Efficiency Indicators Activity
IEES Project Monograph

Collaborative Design of Educational Indicator Systems in Developing Countries: An Interim Report on an IEES Project Intiative

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Collaborative Design of Educational Indicator Systems in Developing Countries: An Interim Report on an IEES Project Initiative

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I. INTRODUCTION

The design of educational indicator systems is presently a "hot topic" in both the industrial and developing worlds (Bottani & Delfau, 1990; Chapman, 1990; Odden, 1990; Windham, 1988a, 1988b) as better use of existing data at all levels holds out the hope of rationalizing the macro-management of educational systems and directing attention to the real impediments to improved performance and greater equity.

IEES Project activities in this domain were born of some related concerns, though ones that changed form significantly in the course of implementation. Evaluation of the first five years of IEES Project activity suggested a number of positive effects, but also a need to better document project impacts and the evolution of the baseline situation and socio-economic environment of the educational systems in question. Project staff therefore decided to begin work on a prototype indicator system for tracking the overall state of the education systems in participating countries, in part as an ongoing and greatly simplified form of sector assessment.

Once the team responsible for this effort began to bring together current research and thinking on indicator systems with its own experience in educational data use in developing countries, it quickly became clear that an additional two dimensions would be needed: first, incorporation into the model of qualitative data on educational processes, habitually the weak point of indicator systems; and, second, major and structural provision for host country counterpart participation in indicator system design and data definition, as well as anticipation of considerable variance and country specificity in design characteristics.

In the rest of this paper, we briefly describe our conceptual analysis of educational indicator systems, the prototype model of primary education developed, and the process envisaged (and now underway) for host country elaboration and modification of the model. We will also discuss the potential for utilizing the indicator system both for in-country educational planning and staff training purposes.

II. CONCEPTUAL ANALYSIS OF EDUCATIONAL INDICATOR SYSTEMS

A. The Nature of Indicators and Indicator Systems

Recently there has appeared an increasing amount of literature about indicators for educational systems, provoked by concern with educational accountability in this country and spearheaded by the OECD Indicators Project in the rest of the industrialized world, as well as by donors' attempts to improve educational management and soften the blow of diminished educational resources in less-developed countries (LDCs).

There is no uniform definition of the notion of an "indicator," however. Chapman (1990, p. 229) terms indicators "proxies used to represent the underlying reality of a system or program" and notes that they are necessarily an "oversimplification" of this reality. Cobbe (1989, p. 3) makes a distinction in his monograph between raw data, statistics and

indicators, noting that the latter "should permit immediate – or nearly immediate – inferences about the performance of the [educational] system from the point of view of the objectives of the system."

Oakes (1986) defines an educational indicator as "a statistic about the educational system that reveals something about its performance or health;" and Smith (1988) further suggests that it "either assesses or is related to a desired outcome of the education system or describes a core feature of that system." Odden (1990, p. 24) points out that an "indicator **system**" is considerably more than a single indicator or statistic. It should

> provide measures of various components of the educational system as well as information about how those components work together to produce the condition of the system and changes in the condition of the system over time.

Most researchers identify indicators with **composite** indices of the operations of the educational system designed to reveal some critical aspect of its operation. Johnstone (1984) goes so far as to restrict the term to rather complex compounds of data providing a highly synthetic picture of the system.

Such an approach seems unnecessarily restrictive, however. The essential notion is simply that of particularly meaningful data that point to and describe a significant characteristic of the educational system. In some cases, a single type of data may do this (Nuttall [1990] calls these "primary indicators"); in other cases, more processed composites of raw data or statistics may be used ("secondary indicators," in Nuttall's parlance). In all cases, commentators tend to emphasize the fact that, as Bottani (1990, p. 337) puts it, "indicators do not explain; they only point." Some additional resources must be called upon in order to **interpret** the data that an indicator system produces.

B. What is Worth Indicating?

If indicator systems only point, what are we pointing at? From a generic and "rational" point of view, the underlying concern in indicator system development seems to lie with discovering whether and how – or "to what degree" and "in what way" – the educational system is accomplishing its goals. Since those goals will generally be quite country-specific, and given that there is often considerable debate within a country as to what those goals ought to be, it follows that indicator systems may also need to be quite idiosyncratic and subject to modification, a tendency tempered only by some measure of concern with consistency and comparison over space and time.

At the same time, it is evident that the IEES Project, like other multinational endeavors of donor agencies, is predicated on the notion that there are some universal criteria of educational system performance, related in particular to issues of efficiency and quality. How universal are these criteria and how much uniformity can or should they lend to a multinational indicators project?

Educational Efficiency: Efficiency in the delivery of educational services is a central concern of the IEES Project. It is the Project's "middle name." A good deal of conceptual work has been done on the topic under the aegis of the project, particularly the substantial monographs by Windham (1988a, 1988b). Much of that analysis is implicitly adopted here.

At the same time, we feel constrained to note that injunctions to maximize the ratio of educational outputs or outcomes to educational inputs frequently glaze over three fundamental issues:

First, technically speaking, the **concept of efficiency is only meaningful if you correctly specify** (and measure) **the outputs or outcomes in question.** Desired educational outputs and outcomes are not simple, and they may vary significantly from one country or region to another. They may involve affective as well as cognitive results, group as well as individual effects, and distributional as well as summational considerations. Policy makers may in reality be trying to maximize an entire vector or set of outcomes – Windham refers to it as the outcome "mix", – including (conceivably) the **desideratum** that the relative position of one group improve relative to that of another. Issues like these are often circumvented by imposing at the outset a conventional series of objectives and desired outcomes – generally those in vogue with major donors.

Second, **efficiency is a ratio, not an absolute magnitude.** Applying the perfect competition and general equilibrium postulates of neoclassical economics, it is generally assumed that efficient methods that are applicable at one resource level are generalizable across others as well. This may not be true; and, if not, the reasoning is in serious trouble. Also, for related reasons, as Cobbe (1989) points out, an efficiency criterion can be substantively ambiguous, particularly if a short-term view is adopted. For example, cutting inputs by one-half might "mathematically" improve efficiency in short-run perspective, yet have ruinous longer-term effects.

Third, **educational systems need to be efficient both in generating AND in expending resources,** and these two objectives are not always perfectly compatible. A system which produces less outputs per unit of input but manages to generate or elicit more input – e.g., community or private financing – may be better adapted to accomplishing national objectives than a more "efficient" one. In a sense, this point mirrors the economic distinction between technical and allocative efficiency, since the latter takes account of the relative prices of inputs and outputs and therefore the valuation that (public or private) consumers place on educational system performance.

Overall, Windham suggests that "the efficiency concept is a neutral device" (1988, p. 9), but that **only** holds under one of two very restrictive conditions: (1) if the term is given no content, in which case it is operationally useless; or (2) if there is substantial agreement among all stakeholders concerning the objectives or the "outputs" that are being maximized. To make the concept operational, some set of objectives or desired outputs must be specified; and the question then immediately becomes "Whose objectives? Desired by whom?"

Educational Quality: Fuller (1988) chronicles four different phases in the definition of educational "quality" – from an initial stress on the mix of material outputs, through a period of increased emphasis on the importance of individual abilities and perceptions, to a phase of growing awareness of the centrality of cultural and social patterns that shape school process, and on to more recent awareness of the non-school-related and political objectives that "educational quality" campaigns may fulfill. Cobbe (1988, p. 3) identifies

educational quality with the "value added" by the system, though this makes it nearly synonymous with the efficiency concepts discussed above.

Easton and Cayhana's paper on the efficiency and quality of technical education in Indonesia (Easton & Cayhana, 1989, pp. 3-4) notes two main tendencies in efforts to operationalize the notion of educational quality:

> On the one hand, quality is defined as embodiment or approximation of characteristics that are socially accepted as proof of excellence. Thus, if all teachers in an academic secondary school have Master's degrees, the group will be considered a high quality staff. One the other hand, quality is defined as proven ability to produce results – in short, the argument that 'a tree is known by its fruits.'

Moreover, "educational quality" in the former sense is very often invoked in evaluations and policy studies for two reasons worth noting: first, as a substitute or proxy for efficiency measures, because genuine output data are so frequently unavailable; and second, because this open-ended concept is felt to capture more of the multiple and sometimes unquantifiable dimensions of educational outcomes than stricter input-output measures. Concern with educational quality therefore opens the door to the idea that other than quantitative data may need to be incorporated into an indicator system – or used in tandem with it – in order adequately to describe and analyze the current state of the educational system.

C. Specifying the Underlying Conceptual Model

Two points are made repeatedly in current literature on educational indicators: first, that indicators "do not explain, they simply point;" and second – partly as a consequence – that one needs to take some care to think out the underlying model of educational process on which the indicators are based, and which will serve as a basis for interpreting them. The model need not be very complex. The Rand Corporation scheme presented in Odden (1990) includes only three types of inputs, four types of processes and three categories of outputs. But most authors maintain that some such model is implicit in any set of indicators anyway, and that it is therefore best to get the subject out in the open and examine it.

We concur with the need to give some careful thought to the model of educational processes that underlies an indicator system. Most IEES studies and documents employ some form of a "CIPP" framework (in fact "CIPOO" insofar as the "product" is differentiated into "output" and "outcome"). The CIPP framework is not really a model in the sense meant above, however, but simply a set of categories (based albeit on a production function analogy) for thinking about educational processes. The question remains, "What kinds of 'inputs,' 'processes,' 'outputs' and 'outcomes' will be put in the model?" and "Who will make the decision?"

D. Choosing Indicators: Criteria and Methods

The next step is choosing the specific indicators to be tracked. We feel that the choice should be made in accordance with both conceptual and practical criteria. Before discussing those criteria, however, there is a prior question concerning the "population" of

possible indicators **from which** the choice will be made. In order to avoid overly or artificially constraining that initial set (and therefore all the choices made from it), we decided to inventory a large number of potential indicators, cross-classifying them by conceptual category or cluster. The choice criteria were then to be applied to this stratified grouping.

Chapman (1990, p. 229) suggests that "the appropriateness of particular indicators is judged in terms of their fidelity with the underlying reality they represent, the extent to which the indicators are relevant and understandable by the data users, and the extent to which data on these indicators can be collected and analyzed in a cost-effective manner." We attempt to include these criteria and perspectives in the discussion below.

1. Conceptual Criteria

Conceptual criteria essentially involve considerations similar to the ones governing the articulation of the underlying model. Since only a relatively few indicators will be systematically monitored, one wants to be sure that they relate to "key" aspects of the educational system. What does "key" mean, however, and who decides which indicators meet this criterion?

Considering the first question first – we think that the word "key" essentially means that the aspects of the educational system in question are judged (by appropriate parties and in an appropriate manner) to be particularly expressive of its current state or level of quality, or particularly critical to its performance in achieving (their) priority objectives. Two technical issues are at stake here: the first concerns validity, and the second has to do with causality.

The validity question involves the degree to which the particular indicators chosen validly represent the underlying characteristic of the educational system that one wishes to measure, an argument that can be made on either conceptual (construct validity) or empirical (concurrent validity) grounds. The causality issue concerns the degree to which these underlying characteristics are in fact related in some cause-and-effect manner to achievement of the given system performance objectives.

On both grounds, we can use – though advisedly – some of the literature reviewed by Fuller (1986, 1987) and others that seeks to identify key factors in improving educational quality in LDC schools. Obviously research on the countries in question has the greatest face validity, but is frequently hard to come by.

2. Practical Criteria

Practical criteria to use in choosing indicators are essentially of two kinds: (1) data availability considerations, and (2) data quality considerations. They will be broached in that order.

Data availability considerations are relatively straightforward, but are nonetheless worth careful examination. From the point of view of a centrally-administered international project, one could establish a hierarchy from "more to less available" with gradations something like the following:

(a) Available in easily accessed international publications.

(b) Available in more remote international publications.

(c) Available in easily-accessed international data bases.

(d) Available in national publications easily accessed in-country.

(e) Available in national publications requiring specially-authorized access in-country.

(f) Available in international data bases requiring special search or access.

(g) Available in national data bases requiring special search or access in-country.

(h) Available in-country in dispersed or raw data form requiring considerable collection or collation effort.

The order and relevance of this scale is obviously different if one is situated at the national or regional level, and appropriate changes should be made. In any case, there is some implicit rank order of availability characterizing the different forms of data that one might want to include in an indicator system.

Note that the time period must also be specified in determining availability. Data for a given indicator may be fairly accessible for the 1988-90 time period, for example, but much more difficult to obtain for the 1984-87 period.

Data quality: This is both the most critical and the touchiest practical criterion, it seems to us, a problem of major dimensions that is nonetheless carefully skirted in most discussions of educational indicators or management information systems in LDCs. The issue can be politically sensitive, but it is also absolutely central to the development of any tracking system. The articles of Chapman (1990) and Chapman & Boyd (1988) are among the very few writings we have found to treat the topic straight-on, though the authors limit themselves to a particular technical treatment of the issue.

The underlying question concerns the **margin of error** in data; and the basic principle to assert, we feel, is that all information contains elements of error, and any responsible presentation of data should include an estimate of this margin or at least a discussion of the sources of error. The underlying types of error are threefold, and can moreover compound each other: reliability, validity, and sampling (representativity). Validity errors have already been discussed. We briefly consider the other two types in the following paragraphs.

Reliability: Missing information, fanciful estimates, miscopying, falsifications, misunderstanding of instruments, and a legion of other miscues increase the margin of error in the data (or, technically speaking, increase the variation that would be found in the results of successive efforts to determine the same information by separate means). It is important to get some handle on this issue.

In a certain sense, the problem may be compounded by the use of composite indicators. (e.g., if our estimate of enrollments has a margin of error of +/- 10% and our information on numbers of classrooms has a +/- 20% confidence interval, the range for the

pupil/classroom ratio computed from this data could vary by as much as +/- 29% around the true value.)

Representativity or sampling error: What population do the data represent with reasonable accuracy? Often data presented as national in scope have only been collected on a distinctly non-random subset of locations or units, perhaps because of poor response rates. This situation does not necessarily invalidate the information in and of itself. Decent data on a particular subset (which is usually representative of **something**, even if not of the whole country) is immensely better than no data, and may be very informative, provided that one takes account of its limitations.

At first glance, it might seem impossible to get information on – and take account of – these sources and margins of error. Given that the whole topic has potential for undermining the credibility of any information system, one could then understand the inclination to scrupulously ignore it. But the main point is simply to refrain from throwing the baby out with the bath water; or, as the French say, to remember that "the best is an enemy of the good." The main point is to start taking **some** account of sources and margins of error, to be ready to exclude the data that seems most suspect in this regard, and to begin pushing for inclusion of margin of error information along with any data collection or analysis activity.

E. Whose Conception?

A number of critical questions arise throughout the foregoing reflection on the conceptual framework and practical guidelines for devising an indicator system: namely, **whose** conceptual framework shall underlie the indicator system? **how** shall it be devised? and **who** shall specify the criteria for choosing indicators and the complementary roles of qualitative and quantitative inputs? Though there is incontestably an international language of educational planning and research currently largely dominated by economics, there are a number of reasons to assert that actual indicator systems may and should vary significantly by locality.

The first reason is that, as noted above, efficiency has little meaning until operationalized by the specification of objectives, and those largely depend on the development strategy and perspectives of the countries in question. The second is that actual data availability may vary enormously as a function of other conditions within the host country environment. A third is that the ultimate utility of an indicator system depends entirely on one's ability to **interpret** the data, and most indicator systems therefore require a complementary set of qualitative insights that are normally highly country-specific.

To the degree that there is effective host country participation, therefore, the potential for variation in the indicators from one country to another will significantly increase, even though there certainly are international paradigms of educational development that exert major conceptual influence nearly everywhere. Moreover, there is also a potential here for variation **over time**. The notion of a key or critical aspect of an educational system has a time-bound quality and is strategy-related – aspects that are thought to be critical at one point in time may not be at another period. The high value (and rare occurrence) of

longitudinal analysis should drive proponents of the system to resist too many changes, but the likelihood of variation in data specification over time must be taken into account.

The conceptual analysis in and of itself therefore drives us to emphasize host-country participation and local "ownership" of the indicator system design process. Of course, this shift in center of gravity does not automatically answer and resolve the "cui bono?" or "who decides?" question. The same issues are simply transposed to a host-country level, and one must ask again whose criteria and conception are being used and to what degree they match those of the supposed beneficiaries or ultimate underwriters of the educational system. We will return to this topic a little further on in discussing field implementation strategy.

III. DEVELOPMENT OF A PROTOTYPE MODEL

A. Steps in the Process

Our original intention was to move from consideration of these conceptual bases to the development of a simple indicator model applicable to all IEES countries and thence to collection and analysis of data that would illuminate trends in system performance and set a framework for discussion of Project impacts. As just explained, however, we came out of the original conceptual stage with a different set of proposed orientations. At that point, the ideal procedure would seem to have been an interactive design process including substantial host-country participation from the outset. For logistic and budgetary reasons, however, this was not feasible. Our fallback strategy was to proceed with design of an initial prototype model, using our collective field experience – and that of the rest of IEES staff – as a sounding board, then to treat the result as a stimulus for country-specific work and to develop a strategy for recentering the debate in host-country locations. In this section of the paper, we briefly describe the model development process and its initial results. In the next section, we turn to the question of the process for recentering the debate in participating countries.

The model elaboration process included the following steps: First, review of the theoretical bases of indicator systems and development of an initial conceptual framework. Second, inventory of potential indicators of system performance and classification into the categories of the conceptual framework. Third, choice of a set of indicators to compose the initial "indicator system." Fourth, submission of this framework to IEES staff and other colleagues for critique, discussion and modification.

This work was undertaken in the course of the 1990-1991 academic year. Candidate indicators were drawn from Windham's monographs (1988a, 1988b), sector assessment documents, World Bank and UNESCO publications, the writings of Fuller (e.g., 1986, 1987) and others on educational quality concerns in developing countries, and experience with indicator systems in Indonesia, Haiti and Botswana. To simplify the conceptual task, we based all reflection on the example of a country's primary education system.

B. Initial Conceptual Model

The underlying conceptual model that we adopted was based to a certain extent on work previously done in Haiti and consists of three tiers: descriptive indicators, efficiency indicators, and equity indicators. At the descriptive level – portrayed on the adjoining

table – the characteristics of the educational subsystem in question are organized into fifteen domains in roughly production-function fashion: beginning, that is, with context and proceeding through inputs, processes, outputs and outcomes of education. In an effort at simplification, we decided to choose for the initial prototype model two summary indicators per descriptive domain – or thirty in all – based on criteria of likely availability and relevance to overall issues of educational quality and efficiency. It subsequently proved difficult to narrow choices down this far without reference to the particular countries where the work would be done, so we retained an average of four proposed indicators per domain, counting on subsequent in-country work for refinement and pruning. The actual indicators and the rationale are laid out in Appendix A.

The next tier of the model concerns **efficiency indicators**. Strictly speaking, efficiency is a ratio of outputs to inputs. An efficiency measure is therefore generally a secondary indicator which is based on two or more primary indicators and may span across domains of a model like the one presented above for the primary education subsystem.

Each of the domains in the model may of course have its own **internal** efficiency measures, involving its own particular inputs and outputs. For example, the input to the school management domain may be dollars, and the output a certain number of services provided to teachers and students by school administration. These two measures could then be combined into a "local" efficiency indicator concerning purely the realm of school management. For the most part, however, we are dealing with more global composite measures.

Some of the descriptive indicators included in the list above are already implicit efficiency measures. Any form of completion or graduation rate, for example, is of this nature, since the "rate" compares those who succeeded (output) to all those who took part (input). We propose in addition to track three kinds of composite efficiency indicators based on the descriptive indicators already detailed:

1) Enrollment ratios

Essentially total enrollment over the size of the appropriate age cohort in the population.

(2) Resource sufficiency ratios

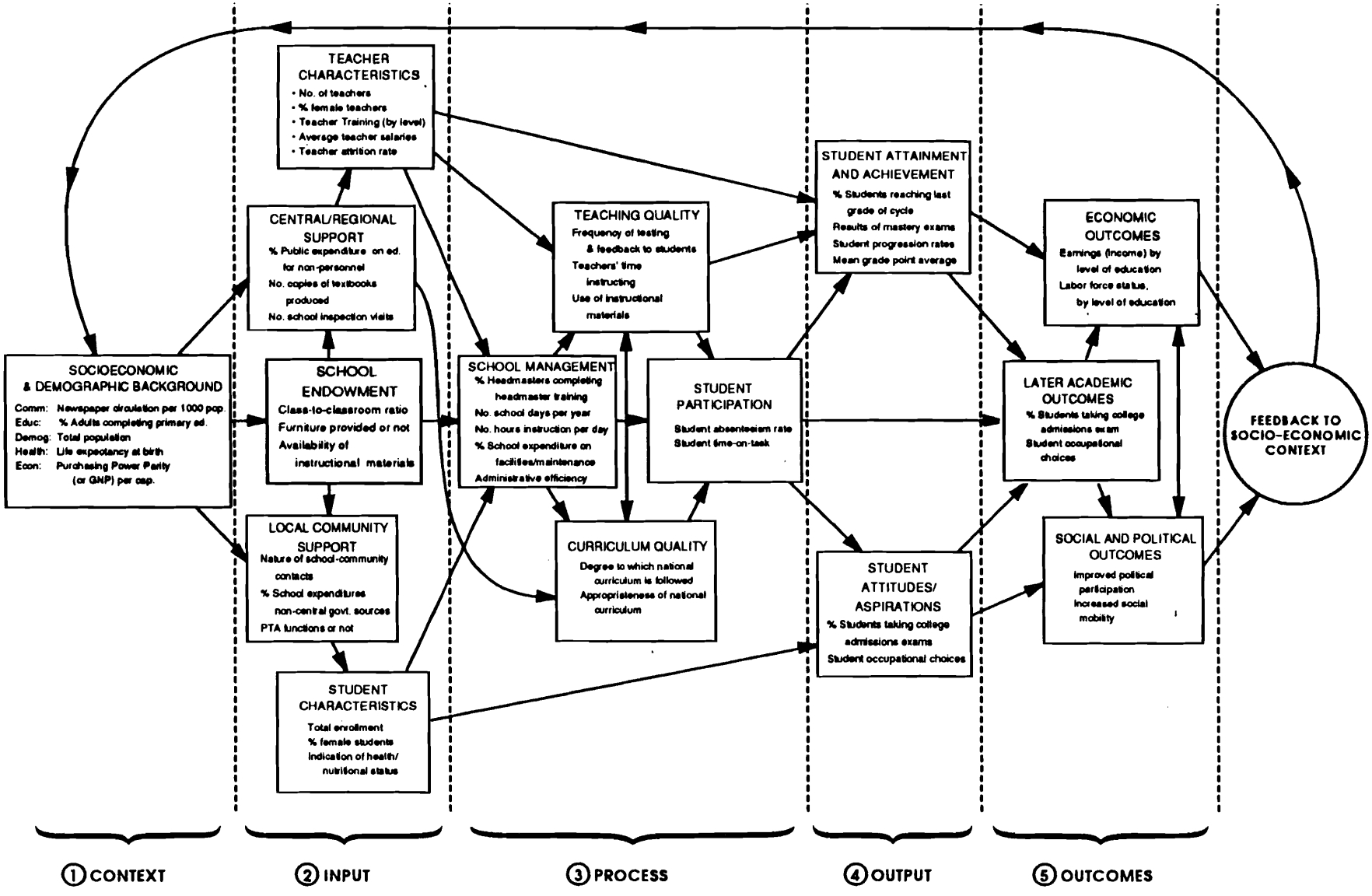
These include textbooks per student and non-salary expenditures per student.

(3) Resource cost per graduate

Actual costs per graduate are too complicated too compute and require cost studies to which we will probably not have access. A simpler measure is **graduates per teacher-year**.

The third tier concerns **equity indicators.** Establishing equity indicators essentially involves attempting to disaggregate the types of data already proposed for assessment of the overall primary school system. To keep from exponentially increasing the amount of work to be done, the number of equity indicators, and the number of axes of disaggregation,

TENTATIVE EDUCATIONAL SYSTEMS MODEL



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should be kept modest. We suggest three axes of disaggregation and four indicators for equity comparisons:

Axes of disaggregation
Significant geographic or administrative regions
Private/public education
Gender (male/female)

Equity indicators
Net enrollment ratio
Cycle completion rate
Textbooks/student
Teacher training

C. Debate and Modification

Discussion of this overall model with IEES Project staff proved to be a highly instructive exercise and yielded a number of suggestions for improvement. Notable among these was the recommendation that at both the central and the country levels a distinction be made between an "ideal" version and a "feasible" version of the model.

The underlying idea is to identify and distinguish both a "best case" and a "likely" set of indicators. The first one gives all participants an occasion and an incentive to think about the kinds of information that they would really like to have in order to inform educational decisions bearing on system efficiency. It also gives us some protection against the danger of getting mired down in "least common denominator" approaches that lead to collection of an incoherent assemblage of data with borderline validity simply because it was (all that was) available.

The second approach (development of "feasible" indicator sets) provides a reality check against impractical or inappropriate model specifications born of too much concern with conceptual elegance or completeness and insufficient attention to what is currently possible in different country settings. We anticipate that iterative review of the ideal and feasible models will result in (a) an operational (feasible) model that is conceptually tighter, and (b) a better articulated optimal model that will be increasingly useful for purposes of training, policy discussion and educational planning.

IV. IMPLEMENTATION IN THE FIELD: PROCESSES ENVISAGED

A. Development of country-specific models

The next step foreseen in the process is to move the center of gravity in the development of the ideal and feasible indicators sets to three IEES participating countries. At present, there have been expressions of interest, but the final "self-selection" of these countries has not been made, nor has the exact process to be respected in-country been specified. This will doubtless vary from one location from another and be developed largely *in situ*, with the participation and support of IEES Resident Technical Assistants, where applicable. The minimal objective of the exercise will be to use the proposed system

simply as **a tool for discussion and staff training**, and to enlist the help of host country counterparts in modifying and improving a model that the IEES Project will then use to track trends in educational system performance in the country.

If there is interest in participating countries, a good deal more can be done with the resulting system, or with the process of developing it. The exercise can serve as a basis for reviewing current uses of educational management information systems, designing means for interpreting their outputs, integrating qualitative information into the interpretation process, specifying types of local process research to be targeted for support, and/or training staff at different levels in the related analytic tasks.

B. Related Issues

Four major issues that merit exploration in tandem with this process are worth mentioning here. The first concerns the complementary roles of qualitative and quantitative outputs in educational decision-making, and the best means for ensuring a supply of relevant qualitative insight. Process data is the habitual weak point of indicator systems. We therefore envisage, as one component activity, a careful census of the qualitative and process studies currently underway in the countries in question (and potentially the encouragement of others through the IEES research agenda) in order to fill the gap and lay a firmer foundation for analysis.

A second and closely related issue concerns investigating actual patterns of use of data in educational agencies and pinpointing factors that determine their utility. The "sociology" and politics of data use is a topic as centrally important to EMIS operations as it is sensitive, and certainly merits thoughtful recognition.

A third important topic is related to the appropriate mix of nationwide and sample data in an indicator system. A number of more refined quantitative indicators – as well as most types of qualitative information – cannot be reliably collected for the whole country but can be very usefully approximated through focused sample studies. Developing this methodology as part of an EMIS merits closer attention.

A fourth critical subject concerns the relationship to be developed between national management information and indicator systems on the one hand, and regional or local ones on the other. Our experience clearly suggests that overly-centralized systems where field staff collect data solely to feed central files or computers end up receiving increasingly unreliable information. It is important to develop at the same time methods and procedures for synthesis and use of data **at local and regional levels**, not only as a support for better decision-making at this level, but also to help ensure that field staff see the use of the data collection effort and remain conscientious about it.

C. Analysis Strategy

Analysis is another congenital weak point of indicator systems, as participants in the current debate about educational indicators in this country have been quick to point out. Exactly how is one supposed to use the data gathered? Here lies one clear advantage of trying to articulate an underlying conceptual model, as we have begun to do above. That model can serve as an important aid in the analysis and interpretation of the indicator data.

Generally, we see two related directions for analysis: (1) examination of trends over time; and (2) diagnostic interpretation of system status data.

(1) Examination of trends over time.

Part of the purpose of the indicator system is to provide a means of **tracking** the evolution of the educational system (most fundamentally vis-a-vis IEES activities) and spotting changes that provide early warning of serious problems or early evidence of major opportunities for school improvement. Consequently, a first level of analysis consists essentially of deducing direction and magnitude of changes in the key indicators from the longitudinal data assembled.

This is, of course, not quite as simple as it sounds, even assuming that enough sequential data on the same indicators are assembled to document a trend. One problem that typically confounds such an effort must be resolved before analysis can begin: the non-comparability of data on the same indicator at different points in time. It is quite conceivable that over time the indicator may be defined differently, the population on which the data were collected may be different and/or the reliability of the methods used may vary markedly. An initial effort to take account of these irregularities will need to be made.

(2) Interpretation and diagnosis

In a sense, the analytical model pictured above already constitutes a framework for interpretation of the data and even diagnosis of the problems observed, since the network pictures a series of supposed causal linkages among educational system variables. If an anomaly or problem is observed at one level, we therefore have at least a suggestion of where to look for causes or contributing factors.

Of course, what constitutes an "anomaly" or "problem" for highlighting and investigation can only be determined with reference to the particular objectives and norms of the educational system under examination. This once again supposes the active participation and involvement of host country planners.

These remarks suggest the following order of action for interpretation of the data: First, determine trends. Second, isolate trends or persisting conditions that seem problematic, given the country's educational objectives (or, in their absence, accepted international norms.) Next, by comparative trend analysis, formulate questions and proposals about possible contributing conditions. Fourth, discuss the entire matter with host country researchers/planners and revise the analysis on this basis. Fifth, revise the indicator scheme and collection plan as warranted by the results of the analysis.

D. Dissemination Phase

The efforts described in this paper seem to us potentially to have some larger implications for data collection practices in education at the level of each country, as well as internationally. As much should be expected, since the IEES Project is in part an R&D endeavor with the explicit charge from AID of developing new procedures for educational

planning and research that may be worthy of broader dissemination. If so, how should such dissemination be handled?

We think that the first critical dimension of the dissemination task lies **within** each host country. We will therefore be verifying in each case what are the existing in-country media for dissemination of educational research and reflection, and how we might collaborate with counterparts in using – and simultaneously in strengthening – these media. A second dimension evidently concerns exchange among participating countries and/or with educational personnel from potentially interested nations in the same region as the host country. A third and final dimension embraces international dissemination and publication within the United States.

In addition, we envisage publication at one or more of the above levels of a series of monographs to ensure broader availability of documentation on the development and products of this activity. Each monograph will represent a phase or particular theme of the project. Four distinct monographs and topics are presently anticipated:

(1) Overview monograph on conception, development and adoption of appropriate indicator systems for tracking educational efficiency;

(2) Survey and analysis of research now completed or presently being conducted in participating countries on educational **processes** and **quality dimensions**, the habitual weak areas in indicator systems;

(3) Monograph on problems of dovetailing national and local indicator systems and MIS's and on the staff and teacher training issues involved; and

(4) Monograph on questions of cross-national comparison of procedures and resulting data from efficiency indicators systems.

V. CONCLUSIONS

Several limitations of the analysis and processes presented in this monograph should be kept in mind. The first and foremost is that the schema presented is purely and simply a framework for thinking about indicator systems and so a potential starting point for the more important phases of related work that must go in the field. A second limitation is that the discussion is largely theoretical. In fact, much of what needs to be done in improving data utilization in the field is more particular and concrete and has to do with questions of how useful insights are drawn from existing data, how one diagnoses the small shifts in the type of information collected that could have major impacts on its usefulness, how disparate data collection systems in a single country or region are coordinated to eliminate waste effort and contradictions, and so forth. The framework suggested in this paper may nonetheless have some value for stimulating discussion and focusing attention on some "common denominator" issues in indicator system management.

In summary, one could say that "a funny thing happened on the way to establishing a project-wide indicator system for tracking efficiency trends": we remembered the importance of place and process and came up instead with a plan for engaging host-country participants in dialogue about – and collaborative design of – more flexible and location-specific systems. That this should happen in the IEES Project is not surprising, for

the Project's finest hours and best accomplishments have lain in the impulse to translate the current technique and jargon of educational planning into participatory exercises, accessible to host country counterparts and subject to their modification, criticism and influence. Sector assessment as practiced in the project, for instance, for all its sometimes heavy jargon, positivistic assumptions and economic bias, has been widely appreciated as a means of making the process of foreign aid allocation and educational policy analysis more visible and of opening the door to greater direction of the process by host country nationals (Easton, 1988). A number of project activities have had, intentionally or not, major institutional development consequences; and most have been characterized by a concern to adapt research agenda to capacity-building priorities. The reorientation of the efficiency trends activity is thus in a sense simply a move to make it more consistent with the spirit of the IEES Project.

REFERENCES

Bottani, Norberto. (1990). The background of the CERI/OECD project on international educational indicators. *International Journal of Educational Research, 14*, 335-342.

Bottani, Norberto & Delfau, Isabelle (Guest Editors). (1990). Indicators of the quality of Education systems: an international perspective. Special edition of *International Journal of Educational Research, 14*, 321-408.

Chapman, David (1990). The role of education management systems in improving educational quality. In Chapman, David & Carol Carrier (Eds.) *Improving educational quality: A global perspective*. New York: Greenwood Press. 217-242.

Chapman, David & Boothroyd, Roger. (1988). Threats to data quality in developing country settings. *Comparative Education Review, 32*, 4, 416-429.

Chapman, David & Carrier, Carol A. (1990). *Improving educational quality: A global perspective*. New York: Greenwood Press.

Cobbe, James H. (1988). Education indicators for policy purposes in Indonesia. Jakarta: Balitbang Dikbud.

Easton, Peter. (1988). *The role of economics in educational policy-making: Case study of an education sector assessment in the Republic of Haiti*. Unpublished doctoral dissertation. Tallahassee, FL: Florida State University.

Easton, Peter & Cayhana, Ade (1989). *The quality and efficiency of vocational-technical education in Indonesia*. IEES Monograph series. Tallahassee, FL: Learning Systems Institute.

Fuller, Bruce. (1986) Defining school quality. In Hannaway, Jane & Lockheed, Marlaine (Eds) *The contribution of the social sciences to educational research: 1965-1985*.

Fuller, Bruce. (1987). What school factors raise achievement in the Third World? *Review of Educational Research, 57*, 255-292.

Henderson, Hazel. (1990). Moving beyond economism: New indicators for culturally specific, sustainable development. *IFDA Dossier, 75-76*, 68-76.

Johnstone, James H. (1981). *Indicators of Education Systems*. London: Kogan Page.

Nuttall, Desmond L. (1990). Introduction: The functions and limitations of international educational indicators. *International Journal of Educational Research, 14*, 327-334.

Oakes, J. (1986). *Educational Indicators: A Guide for Policymakers*. New Brunswick, NJ: Rutgers University, Center for Policy Research in Education.

Odden, Allan (1990). Educational indicators in the United States: The need for analysis. *Educational Researcher, 19*, 4, 24-29.

APPENDIX A

DEFINITION OF MODEL DOMAINS WITH PROPOSED INDICATORS

I. CONTEXT

1. *Socio-Economic and Demographic Background*

This domain serves to establish the baseline context for assessing schooling inputs, processes, outputs, and outcomes. Five indicators have been selected to represent this domain: a) total population, b) life expectancy at birth, c) Purchasing Power Parity GDP per capita, d) newspaper circulation per 1000 population (to reflect literacy/communications), and e) the number of adults completing primary education.

II. INPUT

2. *School Endowment*

The domain of school endowment is intended to reflect the basic physical and material resources available at the school site. The three indicators selected to reflect the availability of instructional resources are a) class to classroom ratio, b) whether furniture is provided, and c) the availability of instructional materials.

3. *Local/Community Support*

The degree to which local schooling is supported by the community is reflected by this domain. The indicators of this support are a) whether a functional PTA exists, b) the nature of school-community contacts, and c) the percentage of school expenditures met through non-central government sources.

4. *Central/Regional Support*

The support offered to local schooling through the central/regional offices of the Ministry of Education, or other institutional provider is represented by a) the number of textbooks produced, b) the number of school inspection visits by MOE officers, and c) the overall and non-personnel Government/MOE expenditures.

5. *Student Characteristics*

Student population characteristics, i.e., what they bring to the schooling enterprise, are represented by a) total enrollment, b) the percentage of female students, and c) data on their health and nutritional status. This domain of student characteristics is distinct from how students engage in the instructional process, which is represented below in "student participation."

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6. *Teacher Characteristics*

The characteristics of the teacher population (status of the profession and what they bring to the instructional process) are represented by a) the number of teachers, b) the percentage of female teachers, c) training (by level), d) average salaries, and e) attrition rates.

III. PROCESS

7. *School Management*

School management refers primarily to the organization and provision of instructional time and resources, with additional indicators of administrator qualification and efficiency. To represent instructional time and resources, the following indicators have been selected: a) number of school days per year, b) hours of instruction per day, and c) school expenditures on facilities and maintenance. Indicators of administrator characteristics are d) the percentage of headmasters completing headmaster training, and e) a summary index of administrative efficiency.*

8. *Curriculum Quality*

The quality of the curriculum will be represented by summary indices of a) the degree to which the national curriculum is followed, and b) the appropriateness of the national curriculum.*

9. *Teacher Quality*

The quality of teaching is represented by a) the amount of teacher's time spent on instruction, b) the use of instructional materials for instruction, and c) the frequency of testing and feedback to students.

10. *Student Participation*

This domain refers to effective school attendance and participation in organized learning activities. The underlying variables concern quantitative and qualitative appreciation of "time on task" that is, time spent on the activities designed or intended to promote achievement of the school's learning outcomes. The indicators that we have chosen in this realm are a) student absenteeism rate, and b) student time on-task.

IV. OUTPUT

11. *Student Attainment and Achievement*

This domain concerns the degree of achievement of primary school learning objectives in the cognitive and psychomotor realms and includes quantitative and

*** Note: These "indicators" are a conceptual placemark, representing, to date, categories rather than actual indicators.**

qualitative assessments of those scholastic "outputs." The indicators that we have chosen in this area are a) percentage of students reaching the last grade of the cycle, b) results of mastery exams, and c) student grade-to-grade progression rates.

12. *Student Attitudes and Aspirations*

This domain concerns the degree of acquisition of selected attitudes, or the degree of achievement of specified affective learning outcomes, by primary school students. Chosen indicators are a) percent of students taking admissions exam for next cycle and b) the general area of student occupational choices (specific indicator yet to be designated).

V. OUTCOMES

13. *Later Academic Outcomes*

"Later academic outcomes" refers to the degree of success of primary school graduates in their further schooling, including admissions to higher level institutions of learning and completion of these subsequent cycles. The specific indicators chosen in this area are a) percent of graduates of the primary cycle entering the following cycle, and b) the number of graduates in scientific/technical fields.

14. *Economic Outcomes*

The category "economic outcomes" refers to financial success in post-schooling employments and can include indicators like measures of the length of job search, stability of employment, and income of primary school completers or leavers. The specific indicators chosen are a) average earnings of graduates of cycle, and b) labor force status of graduates of cycle.

15. *Social and Political Outcomes*

This domain covers other dimensions of social and political behavior that may be influenced by primary school attendance, including social mobility, political participation, number of children and their schooling, etc. The indicators chosen for this exercise are a) the general area of political participation of graduates of cycle (particular indicator yet to be designated), and b) an index (yet to be specified) of social mobility of graduates of cycle.

16. *(Feedback to Context)*

This category simply indicates that the outcomes of primary schooling have in turn an impact on the characteristics of the socio-economic context in which the school system operates.