
School Effectiveness Research and the Development of Process Indicators of School Functioning

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ABSTRACT

Educational systems can quite easily be described in terms of a context-input-process-output model. Likewise systems of educational indicators – i.e. statistics on key aspects of educational systems that are of evaluative relevance – can be categorized as context, input, process and output-indicators. Process-indicators are the subject of this paper. The rationale for selecting the process-indicators chosen here was to look for those school- and teaching characteristics that are positively associated with educational achievement. The research literature on school and teaching effectiveness is the most relevant for this. An attempt has been made to formulate a comprehensive model of school and teaching effectiveness and to use this as the basis for a list of the most promising process-indicators. Some of the key process-variables that are proposed include stimulating environmental factors, achievement oriented policies, educational leadership, amount of instruction, learning opportunities, structured teaching, collaborative planning and evaluative potential of schools. The problems of constructing and using process-indicators based on these variables are discussed from the perspectives of macro-, meso- and micro-level applications of educational indicator systems.

INTRODUCTION

Educational indicators are statistics that allow for value judgements to be made about key aspects of the functioning of educational systems. To emphasize their evaluative nature, the term “performance indicator” is frequently used.

Included in this definition of educational indicators are:

- the notion that we are dealing with measurable characteristics of educational systems;
- the aspiration to measure “key aspects”, be it only to provide an “at a glance profile of current conditions” (Nuttall, 1989) rather than in-depth description;
- the requirement that indicators show something of the quality of schooling, which implies that indicators are statistics that have a reference point (or standard) against which value-judgements can be made.

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Usually policymaking at national level is seen as the major source of application of indicators (indicator systems as policy-information systems). This view on the application of indicators should be enlarged, however, since consumers and "third parties" like private industry are also seen as users of the information that indicator systems provide. Likewise, the education system at local administrative level and even individual schools could also use indicators to support policymaking (indicator systems as management information systems).

During the last decade various types of collections of indicators, usually referred to as indicator-systems, have been proposed and a sub-set of these have been actually used. Van Herpen (1989) gives a comprehensive overview of what he calls "conceptual models of educational indicators". For our purpose it is sufficient to discern some major developments in these various approaches to conceptualizing education indicator systems.

Economic and social indicators are the origin of educational indicators. "Social indicators of education" describe educational aspects of the population, whereas educational indicators describe the performance of the educational system (Van Herpen, 1989, p. 10). The first trend in the development of educational indicators was the transition from descriptive statistics to measuring performance or, more generally, a shift towards statistics of evaluative importance.

When we look at developments in educational indicators at the National Center for Statistics of the US Department of Education we can discern a second trend. At first this offered descriptive statistics on the state of the educational system, including data on inputs and resources. Since 1982, "outcome" and "context" data were given a more prominent place, and in a recent proposal to redesign the education data system, "process" aspects of the functioning of educational systems were also included (Stern, 1986; Taeuber, 1987). This second trend can thus be characterized as a movement towards more comprehensive indicator *systems*, first adding output measures and context measures to the more traditional measurement of inputs and resources, and secondly by a growing interest in "manipulative input factors" and process-characteristics.

The third trend is somewhat related to the second one, as far as the interest in process characteristics is concerned. Traditionally indicator systems have concentrated on macro-level data, such as national illiteracy rates, the proportion of pupils that have passed their final secondary examinations, etc. When we think of process-indicators as referring to the procedures or techniques that determine the transition of inputs into outputs, interest in process-indicators naturally leads to an interest in what goes on in schools. So, the third trend in conceptualizing indicator systems is to measure data at more than one aggregation level (national system, school, perhaps even the classroom; for example see Taeuber, 1987; Scheerens et al., 1988).

What emerges from this brief overview of developments in the field of educational indicators is the notion that a context-input-process-output model is the best analytic scheme to systemize thinking on indicator systems. Such a model is depicted in Figure 1.

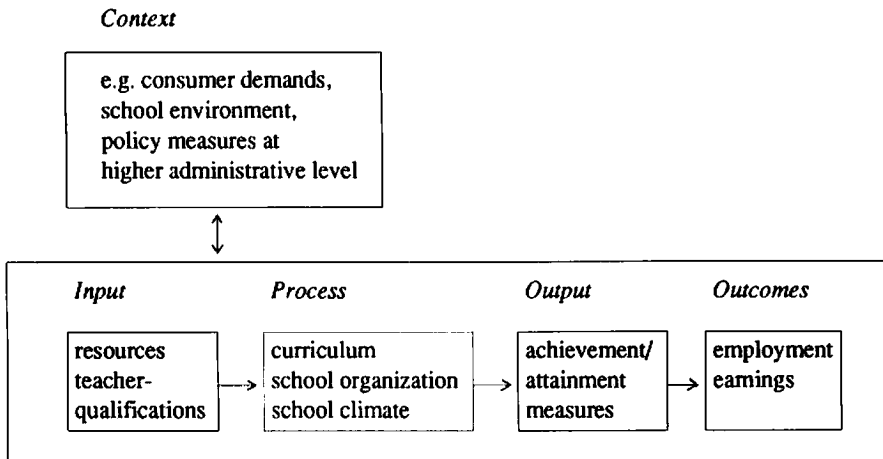


Figure 1: Context-input-process-output-outcome model of schooling

Process indicators and their specific place within educational indicator systems will be discussed in the next section. In the following sections the literature on school effectiveness will be used as a basis for the selection of specific process indicators.

BASIC QUESTIONS ON PROCESS INDICATORS

The question arises whether process measures of school functioning do indeed conform to the definition of educational indicators that has already been given. It is doubtful whether process measures as such can be used as a basis for judging the performance of an educational system.

Would one, for instance, be willing to accept the degree to which a school (or a school district) used a specific curriculum as a valid criterion for judging educational performance? Process measures relate to outcome measures as a means to an end and thus, it could be argued, using these as performance indicators would be "goal displacement" in a new form. To put it bluntly, process indicators could lead to evaluative conclusions of the "operation successful, patient deceased" kind. The only way out of this would be the existence of empirically supported causal models of educational performance, from which the importance of specific process measures could be deduced. Unfortunately, as we shall further demonstrate, no such established causal models exist. Generally, the variance in output measures that is accounted for by input and process measures is rather low. So, the only legitimate way to employ process indicators seems to always link them to output indicators. Process indicators then have the function of offering hypothetical explanations on *why* certain schools, or school systems, do better than others. The notion that process indicators derive their value from their relationship with output indicators forms the basis of this paper; namely to select process indicators by examining the findings of school effectiveness research.

Process indicators generally refer to characteristics of educational systems that can be manipulated. Adding process measures therefore enhances the policy relevance of indicator systems. The question of measurement is also another point.

Generally, indicators are thought of as quantitative "low inference" measures. Process characteristics like school climate, educational leadership and opportunity to learn are rather broad characteristics; their operationalization and quantification is neither straightforward nor "low inference". Besides, elaborate procedures sometimes have to be used to collect data on these. Remaining strictly within the domain of indicators this problem can only be solved by using "proxy" measures of process characteristics, for instance by counting the instances when formal testing takes place during a school career as a proxy for the frequency of instructional evaluation, and by omitting all process variables that are not amenable to these kind of approximations. Another way of tackling this problem is to use in-depth studies (surveys or observational studies) that are connected to regular indicator systems.

SCHOOL EFFECTIVENESS RESEARCH AND THE IDENTIFICATION OF PROCESS INDICATORS

As has already been stated the most likely rationale for selecting process indicators is to choose those variables that are manipulative predictors of school output. Research literature on school effectiveness can be used as a source to identify promising process variables. Generally speaking, school effectiveness research is aimed at discovering school characteristics that are positively associated with school output, usually measured as students' achievement. Various research traditions can be subsumed under this heading, including (in)equality of education (sociological), educational production functions (economic), school improvement and effective schools, and teacher- and instructional effectiveness (psychological). Apart from these, more theoretical and analytic contributions from organizational science and from the micro-economic theory of public-sector organizations can also be sources of inspiration in selecting process indicators (see Cameron & Whetten, 1983 and Niskanen, 1971, respectively).

In this section the main findings of each of the four types of school effectiveness research will be briefly summarized and used to generate proposals for process indicators.

Research on (in)equality in education and school effects

The Coleman report (Coleman et al., 1966) on the Equal Educational Opportunity Survey should be seen as the impressive starting point for school effectiveness research. Although the major thrust of the Coleman survey was to investigate (in)equality in education, it also became quite famous for its supposed negative conclusions on the influence of school on educational achievement. Coleman et al. found that schools accounted for approximately 10% of the variance in pupil achievement, after statistical adjustments had been made for the influence of background characteristics of pupils. The significance of this finding for judging the importance

of process indicators on school functioning is that all the feasible process indicators one could think of would not account for more than ten per cent of the variance in pupil achievement.

Other large-scale studies replicated Coleman's findings in their pessimistic conclusions on the importance of schooling as such and its possibilities for lowering educational inequality (Jencks et al., 1972, 1979; Hauser, Sewell & Alwin, 1976; Thorndike, 1973). Specific school characteristics that were measured in these studies were mainly resources and material inputs (such as the age of the school building, per pupil expenditure and the number of books in the library) although some measures of teacher attitudes and classroom management were used. The significance of this first generation of school effectiveness research for the issue of educational indicators can be summarized in three points:

- a. School process variables account for relatively little variance in educational achievement. The educational significance of this will be given further consideration in a subsequent section.
- b. Resources and "material" inputs are not very promising in explaining school output, though this would not necessarily imply that they should not be included in indicator systems, because in heterogeneous school systems in, for instance, developing countries they might still be of great importance.
- c. Pupil background characteristics such as socio-economic status or race should be used to adjust raw output measures to arrive at fair and valid performance indicators and to allow for an unbiased interpretation of the influence of process characteristics on the functioning of schools.

Research on educational production functions

The economic approach to school effectiveness is concerned with the question 'which inputs lead to more output, also considering the cost of the inputs'. Stated in more abstract terms knowledge about stable relationships between input and output variance is sought in order to specify a function that could express the effects more inputs would have on output. This school of effectiveness research is both known as 'input output analysis' and as 'research on educational production functions'. In fact this type of research is very similar to other types of educational effectiveness research in that the relationships between school characteristics and achievement is investigated, while adjusting for background characteristics of pupils (such as level of intelligence and socio-economic status). The characteristic that sets this research tradition apart is the choice of a particular category of inputs that are readily expressed in monetary terms, such as teacher salary, teacher experience, teacher-pupil ratio, teacher qualifications, per pupil expenditure.

The results of this type of effectiveness research are rather disappointing. Research reviews like those of Mosteller & Moynihan (1972), Averch (1974), Glasman & Biniaminov (1981) and Hanushek (1979, 1986) agree upon the inconsistency of research findings and the rather small effects of the input variables concerned. A research synthesis by Hanushek (1986, p. 1161), shows that only the variable "teacher experience" shows some consistency, in that 30% of estimated coefficients appeared

to be statistically significant. Hanushek's overall conclusion is that as yet educational expenditure is not consistently related to achievement. He suggests that it would take greater variation in inputs to expect important effects. So, for instance, in most countries where teacher salaries are strictly regulated and rather uniform, if a system of "merit pay" were to be introduced the variance in teacher salaries would be expected to increase and significant effects in pupil achievement might be revealed. The larger significance of input characteristics in effectiveness studies conducted in Third World countries supports this point (see e.g. Windham, 1988).

Although this research tradition does not focus on "process" measures - in this respect the production functions are rather primitive in that the whole area of educational technology remains a black box - some of the input variables could be considered for inclusion in indicator systems. Judging from Hanushek's research synthesis, teacher experience would be the most likely candidate. Yet, I think, particularly when one wishes to construct educational indicators for international comparison, it would be wise to include variables like per pupil expenditure and teacher/pupil ratio, since these might show significant variance between countries.

Effective schools research

After the Coleman report a second wave of school effectiveness research came into being. Its pioneer studies can be seen as a reaction against Coleman's negative conclusions. As titles like "Schools can make a difference" (Brookover et al., 1979) and "School matters" (Mortimore et al., 1988) show, refuting the message of the Coleman report has been, and still is, an important motive for this more recent research. The most important characteristic that distinguishes the effective schools research from earlier school effectiveness research is that the black box of what happens within schools is opened and school variables are revealed that include school organization, school culture and educational technology.

Studies within this new type of school effectiveness research vary from case studies of exceptionally effective schools (e.g. Lezotte et al., 1974; Weber, 1971), to evaluations of school improvement projects (e.g. Miller et al., 1985; Achilles & Lintz, 1986; MacCormack-Larkin, 1985) and to studies that combine relatively large sample survey research with in-depth case-studies (Brookover et al., 1979; Mortimore et al., 1988).

School characteristics that were found to be consistently associated with positive achievement were:

- a safe and orderly school climate;
- high expectations of pupils' achievement and an achievement oriented school policy;
- educational leadership (i.e. a school leader who is actively involved in developing and monitoring educational activities, and who is more than merely an administrator);
- frequent evaluation of pupils' progress;
- clear objectives concerning basic skills;
- continuity and consensus among teachers.

It is quite obvious that ideally these effective school characteristics would require intensive data collection and high inference measurement. Some of them, however, can be operationalized in terms of relatively uncomplicated scales or questionnaire items. Some examples are:

educational leadership

- the amount of time headteachers spend on educational matters, as opposed to administrative and other tasks;
- whether headteachers do or do not discuss test results on pupils' progress with teachers;
- the amount of instructional issues on the agenda of staff meetings;

achievement oriented policy

- the amount of overt statements in official school documents that express an achievement oriented emphasis in school policy;

orderly and safe climate

- statistics on absenteeism, lesson drop-out and delinquency as instances of the degree of order in the school;
- ratings of school discipline by teachers and headteachers;

clear objectives

- whether or not explicit school curricula, stating educational objectives and levels of achievement, are available;

high expectations

- estimates by teachers and/or headteacher of the percentage of students that will complete their secondary schooling;
- student estimates of their further educational career;

monitoring/evaluation of pupils' progress

- the frequency of the use of curriculum specific tests at each grade level;
- the frequency of the use of standardized achievement tests;
- whether or not the school uses a (computerized) system to monitor pupils' progress at all grade levels;

continuity and consensus among teachers

- the amount of changes in staff over a certain period;
- the presence or absence of school-subject related working groups of teachers (secondary education);
- the degree of opportunity for communication and cooperation among staff.

Some characteristics associated with school effectiveness could be assessed by unobtrusive observations by researchers or inspectors. For instance the presence or absence of graffiti in and around the school and the noise level in school corridors.

Research on instructional effectiveness

It would be far beyond the scope of this article to attempt to give a comprehensive overview of the research literature on teacher effectiveness, effective classrooms, instructional effectiveness and the like. The distinguishing characteristic of this stream of educational research - compared to the various types of school effectiveness studies described earlier - is the fact that process characteristics of education are studied at the teacher or classroom level. So, when we are considering variables at this level that have been found to be associated with achievement, we are really delving into the primary processes of schooling. We shall come back to the question which place these kind of micro-level variables could have when considering indicator systems.

Where a detailed overview of the relevant research literature is out of the question, the next best solution in the search for the most promising process variables is to use already existing research reviews. Fortunately, many excellent reviews are available (e.g. Kyle, 1985; Brophy & Good, 1986). Moreover, a growing amount of quantitative syntheses of research on educational productivity has become available (Walberg, 1984; Fraser et al., 1987; Kulik & Kulik, 1982).

This review literature reveals a set of categories of variables that have repeatedly been shown to be positively associated with achievement (for a more detailed account of the selection of these variables see Scheerens, 1989). These are:

Effective learning time or "time on task". Specific aspects of learning time are: the duration of the school day, school week and school year, whether or not pupils get homework assignments, the amount of the official duration of lessons that is actually spent on task-related work, absenteeism, drop-out of lessons and reallocation of the total time that is available for instruction over school subjects. Issues of school discipline are also relevant here since disturbances reduce the amount of time that is effectively available for instruction.

Although interpreting the results of increased effective learning is straightforward, two points should be noted. Firstly, it is obvious that extending the official school hours must at some point become counter-productive. Secondly, moderate increases in learning time have yielded only moderate effects on achievement (cf. Levin, 1988; Walberg, 1984).

Structured or "direct" teaching. The general idea of structured or "direct" teaching is the application of frequent interventions to support the learning process. Examples of these include: stating educational objectives clearly, dividing the total subject matter that must be learned into relatively small units, providing a well-planned sequence of these units, providing many opportunities for pupils to do exercises, giving cues and hints, frequent questioning and testing to monitor progress, and giving feedback.

Mastery learning is a didactic approach in which most of these principles are represented. Although direct teaching has been demonstrated to be particularly effective in primary education and for the teaching of basic skills, it has also been shown

to work in secondary education and in the teaching of higher order cognitive skills - though in a somewhat modified form - larger steps in subject matter presentation, more initiative for pupils - cf. Doyle (1985); Collins & Stevens (1982). Adaptive instruction, i.e. adapting instruction to pupil characteristics, in matters like tempo and way of presentation, can be seen as a more individualized use of structured teaching.

Opportunity to learn or "content covered". The essence of "opportunity to learn" is the correspondence between the subject matter that has been taught and the content of the tests that are used to measure achievement. As is to be expected, pupils do better when the subject matter is covered by test-items.

Teacher attitudes and expectations. As was shown in the older literature on teacher research, the enthusiastic attitude of teachers is important. From more recent studies where effective teaching is compared to less effective teaching in inner-city schools, it seems important that teachers remain optimistic about the capabilities of their students; nothing seems worse than a defeatist attitude. This attitudinal factor of teacher functioning directly corresponds to the 'high expectations variable' known from school effectiveness literature.

Enhancing student motivation. According to Walberg's (1984) research synthesis, the variable most strongly related to achievement is reinforcement. This variable is closely related to structured teaching, where frequent monitoring of progress and feedback are important. It appears that praise, or positive feedback, works far better than punishment (see Brophy & Good (1986) for a more detailed analysis).

The alterable curriculum of the home. This category of variables - as it was named by Walberg (1984) - covers the ways in which the home situation of students can affect school performance. Positive instances of this category include parental interest in what children do at school, reading to children at home and moderate television viewing.

INTEGRATING THE RESULTS OF SCHOOL EFFECTIVENESS RESEARCH AS A BASIS FOR THE SELECTION OF PROCESS-INDICATORS

As was apparent from the research review in the previous section, the various schools of educational effectiveness research each concentrate on different aspects and different organizational levels (school and classroom level). When an attempt is made to integrate the results of these different types of effectiveness research a few "ordering principles" are required.

First of all, the analytic systems model, recognizing context, input, process and output variables (see Fig. 1) serves quite well as a general frame of reference to determine the position of process-indicators.

Secondly, a multilevel framework is needed, to do justice to the fact that process-indicators can be defined at the level of the school environment, the institutional

level (i.e. the school level) and at the classroom level. And, furthermore, the pupil level must also be taken into account, since educational outputs - to which process-indicators should be "anchored" - should preferably be measured at the lowest level of aggregation.

In the third place, we need some theoretical perspectives to view the interrelationships between variables at different levels. As such we could use the basic principles of contingency theory, developed in the field of organizational theory and that of micro-economic theory on the functioning of public sector organizations.

Briefly stated these say that:

- it depends upon contextual characteristics, like environmental and technological constraints, whether or not organizational structures or managerial processes will be effective. A specific class of these environmental characteristics are external incentives of organizational efficiency;
- meso (school-organizational) conditions are to be seen as facilitating conditions of micro (classroom level) conditions.

These two points will be elaborated in the following sub-sections (further details are given in Scheerens (1989a and b) and Scheerens & Creemers (1989)).

Contingency perspective

The general view of contingency theory is that it depends upon contextual characteristics whether or not specific organizational structures or managerial processes will be effective (e.g. Mintzberg, 1979). At first glance contingency theory seems at odds with school effectiveness research, which is concerned with a set of school characteristics that are very robust in predicting effectiveness. On closer analysis of the research and literature on school effectiveness it becomes clear that claims regarding the generalization of effective predictors across contexts have only partly survived empirical tests (Firestone & Herriott, 1982; Teddlie et al., 1987; Scheerens, Nannin-ga & Pelgrum, 1989). In fact, including contextual variables like student-body composition, school type, or national educational context can be seen as a relatively new and very interesting development in school effectiveness research. Some studies even try to establish interactions between various contextual conditions and performance (i.e. Friedkin & Necochea, 1988, who investigated the interactional effect of school size and SES student-body composition on performance).

Two applications of contingency thinking seem to be particularly relevant to the subject of school effectiveness. First, in organizational theory the notion of effectiveness as it is used in research literature on school effectiveness (i.e. productivity) is sometimes seen as just one particular type of effectiveness. Alternative effectiveness criteria are resource acquisition, stability and control in the functioning of the organization, and cohesion and morale among the organization's members (Cameron & Whetten, 1983; Faerman & Quinn, 1985). Depending on contingency factors such as the degree of environmental uncertainty the organization is faced with, or the stage of its development, the emphasis on each of these types of effectiveness criteria might shift. For instance, when a school is faced with important drops in enrolment, it is

quite understandable that relatively more energy will be put into acquiring more pupils. And when a school, for whatever reason, has to merge with another one, a lot of attention will have to be given to reaching stability and control in the new organization.

As school effectiveness research shows, schools differ in the degree to which achievement is emphasized in school policy and teacher expectations. Moreover, achievement orientation is generally found to be positively related to actual achievement. The organizational conceptualization that recognizes effectiveness criteria other than productivity and explains their relative influence in a particular setting by referring to contextual conditions helps answer the question why some schools are more achievement oriented than others.

The second instance of contingency thinking relevant to school effectiveness is recognizing the importance of external *incentives* on achievement oriented school policy.

The political will of a school to achieve is perhaps the most essential condition for actual school effectiveness. When higher administrative bodies, consumers, or other stake-holders also emphasize achievement or even reward schools for high achievement and "punish" others for low, this political will can even be seen as a malleable factor. In this respect a range of measures including output finance of schools, "privatizing" schools, deregulation, voucher systems and publishing schools' performance in local newspapers is relevant. Micro-economic theories on the efficiency of public sector organizations (i.e. Niskanen, 1971, Breton & Wintrobe, 1982) explain how these mechanisms operate. For our purpose we can put all these external mechanisms to stimulate schools to be effective under the heading *achievement incentives in the local and the larger school environment*. At the local level we could look at the presence or absence of achievement standards for schools, clear objectives, evaluation systems and public records on school achievement. When comparing national educational systems one could measure the presence or absence of assessment projects, the degree to which the inspectorate employs output evaluation, the development of consumerism on education, whether or not output finance is used, etc.

Meso-micro relationships

In the review of different types of educational effectiveness research, research which focused on process characteristics at the school level and instructional effectiveness research at the teacher or classroom level were discussed. Both research schools have yielded a list of the most promising process characteristics, i.e. school and instructional characteristics respectively. The relationship between these two categories is an important aspect of the envisaged integrated model of school effectiveness. The most straightforward way of seeing this meso (school level) – micro (classroom level) relationship is to assume that meso-level conditions facilitate micro-level conditions. This implies that instructional processes are seen as the most direct determinants of school learning and achievement, and that organizational and curricular conditions at school level are thought of as more indirect conditions of educational achievement. When we examine the actual research outcomes on meso and micro conditions of

educational achievement more closely, it is evident that some important variables are meaningful at both the school and teacher/classroom level:

- structured teaching at classroom level can be stimulated by means of explicit curricular policy at school level (e.g. by using school development plans);
- 'high expectations of student performance' is essentially a variable defined at the teacher level, though its aggregate, an achievement oriented school policy, may be taken as a whole that is more than the sum of its parts;
- order in classrooms will be enhanced by an orderly atmosphere in other parts of the school building;
- frequent monitoring of pupils' progress will usually take place at classroom level, though this evaluation may be a result of a school evaluation policy and will benefit from instruments at this level, such as computerized school evaluation or a management information system;
- opportunity to learn can be defined at the classroom level, but can also be seen as being enhanced by a school curriculum that is closely linked to the educational objectives that determine the contents of achievement tests.

Apart from these factors that can be defined at both school and classroom level, we can discern a second class of conditions at school level that facilitate effective instruction at classroom level. Their successful operation is dependent on the organization's superstructure (e.g. management, coordination structures) protecting the core production process against disturbances and external uncertainties (Thompson, 1967). Instructional leadership, the degree of collaborative planning and collegial relationships plus an active policy in recruiting students and acquiring resources are examples of the latter type of conditions that have received some support in research literature on school effectiveness.

Synthesis

The ingredients for an integrated model of school effectiveness are in place. To summarize we have:

- an analytic systems model recognizing context, input, process and output variables;
- a multi-level framework discerning pupil-, classroom-, school and environmental characteristics;
- perspectives to view the interrelationships between variables defined at different levels, most notably contingency theory and organizational conditions that facilitate the schools' primary processes;
- substantive findings from different types of educational effectiveness research.

Figure 2 gives a schematic summary of the model.

One observation that should be made when considering the variables in Figure 3, is that these variables differ in the degree to which they have been supported by empirical research. Generally speaking there is a stronger empirical basis for the importance of instructional characteristics at classroom level than for the contextual and school level characteristics.

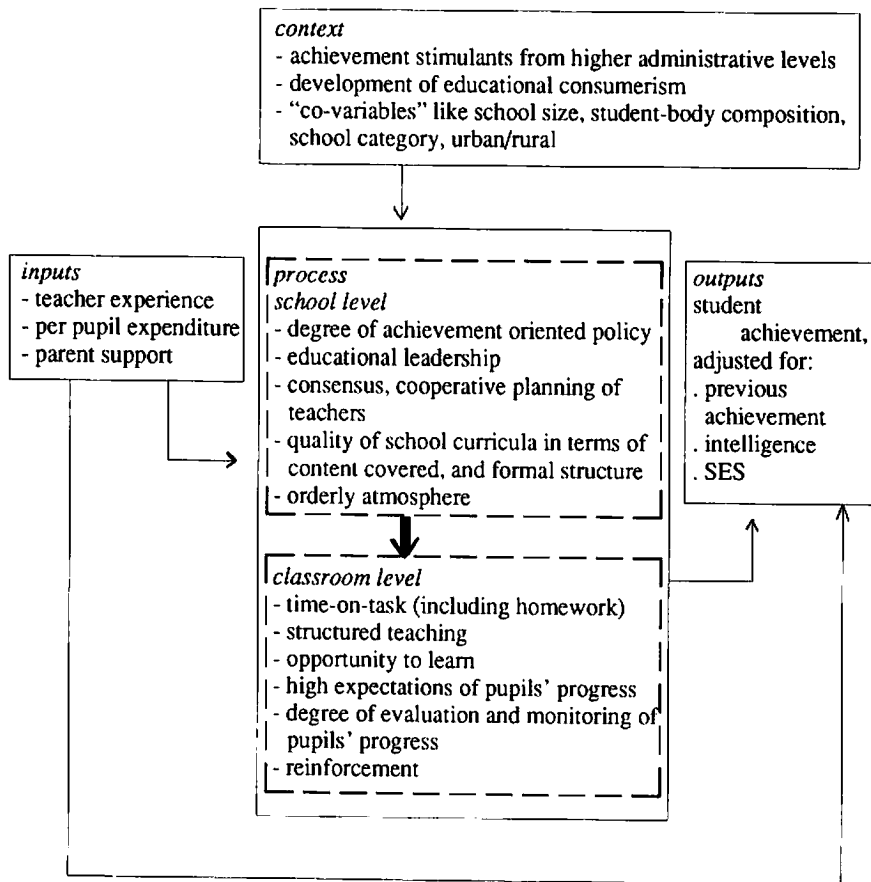


Figure 2: Integrated model of school effectiveness

The theoretical notions about the interrelationships of the various categories of variables provide the extra dimension that the model depicted in Figure 2 offers over a mere listing of the most promising variables. Although the empirical testing of this integrated model and its theoretical assumptions is clearly beyond the scope of indicator development, its present tentative formulation might nevertheless be helpful in selecting those process variables that are most relevant in exploring the causes of achievement differences between schools.

COMPARISON OF AVAILABLE PROCESS-INDICATOR SYSTEMS

Process indicators are a somewhat difficult category among other, more established, types of indicators. The main difficulty is that process indicators usually require rather complicated procedures of data collection and measurement and thus do not fit the requirement of readily available data for computing indicators. Yet, there is an

Table 1: Comparison of sets of process indicators

<i>Scheerens, 1989</i>	<i>Unesco, 1976</i>	<i>Windham, 1988</i>
achievement stimulants achievement oriented policy educational leadership teachers' cooperative planning quality of curriculum evaluative potential orderly climate time on task structured teaching opportunity to learn high expectations monitoring progress reinforcement	allocation of resources retention & progression rates teacher/hours per pupil per year cost and management <i>Taeuber, 1987</i> instructional leadership curriculum type of instruction (whole class, small group, etc.) time on task school climate influence of peer group	instructional organization alternative technologies use of teacher and student time <i>Oakes, 1987</i> access to knowledge (e.g. instructional time) press for achievement (e.g. graduation requirements) professional conditions for teaching (e.g. time spent on collaborative planning)
<i>Benveniste, 1987</i> teacher time (teaching/non-teaching) student learning time: - course enrolment - turnover rates - pupil/teacher ratios - school day activities - length of schoolyear - out of school learning time order and consistency: - truancy, absenteeism, vandalism, disruptions - student turnover - student cooperative behaviour		<i>Selden, 1990</i> time allocated to instruction content of instruction indices of effective schooling quality of teacher preparation characteristics of teacher workforce quality of teaching participation

important motive to try and include process information in indicator systems. Like data on resources and inputs, process data provide background material that is helpful in making sense out of mere performance data on the functioning of educational systems.

The literature on school and instructional effectiveness has been used to suggest likely candidates for process indicators. In Table 1 the list of variables that is proposed here as a basis for the development of process indicators is compared to other lists of process indicators that have been proposed.

As appears from Table 1, there is considerable agreement between the proposal that is made here and those by Oakes, Benveniste, Taeuber and Selden. The proposals by Unesco and Windham are stated in more general terms. The one factor that is included in all of the proposals summarized in Table 1 is instructional time. The ca-

tegies of variables that distinguish the proposal that is made here from the others are: achievement stimulants from the school environment, structured teaching and the evaluative potential of the school.

CONCLUSION: MULTIPLE CONTEXT, MULTIPLE LEVEL AND MULTIPLE MEASUREMENT APPLICATIONS OF PROCESS INDICATORS

As stated in the introductory section, indicator systems can be used in several administrative contexts: by national educational policymakers; by officers at local level, by managers at school level and even by teachers at the classroom level.

A second distinction that has been used in this article is the aggregation level at which basic variables, from which indicators can be computed, are measured. In the integrated model of school effectiveness measures at student, teacher/class, school and school-context level were discerned. Although the same levels are used as reference points for both distinctions there is no compelling one-to-one correspondence between the two, since the highest administrative level may wish to use measures at any level of aggregation.

A third dimension that can be used for classifying indicators refers to the nature of measurements. Measures can be of high or low inference (e.g. the number of books in a school library vs. educational leadership), more or less readily available from existing data sources and of a standardized quantitative or a relatively unstructured nature (e.g. participant observation or "open" interviews). The seriousness of measurement constraints with educational indicators depends on whether indicator systems are exclusively thought of as "closed" information systems of longitudinal data or as "looser" structures that also allow for the inclusion of specific evaluative studies (such as the international comparisons of educational achievement conducted by the IEA or in-depth studies that could be conducted by audit commissions or the inspectorate).

When we are looking at educational indicator systems from the perspective of multiple administrative levels, multiple levels of aggregation of basic data and multiple types of measurement, we are clearly using a broad interpretation of the term "educational indicator". The common core of all these applications still conforms to the definition that was stated in the introduction: measurement of key aspects of educational systems that are of evaluative relevance.

According to the three distinctions that were discussed, we could use a three-dimensional framework to classify types of indicator applications (see Figure 3).

In order to determine the role of process indicators within this framework of applications some of the most likely combinations of scale points on the three dimensions of Figure 3 will be examined.

Determining the condition of education at the national level

First, we consider decision-making at the national level supported by summary statistics at high levels of aggregation using low inference measures and existing data bases. This is the more traditional type of application of educational indicators.

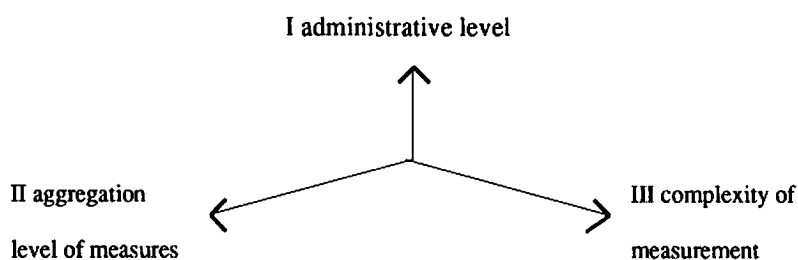


Figure 3: A three-dimensional framework to classify types of indicator applications.

Descriptive statistics on, for instance, enrolments and financial data are likely to be included in this type of application of indicators, as are statistics on educational productivity in terms of, for instance, proportion of age cohorts that pass final examinations. Could one conceive of a place for process indicators in this kind of macro-level indicator system? The aim of including process indicators would be to gain insight into possible causes for high or low educational productivity in a particular period. The difficulty with process variables (see the list that is contained in Figure 2) is, of course, that most of them are neither easily measurable nor readily available from existing data sources. Some proxy variables that might be considered as a basis for macro-level process indicators are:

- number of schooldays per year for a particular school type in a particular year;
- depending on formal regulations which require schools to register lesson “drop-out”, the percentage of lessons that - for one reason or another - were not given for a particular school type, during a specific period.

These two variables could be used for calculating an indicator of ‘net-time for tuition’. The policy relevance of such an indicator would depend on the variability of this indicator over time. It could also play a role in international comparisons of the functioning of national educational systems.

One could also think of constructing a macro-level indicator for the evaluative potential of educational systems. In this respect it would be relevant whether or not a country has a national assessment project and whether or not the results of assessment are fed back to individual schools. At the national level this indicator could be of relevance because of possible changes over time.

A further possibility for a proxy macro-process indicator could be in the area of educational leadership, for instance, by using a measure of the total effort (time, money, enrolments) of management training courses directed at stimulating this. It should be noted, however, that such an indicator would require rather detailed content-analysis of existing management training courses and therefore would probably not fit the requirement of easy measurement.

The conclusion is that process indicators only have a limited place within pure macro level indicator systems. If, however, one could consider patching up these indicator systems by means of periodic surveys of process variables that could be lin-

ked to regular data streams, there is a tremendous increase in possibilities. In-depth studies could take the form of comparative international surveys, specific research projects at the national level, or audits by expert committees or the inspectorate. In these studies all process variables mentioned in Figure 2 could be included, be it by means of scales and questionnaire items or by means of more open check-lists for observation or content-analysis.

School monitoring at the district level

District level monitoring of schools could benefit from systematic data collection as a basis for a limited set of indicators. For such management information systems, as for the previously discussed application of indicators, low inference measures would be preferable. The most likely level of aggregation of the data would be school level, though teacher and student level data might also be used. Financial and output data (both in terms of overall productivity and student achievement) are the most important data categories for such monitoring systems. Examples of process variables that could be included are:

- whether or not schools use explicit achievement standards (to be deduced from school curricula, development plans or other official documents);
- whether or not school leaders refer to achievement records in official documents and brochures intended for the school community;
- the amount of non-teaching time that is spent on collaborative planning of curricula and lessons by the staff;
- number of students expelled from school, in a particular school year;
- whether or not headteachers formally evaluate staff on a regular basis;
- the frequency of the use of achievement tests at all grade levels;
- figures on pupil absenteeism and lesson drop-out.

The above variables are assumed to be available from administrative school records or assessed by means of relatively brief encounters with headteachers. The process variables could be enlarged if research-like data collection was added at regular intervals.

School self-evaluation

One might say that the two applications of indicator systems that were discussed in the above are accountability oriented rather than improvement oriented. In my opinion, the distinction between evaluating for accountability vs. evaluating for improvement should not be drawn too sharply, since there is an important common element in both: the element of learning by means of empirical test and feedback of information to relevant actors. However, the third kind of application of educational indicators that will be referred to here is most strongly associated with improvement (cf. Hopkins & Leask, 1989). Although output indicators deserve a central place in self-evaluation procedures as in all other applications of educational indicators, in procedures for self-evaluation or school-based review, process variables are of particular relevance. Since organizational learning is the key motive for using self-evaluation schedules for school improvement, one will need rather detailed information on

those processes that might explain disappointing results and at the same time offer handles for improvement. The list of process variables, based on the results of school effectiveness research, might be used to review existing schemes and check-lists for school-based review (for an overview of these check-lists, see Hopkins, 1987).

One might conceive of integrating these macro-, meso- and micro-level applications of indicators. In fact, the US educational data redesign project (Taeuber, 1987) does exactly this. In this way detailed information is collected at the lowest unit (the classroom), and part of this information is aggregated to be used at the next level up, and so on. Although such an integrated multiple context, multiple level and multiple measurement indicator system may have important advantages, it is a very ambitious endeavour. One could also conceive of looser coupling of macro, meso and micro applications, for instance by exchanging instruments and data between the various contexts of application.

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