Through Increased Internal Efficiency

Walter W. McMahon and Edison Panjaitan

Concerns are frequently expressed in Indonesia about the quality of college graduates by employers and others, and about the high cost of overseas advanced degree training programs.

Much of the source of both of these problems lies in internal inefficiencies. This is true wherever the outcomes are insufficient in relation to the costs. This is true, for example if the quality of domestic college graduates is not what is desired, given the time taken to complete a BA, or if overseas PhD programs are frequently too long and too costly.

This chapter seeks to consider these problems of inefficiency. It suggests several possibilities for improving the quality of the training, while simultaneously reducing the cost, both within the domestic and within the overseas training programs.

These problems with internal inefficiency are not unique to Indonesia. "Program budgeting" for higher education programs for example is currently being very widely discussed. It has been implemented in some places. In Texas for example, the State Legislature has mandated program budgeting for all universities, and the universities in Texas are busy in identifying their costs. Discussions of ways to measure them, and then relating these outputs to the costs of each are underway. Each campus has been asked to define its outputs within each of the education or research programs that it operates.

So part of the discussion that follows relates to the progress that is needed to identify the higher quality programs relative to their costs, build consensus through discussion, and then gradually over time reallocate resources internally to improve internal efficiency. Some selected possibilities for immediate saving, and simultaneous quality improvements are also suggested below. Others are considered in Chapter VIII of Volume II. But the list is not meant to be exhaustive. Quality and its relation to costs has many many dimensions.

This chapter which focuses on internal efficiency is complementary to the chapter on the external efficiency of higher education in Volume II (i.e. Chapter VIII). They are interdependent, and even overlap at some points. Improvements in internal efficiency that improve the quality of the graduates at no greater cost, for example also improve external efficiency, or the effectiveness with which the graduates relate to the job markets.

I. Sources of Improvement in Internal Efficiency

For improved cost effectiveness, there are several possibilities that appear to be worth consideration. For performance budgeting to work, the cost data must be collected and related to the output of the program. For example:

- (1.) If universities and college were required to compute the cost per graduate in each academic program this would likely reveal that internal efficiency could be increased by reduction in the length of many Bachelor's Degree programs.

It is taking 6 1/2 to 7 years to finish a 4 year bachelors degree in many Indonesian universities. (See Cost Appendix in McMahon, Millot, and Eng, 1987) and Clark (1989). This nearly doubles the cycle cost, which is the total cost per graduate in each degree program. If these direct and foregone earnings costs could be reduced, then the saving could be used to finance improved faculty salaries based on faculty productivity, improve the libraries, and provide better faculty offices, lab facilities and classrooms.

Program budgeting requires that the institution compute the cost by program, and per graduate, as a requirement for continued funding of that program. The lack of knowledge of costs, and of pressure to manage costs, is a major source of internal inefficiency. It also has very negative effects on the rates of return to higher education because it raises the cycle costs in cost/benefit calculations to a high level. This requirement to compute cost per graduate in each program can then be related to the cost effectiveness indicators discussed below and in Chapter 2.

The costs include unit costs per student (or institutional direct costs), plus foregone earnings costs given by the data on earnings of high school graduates. Cycle costs require separate analysis of the length of the degree programs.

There has been some work done on unit costs in the Higher Education D.G.'s baseline studies, in addition to the work in the Sector Assessment mentioned above. But this needs to be required of all higher education public institutions and coordinated with studies of the length of the degree programs. However, it is not practicable to wait until new accounting practices are in place. For purposes of economic analysis and to assist in management decisions it is possible to construct estimates of unit costs out of the published annual reports, followed by trips to the field to see how long it takes students to complete each degree program, and then modify the cost estimates for each institution. The DGHE expects to be supporting some of these cost studies at other institutions in the nation under the new World Bank loan. It is very important however when the objective is internal efficiency that the cost analysis concepts be coordinated with the uses to which they are to be put, including potential program budgeting uses.

Prior work done on unit costs includes not only the comprehensive work by Gweneth Eng in the Sector Review (see McMahon, Millot, and Eng, 1987, pp. 2-220 and 248-404), and the current new DGHE cost studies under the World Bank soon at selected institution mentioned above, but also the in-depth study at

selected universities by David Clark (1989), and the unit cost study at IPB, Bogor, by the DGHE (1990).

With respect to data on the length of the degree program at each institution, data on the length of some degree programs will soon be available from tracer studies in Sumatera. The questionnaire asks the entering year, and the graduation year of each respondent. The average time currently taken to complete a four year degree has been estimated at 6.5 years for all fields by Eng (see McMahon, Millot, and Eng, 1987, p. 220), at 8.0 years by Godfrey (1987, p. 65, who also quotes the USAID Sector Review), and 6.5-7.5 years for agriculture graduates in Sumatra by Strudwick (1990).

Some of the possible sources of these long degree programs need to be studied. They may include the loss of time if students change faculties, the SCRIPSI requirement, the limited use of a credit systems which would enable a student to change majors with less loss of time, and delaying entry into the job market since job-search times are long.

Once the earnings data and cycle cost data are developed, the data can be publicized to inform students and to facilitate better internal cost management by the universities. The data can also be used to calculate social rates of return that are quite specific to each institution, including comparisons to the private institutions. The results can also be broken down by sex and used to study women in the professions, as well as the cost/benefit ratios for both males and females. This latter can be used to budget allocations as part of a system of performance budgeting to provide the necessary incentives to improve external efficiency.

(2.) Indicators of Educational Effectiveness and Efficiency

These and other line data sets need to be used to support publication of Higher Education Indicators and to serve as a management tool. Several of these Education Effectiveness and Efficiency Indicators are discussed further in Chapter II above as part of an Efficiency-Based Management Information System (EMIS).

It is essential that a system of collecting valid and reliable cost and output data be institutionalized. This data if it is internally consistent then can be converted to a comprehensive set of appropriate quantitative indicators of educational cost/effectiveness and efficiency.

An Efficiency-based Management Information Systems (EMIS) then can contribute significantly to the universities and or faculties evaluation of policies and programs. They will not only enable the production of an initial set of published indicators of educational effectiveness and efficiency (internal and external), but also the assessment of faculty productivity, and the evaluation or curricular and alternative technology interventions. (See also Windham, 1988; and Chapman and Windham, 1986).

Realistically, drawing on EPP's experiences including those by Simon Ju and others in developing the MIS system within Balitbang Dikbud, attaining these goals within the Higher Education branch and within each major university with require many years.

(3.) Incentives for Faculty Performance

In Indonesia, as else where, faculty are rewarded on the basis of their scholarship, teaching and service. There is some evidence in the studies by David Clark and Meling Oey (1988) that the current reward system is inadequate to hold the full time attention of faculty. In other ways it also does not maximise the level of faculty performance desired or expected.

There are both monetary and non-monetary incentives related to recruitment, retention, assignment, evaluation, and promotion of faculty. These in turn relate to issues such as faculty workload. If the quality of instruction in Indonesian universities is to be raised, salary needs to be related to the retention of the best faculty on a full time basis. Also user-driven research grants need to be available to faculty on a competitive project by project basis and research and teaching assistants need to be selected from among the brightest young, new PhD students who are to become Indonesia's future faculty members. User-driven research grant on a project-by-project basis is another of these policy options is considered in detail in Chapter 2 above.

(4.) Improvement of Teaching and Research.

Valid and reliable measurements of teaching effectiveness are difficult in any culture. Further there is compelling evidence that the criteria of effective instruction may be different across cultures. Thus, for the Indonesian context a systematic assessment system needs to be developed and implemented.

This is related to the development through consensus of means of defining educational outputs and then measuring faculty productivity. The use of faculty apprentices in both teaching and research as mentioned above also make it possible to update faculty skills and raise productivity as well as the financing initiative supporting more adequate faculty salaries.

A second aspect is the availability of modern textbooks. The privatization of textbook production, including the more adequate stocking and staffing of libraries are important support elements. Of particular concern is the availability of textbooks, and the stocking of libraries with recent academic journals and scientific publications, with incentives to both faculty and students to use these resources regularly to maintain and update their skills.

(5.) Strategies for Financing Through Internal Cost Recovery.

There are two major sources for internal financing that are widely used elsewhere and that constitute large potential sources of funds for Indonesian higher education. They are (a) internal reallocation and (b) faculty apprentices.

Flexibility in internal reallocation is the subject of Chapter III in Volume II above, needed to improve the response to market signals and external efficiency. But it is also a crucial source of internal funding to improve quality. There are very large differences in instructional units (or students) per faculty member compared to patterns that are typical elsewhere as reported by Clark (1987, p. iv). This indicates that resources are being wasted, and there is a need to reduce salary lines where there are too many faculty and Instructional Units are low. This can be done preferably by attrition, retirement, and shifting faculty. Once that policy initiative is implemented, the Vice Rector would have additional resources available where there are retirements to improve quality. For higher salaries faculty members could be expected to devote full time to high quality teaching and research at their home institutions.

The other major source of internal financing is through greater use of faculty apprentices--both teaching assistants and research assistants, just as is typical for medical interns, apprentice craftsmen, and apprentice attorneys. This must be done wisely (e.g. selection of able younger graduate students as apprentices rather than older staff from other institutions back for advanced training, etc.). But using faculty apprentices to assist with freshmen and sophomore students is well known to be very cost effective (See McMahan, 1991). It also is a crucial element in improving faculty incentives and faculty productivity.

This role for user-driven research at the universities funded competitively on a project by project basis and the apprenticeship training of graduate student research and teaching assistants is of strategic significance in enabling Indonesia to train its own Ph.D.'s eventually who can teach and do research.

Finally, in contrast to European and Australian models, who train less for Engineering, Business Administration, Agri-business and other careers in the private sector, each new generation of faculty apprentices who finish advanced degrees and then themselves enter industry and government take the latest technology and operational research skills with them that were acquired at the universities. This experience with the concepts and the investigatory skills can be the source of major improvements in the dissemination of knowledge to the economy which aids productivity growth and in the external effectiveness of the higher education system.

(6.) To increase the cost effectiveness of overseas training, several possibilities exist. Each will require further study, (e.g. in identifying programs within Indonesia and abroad (that meet or are willing to meet the conditions). They are:

1. Sending students abroad only in those academic fields where high quality domestic PhD programs do not yet exist.
2. Limiting overseas Masters degree support to 2 years, and PhD support to 4 or 5 years. Application for the fifth could require the student to apply based on exceptional circumstances or hold a dissertation fellowship. Both the student and the academic

Department to which she has applied should be informed before she leaves Indonesia that these will be the conditions.

3. Requiring that the student take a one unit independent study course with a faculty member in the last semester of year 2 and/or the first semester of year 3 to complete a proposal for a dissertation topic that she/he is ready to defend by the end of the first semester of year 3.
4. Limiting full time grant support for PhD candidates to 2-3 years after which the Department accepting the student must agree upon admission to the PhD program to provide either 1/2 time research or teaching experience to able candidates accompanied by the usual tuition and fee waiver.
5. For years 3,4, and 5 the Donor's stipend could then be limited to 20% of the normal full stipend during this period. Special dissertation grants could be available for years 4 or 5 on a competitive basis.

Conclusion

Although a large number of individual research studies exist on how to improve quality and effectiveness in higher education in Indonesia, and these are some descriptive studies of costs, we are not aware of any attempts to systematically consider cost effectiveness. It is only this ratio of effectiveness to cost that gets at efficiency.

The five policy options offered here for consideration as ways of improving internal efficiency are interdependent and should be considered together with those related to external efficiency in Chapter VIII of Volume II. Means suggested here for increasing internal efficiency include:

- (1) Computation of cost per graduate (including the time taken to complete the BA degree), and consideration of use of performance budgeting, (and of greater resource recovery from parents as discussed in Volume II).
- (2) Computation of Indicators of cost effectiveness to monitor and hopefully secure improvements overtime in internal efficiency.
- (3) Incentives for faculty performance including
 - a.) User-driven project by project computative research grants.
 - b.) Salary incentives for retention, and full time service.
- (4) Quality teaching and quality research incentives.

- (5.) **Internal cost recovery via:**
- a.) **Internal reallocation**
 - b.) **Apprenticeship training of the brightest young PhD candidates as Teaching and Research Assistant with experiences faculty.**
- (6.) **Increased cost effectiveness of overseas training by selection of fields to be supported (where there is lack of domestic capability) and negotiation with academic departments abroad by offering 3 years of full support bu only under more cost effective conditions.**

References

- Bichry, Rony (1990). Higher Level Manpower Development in Indonesia: Rates of Return and Empirical Technical Change, unpublished Ph.D. Dissertation, University of Illinois, May 1990.
- Bishry, Rony and Walter W. McMahon (1990). "Investment in Higher Education for Economic Development in Indonesia: The Need for Additional Resource Recovery," Working Paper, BPP Teknologi, Jakarta.
- Boediono, W. McMahon, and D. Adams (1992). "25 Year Education Goals for Economic Development in Indonesia," Chapter I in Education, Economic, and Social Development, Jakarta, March 1992.
- Chapman, D. W. and D. M. Windham (1986). The Evaluation of Efficiency in Educational Development Activities. Tallahassee, Florida: IEES Project.
- Clark, David (1989). "Costs of SI Education, Summary and Conclusions," University Costs, C.P.I.S., July 14, Jakarta.
- Clark, David and Mayling Oey (1988). "Towards an Environment for Quality Teaching in State Institutions of Higher Learning," Staffing, C.P.I.S. Draft III, Sept. 12, Jakarta.
- Director General of Higher Education (1990). "Calculation of Unit Costs ..., IPB, Bogor," Research Institute, IPB (World Bank XXI), January 1990, Jakarta.
- Director General of Higher Education (1986). Baseline Tracer Study of University Graduates, Final Report, with Demographic Institute, Faculty of Economics, University of Indonesia, Jakarta.
- Director General of Higher Education (1985). Baseline Study, "Higher Education, Finance and Management," November 1985, Jakarta.
- Godfrey, Martin (1987). "Planning for Education, Training, and Employment in Indonesia," Summary Report, Manpower Department UNDP/ILO.
- Hallack, J. (1990). Investing in the Future: Setting Educational Priorities in the Developing World. Paris, IIEP.
- Hanushek, E. (1978). "Conceptual and Empirical Issues in the Estimation of Education Production Functions," Journal of Human Resources, 14, 3, pp. 251-388.
- Loxely, W. (1987). "Employment Prospects in Twelve Western Indonesian Agriculture Faculties: A Tracer Study Survey of Alumni, Students and Professors," Jakarta, USAID.

- McMahon, Walter W. (1988). "Potential Resource Recovery in Higher Education in the Developing Countries and the Parents Expected Contribution," Economies of Education Review, Vol. 7, No. 1, pp. 135-152.
- McMahon, Walter W., Hans de Groot, and J. Frederick Volkwein (1991). "The Cost Structure of American Research Universities," Review of Economics and Statistics, August 1991, pp. 424-31.
- McMahon, Walter W. (1991b). "Investment Criteria and Financing Education for Economic Development," North American Economics and Finance Association Proceedings, NAEFA/Economics Institute Press, Boulder, Colorado, March 1991.
- McMahon, Walter W. (1992b). "An Efficiency Based Management Information System for Education for Indonesia," Faculty Working Paper 1492, Bureau of Economic and Business Research, University of Illinois, 1988, adapted to a Handbook on EMIS Systems, to be published by IEP, Paris, forthcoming 1992.
- McMahon, Walter W. and Boediono (1992). "Market Signals and Labor Market Analysis: A New View of Manpower Supplies and Demands in Indonesia," Faculty working Paper 90-0140, BEBR, University of Illinois, Urbana.
- McMahon, Walter W. (1990). "Expansion, Quality, and Efficiency of Indonesian Higher Education," seminar delivered at The World Bank, Washington, D.C., October 5, 1990.
- McMahon, Walter W. (1987). "Student Labor Market Expectations," in G. Psacharopoulos, ed., Economies of Education: Research and Studies, Pergamon, reprinted from International Encyclopedia of Education, Pergamon, N.Y. and Oxford.
- McMahon, Walter W. and Boediono (1992). "Universal Basic Education: An Overall Strategy of Investment Priorities for Economic Growth." Economic of Education Review, Vol. 11, No.2 (1992).
- McMahon, W.W., Moegiadi, and Rony Bishry (1992). "Technology and Human Capital Formation: Implications for Indonesia's 25 Year Education Goals," Chapter V, in Boediono, McMahon, and Adams, eds., Education, Economic, and Social Development Plan, Ministry of Education, Jakarta, forthcoming , March 1992.
- McMahon, W. W., B. Millot, and G. Eng (1987). "Economic and Financial Analysis," Indonesian Education and Human Resources Sector Review, Chapter 2, pp. 1-404, IEES, Florida State University, Tallahassee.
- McMahon, W. W. and Yudo Swasano (1990b). "Facilitating Job Placement of College and Secondary School Students," a proposal to the Minister of Education and to the Minister of Manpower, August, 1990, Jakarta.

- Schiefelbein, E. and J. P. Farrell (1982). Eight Years of Their Lives: Through Schooling to the Labor Market in Chile. Ottawa: IDRC.
- Simanjutak, Payamin (1987). "Tracer Study of Indonesian Graduates," Ph.D. Dissertation, Boston University, and Ministry of Manpower, Jakarta.
- Strudwick, J. and P. Foster, (1991). "Origins and Destinations in Jamaica," International Journal of Educational Development, (forthcoming).
- Strudwick, J. (1991). The Transition from Tertiary Education to Employment: A Reverse Tracer Study of Graduates from Seventeen Indonesian Universities and Colleges' Faculties of Engineering, Basic Sciences and Economics. Prepared for USAID/Jakarta. Washington, Institute for International Research, Vol. 1 to 3, (forthcoming).
- Strudwick, J. (1990a). "Guidelines for the Completion of a Longitudinal Study," Jakarta, Balitbang Dikbud, DEPDIBUD.
- Strudwick, J. (1989). "The Quality and Efficiency of Vocational/Technical Educational in Indonesia: A Research Brief," Jakarta, Balitbang Dikbud, DEPDIBUD.
- Van Adams, Avril (1991). Indonesian Labor Markets Study (especially Chapter 1, "Economic Development and Labor Markets," The World Bank, 1991.
- Windham, D. M. (1988). Indicators of Education Effectiveness and Efficiency. Tallahassee, Florida: IEES Project.
- Wise, David A. (1975). "Academic Achievement and Job Performance," American Economic Review, June 1975, pp. 350-66.

Chapter VIII

ABSTRACT

**Improving the Educational Quality of Primary Schools
Assessment of School Quality and Students' Achievement
in the Indonesian Primary Schools**

This study of the quality of basic education is one of the USAID sponsored special studies undertaken within the framework of the Educational Policy and Planning Project in the Center for Informatics, Office Of Educational and Cultural Research and Development. The aim of this study is to produce information concerning the existing problems within basic education in Indonesia. This study is intended to assist policy makers and planners with usable information for use in developing appropriate mid-term and short-term policy strategies. This study also attempts to generate preliminary ideas for the long-term 25-Year Plan in the education sector by establishing baseline data, and for evaluating the quality status of the Indonesian primary education system.

This is a large scale survey study started in 1988. It involves 402 units or census blocks from the 1982 agricultural census conducted by the Central Bureau of Statistics. The census blocks in this study were randomly selected from three provinces; West Jawa, South Sulawesi, and West Nusa Tenggara. The school samples were also random, selected from these census blocks. Within the selected schools 15 students were randomly selected from one of the intake groups of sixth grade students. Data were collected by means of a community survey, a family survey, and a school survey for these schools. In the school survey, the students, sixth grade teacher, and headmaster were administered questionnaires. The respective students and teachers were tested on three subject areas, consisting of science, Bahasa Indonesia, and mathematics.

I. Major Findings of this Study

(1) Provision of access to schools for youth appears to be extra-ordinarily successful since most of the 6-12 year- old children (94.0%) had gained access to the schools by 1988. The rest are those who are economically deprived, living in remote areas, or nomadic. Special efforts will be required to reach these three groups.

(2) The high enrollment ratio does not necessarily reflect the real opportunity to learn because the drop out and repetition rates are fairly high. They have not significantly declined over the last ten years. This has caused an extremely high average study time, i.e., two years behind in the intended schedule.

(3) The analysis of equity generally shows that higher quality basic education in Indonesia has tended to be biased toward students from urban families, wealthy families, male students (especially for school access), and the schools in Java.

(4) This study found that the Indonesia's basic education confronts major problems in teacher quality. Measured in terms of teachers' mastery of the subject areas, this was found to be extremely low. The schools generally had been provided insufficient facilities as well. Schools in West Java and those of the wealthy urban students generally are better equipped than elsewhere.

(5) This study observes that the management of primary schools is characterized by both modest internal control systems and external contacts by the principal. These were measured in terms of the principal's activities in evaluating, observing, correcting, and improving the teachers' work, and his/her involvement in external academic cooperation.

(6) This study generally finds a low level of student academic achievement as seen in terms of the percentage of correct answers from the items in the three subject areas tested. This level of mastery was virtually the same as the one measured in the previous Grade Six Survey 13 years ago (Moegiadi, 1976).

(7) The observed disparity of achievement found in this study is first associated with provincial differences. It is second due to rural-urban differences and related family socio-economic status. It is finally due to differences in the school quality variables, especially teacher quality.

(8) The home and community variables affected the variation in achievement somewhat more strongly than did the school quality variables. This appears to be an increase in variance accounted for by home and community background. This shift has emerged in this study in relation to the study conducted in 1976.

II. Conclusions and Implications

The pattern in international studies reveals that the more developed a society is, the stronger is the effect of non-school variables. The last finding suggests that the Indonesian society has come to this turning point in its journey toward a more developed society, since it shows that family and societal background have a more powerful effect especially in the

provinces where achievement is highest than do school variables. The point made here is the roles played by home and community in education have been increasingly stronger, and this has to be taken into account in quality improvement policy in basic education. The school variables appear to be most important in the rural areas and the lower income provinces in line with international experiences.

This study concludes that "stages of development" is a highly relevant strategy in the improvement of Indonesian primary school quality. Every school should start from their own initial stage of development heading toward a more advanced level of quality. Most Indonesian primary schools are in the first stage of development; the schools' shortcomings especially in rural areas and in the lower income provinces are severe. They are inadequately provided with educational resources, and their quality and teaching staff are low. A quality improvement program should then help them reach the subsequent stage of development; the stage of "formalism" where schools are better equipped and teaching staffs are appropriate in number as well as in educational credentials. This step should result in a substantial increase in learning and achievement. Subsequently however, schools must be helped to reach the stage of transition, in which schools have better support from the available equipment as well as from teacher resources. The final stage of development can then be attained, the stage of meaning.

By this developmental stage approach, the first process of quality development is essentially to help schools reach the second stage of development, i.e., the stage of transition. This will increase the number of schools ready to reach the stage of meaning. It is generally suggested in this study that macro quality improvement policies may be considered relevant only up to reaching the stage of transition.

Subsequently when the stage of meaning has been reached, the schools begin to develop by themselves and evolve to strengthen their own management and instructional quality. The stage of meaning is most desirable where schools have sufficient capacity to continue to help students to learn better, which should move them toward sustainable improvement efforts.

Chapter IX
Summary of Conclusions
Walter W. McMahon, Boediono, and Don Adams

This volume is unique in exploring one question throughout: "What if you want to increase the internal efficiency of the education system?" It considers the methods, and suggests several very specific possibilities.

Efficiency is defined here considering the broader audience to which this volume is addressed, (deliberately avoiding the technical jargon and subdivisions used by economists) as :

- * improving the quality of the outputs and outcomes of education relative to their costs, or
- * increasing the effectiveness of the outputs or processes of education relative to their costs, or
- * maintaining quality and effectiveness while finding ways to save on costs.

This volume focuses on improving internal efficiency but not at the expense of pupil equity. That is, it is mindful of the large inequality of educational opportunities that exist and the problems they create by way of causing later inequality in the income distribution specifically and life changes generally.

Funds released by improving internal efficiency can be used to simultaneously improve both quality in education and the equality of educational opportunity. Volume IV on financing education deals more directly with the alleviation of poverty in the next generation by means of providing for greater equality of educational opportunity now, as well as with the financial incentives for simultaneously improving internal efficiency.

I. What's New?

- * Chapter II develops a unique design for an Efficiency-Based MIS system that makes it possible to comprehensively analyze efficiency. It seeks to define the specific data series on inputs, processes, outputs, and outcomes that need to be maintained rather than discussing MIS systems in general terms. This EMIS system includes data relevant to other education problems as well.
- * Chapter III find from a survey of international research, including Indonesian research, that in general little attention has been given to costs in relation to the process by which quality (and efficiency) is likely to be realized. Tentative inferences are made regarding quality improvements which are comparatively cost - effective.

- * Chapter IV finds that calculations of rates of return by the direct method and by use of Mincer earning functions produces the same results at almost all levels. The Mincer earnings functions show that learning on the job depends significantly on prior schooling in Indonesia. Chapter IV also presents a new and practical LOTUS program for calculating rates of return.
- * Chapter V identifies those Provinces in Indonesia where VOTEC rates of return are low, and others where they are high. It also develops the cause and effect logic of three major sources for these differences.
- * Chapter VI suggest that to improve implementation and absorptive capacity (e.g. in achieving the goal of universal junior secondary education), a specific management plan is needed that identifies responsibilities, authority, accountability, and provides the financial resources necessary for the change. Additionality, and of equal importance, the plan needs to provide ways of coping with the inevitable uncertainty of change.
- * Chapter VII suggests that within higher education serious consideration be given to instituting a system of preformance budgeting. If this were to be done, the first step would be to require all public universities to compute their cost per graduate, (i.e., the annual cost times the number of years it takes the average student in each faculty to complete a bachelor's degree). This alone may lead to large potential cost savings.
- * Chapter VII also suggests that the cost effectiveness of overseas training of Masters and PhD students could probably be increased by steps to require academic departments accepting new PhD candidates to offer research and/or teaching apprenticeships after the first 2-3 years to able candidates, and require dissertation topics to be identified earlier.
- * Chapter VIII reports new findings of enomous differences between rich and poor within the primary education system in Indonesia (e.g. differences are greatest by Province, by Urban/rural, and by wealthy/poor). This is reflected in teacher quality (performance of teachers on tests covering mastery of the subjects they teach), and by access to education by the economically deprived, by those in remote areas, and by nomadic children. The drop-out rates in primary schools (e.g. about -23% do not complete sixth grade) reflect the same pattern. These findings are new.

These findings also have major implications, and require reflection. If steps are not taken to equalize educational opportunity at the primary school level, the problems of poverty alleviation later are sure to become much worse. The experience in western nations is that the social costs of this then becomes a drag on the efficiency of the economy later as the result of the cost of welfare programs, and other problems of low employability.

The findings in this study also suggest that the school inputs into learning tend to become less important and the family inputs become more important as economic development progresses. This finding is consistent with the earlier findings on this point in international studies. But more recent studies using multistage (nested) production functions are now finding that the schools continue to remain just as important as development progresses. In any event, this finding is not new.

II. Conclusion

There are many ways to improve quality and educational effectiveness in relation to costs, as well as to manage educational costs directly. Each of these can contribute to better development of the human resources of the nation.