Planning the quality of education

The collection and use of data for informed decision-making

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Chapter 2

Different information requirements for different levels of decision-making[1]

Introduction

Educational planners in most countries have generally focussed their work on matters concerned with forecasting numbers of students, teachers, and support staff, and predicting the demand for, and location of, the buildings and equipment required by education systems at any one point in time (Levin, 1988). The majority of this work has usually provided detailed information about various educational inputs, but has provided little or no information about teaching-learning processes or educational outcomes. The lack of information in these latter two areas has made it very difficult for educational planners to provide the kind of information that would be suitable for making informed decisions about planning the quality of education. This difficulty has often been exacerbated by a lack of understanding within educational planning agencies that the collection and management of useful information about the quality of education requires an acknowledgement that planning decisions need to be made at various organizational levels of an education system (Tyler 1986).

This chapter explores the types of information that might be employed to guide decisions about the quality of education, and presents some approaches for reporting this information in formats

1. This chapter was prepared by Anthony Somerset and Mats Ekholm.

that are appropriate for the various levels at which these decisions are made. The discussion has been illustrated by considering four broad groups of decision-makers in education: parents and teachers, school principals, state or provincial officials, and national officials.

The main decision-making levels in education systems

The education "enterprise" in most countries is aimed at facilitating an individual's cognitive, affective, psychomotor and social learning. The persons at each of the four decision-making levels described above need to monitor these activities in order to obtain information that will guide decisions (on a daily, weekly, monthly, or yearly basis) that will influence the educational experiences of those in their change. The types of decisions at each decision-making level will generally be quite different and therefore the type and format of information required at each level will also often be quite different.

Teachers and parents

Teachers and parents need to gather and share information concerning the nature of the educational behaviours (knowledge, skills and values) that have been taught, the extent to which these have been learned by the child, and the contexts in which the child has demonstrated these behaviours with either competence or difficulty. The information about the student's performance needs to be expressed in a manner which permits a clear agenda for teacher and parent action to be prepared. This agenda can only address effectively the child's learning strengths and weaknesses in situations where teachers and parents both understand, and agree to, the nature of the child's educational needs.

School principals

School principals seldom require information about the educational behaviours of individual children. When this kind of information is required, the principal can consult with the appropriate teacher. However, principals often need to be informed about the progress of learning for each class in the school. Information expressed at the classroom level is more suitable for assisting with

decisions concerning the deployment of school resources to ensure that all classes achieve the educational goals that have been accepted by the principal, teachers and parents. In addition, the principal needs to have information on how well the school is performing in respect of "core" educational goals that are valued by other similar schools. Principals can use this information to review the school's goals, set priorities among these goals, and focus a whole-school effort on improving the school's learning environment.

State and provincial officials

State and provincial officials do not require information as detailed as that required by school principals because they are far removed from both the daily operations of schools and the daily responsibilities of parents, teachers and principals. The broader role required of these officials, be they administrators, co-ordinators or supervisors, demands that they should make decisions only after having examined information which is sufficient to establish the existence of problems serious enough, or opportunities great enough, to warrant a considerable commitment of their time and state or provincial resources. The main focus of State and Provincial official's attention will usually be concerned with how to employ planning approaches that will provide large groups of schools with the expertise and resources required to set up and evaluate their educational programmes, and then, guided by the results of the evaluations, to adopt procedures that will improve their effectiveness.

National officials

National officials require less detailed information than do state or provincial officals. These officials do not work with individual children or classes, and they are unlikely to concern themselves with the affairs of an individual school or a small group of schools. Rather, their role is to make broad policy decisions concerning the linkages between the legislated directives of past and present governments, and the plans and resources required to attend to these directives. The decisions that they make are expected to have an impact across whole or large parts of education systems and therefore, because of the conservative inertia of educational institutions and the high costs of initiating system-wide change, a

great deal of accurate information about students and schools needs to be collated at the system level. It is particularly important for National officials to be sensitive to long-term trends in their education system's capacity to assist all students to make progress towards achieving a high standard of physical, social and cognitive development. In some circumstances these trends will call for intervention in what is seen as an emerging and widespread inability of students to achieve success in a specific part of the curriculum. In other circumstances, the focus will be on the curriculum itself because it may be seen as being in need of revision and restructuring in order to take account of recent research and/or new social and economic conditions.

Some examples of established information sources

In many countries a great deal of the information required for the various levels of decision-making is already available in the form of large-scale data sets obtained from national and international surveys of educational achievement. Some examples are: the Australian Studies in School Performance Project in Australia (Bourke *et al.*, 1981); the Assessment of Performance Unit (APU) in England (Gipps and Goldstein, 1983); National Assessment of Educational Progress in the United States (NAEP, 1986); the 6th, 9th and 12th Grade Surveys in Indonesia (Jiyono and Suryadi, 1982); the International Association for the Evaluation of Educational Achievement (IEA) surveys in some forty countries (Pelgrum and Warries, 1986).

The data associated with large-scale surveys usually contain useful benchmarks of student performance on at least some of a nation's agreed educational goals. In addition, many of the so-called independent variables used in these surveys provide important descriptive information which may be of use to state and national officials.

It is important to note that care needs to be exercised when employing survey data to ensure that the sample designs have been drawn up and executed in a scientifically valid fashion. Those surveys that neglect to provide a clear description of the target population, the objective procedures used to select the sample, the stratification techniques, the stages and units of multi-stage sampling, the procedures used to minimize the dangers of bias through

non-response, the size of the designed and achieved samples, and the magnitude of the sampling errors, should be treated with great caution.

Another important source of information may be found in data gathered as part of a national examination system. These data can be provided at many levels of aggregation, for example, as average school scores and as average scores for groups of schools serving communities with similar socio-economic characteristics.

If neither survey data nor examination data are available, then school systems may be faced with the design of their own performance monitoring procedures. In some countries, a "complete census" approach has been used in order to test students from *all* schools in a state or province. A recent example of this has been the state-wide testing procedures adopted by the State of California in the United States (Staff, 1987). Other countries, such as Australia, have adopted a "light sampling" approach with an emphasis on collecting a small amount of data at regular intervals in order to establish time-series data for the education system as a whole (Mc Gaw et al., 1989).

Adjusting information formats and information delivery to the specific needs of different decision-making levels

Teachers and parents

At this level, there is a need for information that is clearly integrated with the teaching-learning process. Therefore overall test scores, for example, that cover whole subject areas are not very useful. Rather, student performance on highly focussed sub-dimensions are required. In the Mathematics subject area, the sub-dimensions could be estimation, arithmetic, calculations, measurement, etc. In the Science subject area, the sub-dimensions could be the solar system, differences between plants and animals, properties of metals, etc. In the Mother Tongue subject area, the sub-dimensions could be spelling, understanding simple sentences, basic grammar rules, etc. Generally, for any reasonable level of reliability in judging a student's capacity to have mastered a domain associated with a sub-dimension, it would be necessary to have student performance information on at least eight or ten items (Morgan 1979).

The teacher will be interested in the pattern of performance as shown by the *profiles* of individual student and class performance across the sub-dimensions. For example, consider a situation where a number of students in the class perform quite well on all but one particular sub-dimension. In this case the teacher will be alerted to the need to reflect upon the factors that have prevented effective learning in one specific area. Some of the factors which might have resulted in this unusual pattern might be: (a) that insufficient class time was allocated to learning the material associated with the sub-dimension; (b) that the students were confused by the way in which the teacher explained the material ; (c) that the textbook devoted insufficient space to the material; (d) that no applied examples or homework was given to consolidate the learning of the material; (e) that the material covered for this sub-dimension was unusually complex relative to the other sub-dimensions; and (f) that the material was presented in a fashion that was not relevant to the students's interests and backgrounds.

School principals

The school principal needs several points of comparison in order to know on which sub-dimensions, and at which grade levels, her/his school is doing well or poorly in comparison with other similar schools and in comparison with all schools in the school district. The first point of comparison would be a relative measure of performance -- focussed on the performance level of her/his school with respect to other schools. The second would be an absolute measure of performance -- aimed at providing an indication of the amount of the intended curriculum that has been mastered by the students.

A relative measure of performance could be constructed by comparing school mean scores on the sub-dimensions with other similar schools within the same school district. The term "similar" here refers to other schools serving students from the same kind of socio-economic background, having the same standard of staff and equipment, and teaching the same curriculum. The comparisons between these schools could be carried out using breakdown variables which define important groups of students within schools in terms of gender, ethnicity, year-level, etc. One of the important benefits associated with a relative comparison of schools is that it may be possible to learn from the teaching methods and educational

environments of other schools that serve similar communities but are more productive in terms of student learning outcomes.

An absolute measure of performance could be estimated by using pre-set levels of achievement which indicate several broad bands of performance for the whole school. For example, if 75 per cent or more of the students at a particular grade level master the material associated with a specific sub-dimension then the performance for this class level is said to be "good". If the percentage of students mastering the material is between 50 and 75 per cent then this is defined as "moderate", and below 50 per cent is designated as "poor". Each of these three levels of performance would lead to different actions being required of the principal. For example, a poor performance level may require a major redeployment of school resources in order to improve student learning, whereas a good performance level may require the principal to reward the students and teachers by providing encouragement and, perhaps, more concrete incentives such as prizes, outings, etc.

State and provincial officials

These officials are mainly interested in the efficient deployment of state-wide and province-wide resources so that all schools, for which they are responsible, have an opportunity to optimize the quality of their educational environments. In some instances, these resources may consist of staff and equipment, whereas in other instances less tangible resources may consist of information and innovative ideas that improve educational outcomes without requiring substantial financial inputs. An example of a successful deployment of the latter type of resource would be found in situation where teacher-constructed curriculum materials that have been shown to improve learning are shared with other schools as part of a pool of proven teaching aids.

The main task of these officials is to look for patterns of results for broad subject areas, rather than specific sub-dimensions, in order to locate opportunities for the state or province to target resources in a more effective and efficient manner. This process may uncover clusters of schools that have, for example, poor performance in Mother Tongue Language but good performance in Mathematics and Science. The existence of such a cluster should prompt a detailed investigation of the reasons for this discrepany in performance.

Perhaps, the existence of the cluster be explained in terms of differences in teacher qualifications, curricular differences, or quality of textbooks, etc.?

Where these important patterns exist in school scores it may be necessary for officials to seek supplementary information from "local" sources concerning the special circumstances of the schools in the cluster. An interesting example of this occured during the 1970s in Indonesia where it was found that the Engligh language scores of students in several schools in Bali were far above the scores that could be expected of the most able students in the country. These results were explained following the discovery that the schools were located close to golf courses frequented by English-speaking tourists, and that after school hours, and at weekends, many of the students spent a great deal of time practising their English conversation skills while working at the golf course.

National officials

The National official's task is to address issues concerning the key indicators to be used in order to judge the performance of the education system as a whole. In the past many countries have employed "coarse" performance indicators concerned with enrolment rates and graduation rates. However, more recently, there has been greater interest in highly specific indicators concerned with such matters as attendance rates, retentivity rates, student achievement levels, and discipline problems. Murnane (1987) notes the emergence of this trend in the United States where, although enrolment data had been collected at the national level from 1867, there were no data collected at the national level to assess what students had learned in school until 100 years later.

The "*circumstances*" of schools always need to be taken into consideration by national officials before making decisions concerning their performance as educational institutions. That is, the output of schools, as measured by the amount of learning experienced by students, should be considered in association with the nature of the student intake and the prevailing social and physical environment within which schools operate. If schools are judged solely by the average achievement scores of their students, then many schools that are doing an extremely effective job, given their circumstances, may be misjudged as being ineffective, and vice versa.

For example consider a school that has overcrowed and inadequate buildings, has very few textbooks, has limited access to cultural experiences for its students because of isolation, and has many students from very poor and illiterate families. It would be extremely unfair to judge this school as performing poorly if it was found that the average literacy scores of its students was slightly below the national average. In fact, after taking account of the school's circumstances, it would probably be considered that the school had performed admirably.

The circumstances of schools may be described in terms of two broad classifications of variables that are sometimes labelled as "malleable" and "non-malleable". The non-malleable variables are those that influence the outcomes of schooling, but are not, in the short term, readily amenable to manipulation by persons responsible for the management of the education system. Some examples of these kinds of variables would be the socio-economic circumstances of students' home backgrounds, the geographical environment of the schools, and the distance of school communities from various cultural facilities. The malleable variables are those that influence the outcomes of schooling and, in the short term, may be manipulated by decision-makers. Some examples of these would be textbook provision, teacher in-service training programmes, homework requirements, school staffing, school curricula, etc.

The national official, being less able to influence the non-malleable variables, would most likely be interested in the following two questions: What are the differences between schools in terms of their output, after takining into account school circumstances as measured by the non-malleable variables? Which of the malleable variables are most influential in assisting schools to become effective? One approach to providing answers to these two questions would be to employ regression analysis to create a measure of school output which has been statistically adjusted for the circumstances of the school, as measured by the non-malleable variables. It should be noted here that the calculation of adjusted scores requires a great deal of care with respect to using data aggregated to the school level. (Keeves and Sellin, 1988.)

This adjusted output measure would be equal to the school residual score calculated by subtracting the "expected" achievement score, obtained from the regression analysis, from the "actual" mean achievement score. a large positive residual score would indicate that

a school was performing effectively because it was doing "better than expected" after taking account of the non-maleable variables. Similarly, a large negative residual score would mean that a school was performing ineffectively because it was doing "worse than expected" after taking account of the non-malleable variables. Following these analyses, a sample of very effective schools could then be compared with a sample of very ineffective schools in terms of of their differences with respect to the malleable variables.

In most educational settings the differences between the two groups of schools will probably be associated with a network of interrelated malleable variables. These would need to be grouped according to the different actions that are needed to be taken at the national level. Each action would then need to be costed in financial and administrative terms. When all actions are grouped and costed, they may be presented for further consideration by decision-makers in order to ensure that actions selected for implementation are manageable within a country's economic, cultural and political situation. For example, some actions which involve large expenditures may need to be deferred until better economic conditions prevail, while other actions, which focus on complex ethnic and cultural issues, may require lengthy preliminary negotiations with community leaders before implemenation commences.

Some examples of the use of information to guide decisions concerning the quality of education

Example 1: The improvement of the curriculum through the use of needs assessment surveys

Much important work, usually unpublished, takes place in many national curriculum development centers and units in the world. In order to arrive at the content of a subject area for any one stage of schooling, planners in curriculum centers can conduct "needs assessment surveys". In general terms, there are three main types of needs that are examined by these surveys: the employers' needs of those leaving school and entering the labour market; the needs of the individual to become a good citizen and to be able to develop personal skills; and the needs of the next level of education should the child decide to proceed to that next level.

A needs assessment survey requires the collection of information about the levels of student knowledge, skills and values associated with each of the three sets of needs. The employers needs may be established by conducting a survey using a probability sample of employers in the various domains of work (e.g. agriculture, industry, commerce, the military, etc.), and asking them the extent to which they want to have their employees acquire each of the major educational objectives in the curriculum. At the same time, employers can inform the researchers of other knowledge, skills, and values which they would like the schools to provide. Since national economies are constantly changing, the types of general knowledge, skills and values needed by employers will also change over time and therefore this kind of information must be collected at regular intervals.

It is only the general areas of knowledge, skills and values which can be assessed in this manner because some very specific knowledge and skills are soon out of date. Employers can also be asked to speculate on the general knowledge, skills and values which will be required by those entering their enterprises in five years time. The employers' ratings of "current" and "future" needs can be compared with their assessment of the knowledge, skills, and values currently possessed by their own workforce. These comparisons can be very useful for establishing where the schools are either "overproducing" or "underproducing", and then this information may be used to review the structure of the curriculum.

A needs assessment survey in the area of developing personally and developing as a good citizen can be conducted in a similar way. But, in this case the respondents would be either citizens in general or specific groups within the society. The main aim of such an exercise would be to identify how the society was changing in areas that required different roles to be undertaken by its citizens. For example, in countries where there has been a major swing towards democratic models of government, the citizens will need to acquire sufficient knowledge and skills to be able to participate more effectively in a new political environment.

The third need is for the levels of knowledge required for entry to the next stage of education. Again a survey is conducted on the receiving teachers to assess this. When all of this work is completed, the levels of importance attached to the various parts of the existing curriculum can be gauged and necessary revisions undertaken. There

may well be other forces to be taken into account when determining educational objectives. These may include changes in the subject matter itself, parents wishes, students wishes at the higher level of schooling, political changes, pedagogical changes (for example, moving from a tripatite system of education with different curricula to a comprehensive system of education with one curriculum for all), etc. What is important is that information is collected in a systematic way to form a sound basis from which the curriculum decision makers can take their decisions.

The curriculum developers can then develop curriculum blueprints for the textbooks and materials to be produced, write the materials, revise them, and eventually implement them across the system.

After the changes have settled down in a system, the curriculum center will either assess achievement in various parts of the curriculum or have the research unit of the ministry do it for them. This is usually done by means of a survey and the results would be presented in a similar fashion as was described above. They show those parts of the curriculum being well achieved, averagely achieved, and poorly achieved in the country as a whole, in the different provinces for urban and rural children separately, for boys and girls separately and so on. This allows further revisions to be made to the curriculum to overcome the weak points in the system.

Example 2: The use of examination "backwash effects" to improve teaching and classroom assessment

Most educational systems in the world still have national examinations. Some have continuous assessment and some have school-based examinations moderated by a team of moderators. Examinations determine the future of children and teachers are typically judged within their communities on how well their students do in the examinations. Teachers, therefore, put great emphasis on what they expect the content of the examinations to be.

In many but by no means all systems of education, the national curriculum center hands the blueprint of the curriculum for any one subject or set of subjects to the examinations center and this center ensures that the examinations produced are a true reflection of that which was to have been learned. Even where the curriculum blueprints are handed over, the problem of the quality of

examinations remains. There is rarely sufficient time in the examinations to assess all which should have been learned. Different knowledge, skills and values require different assessment techniques: writing, speaking a foreign language, undertaking scientific experiments, comprehension of a mathematical principle, etc. Very often, however, there is considerable disjunction because the range of competencies tested by the terminating examination may be much narrower than the range the country attempts to develop through its curricula, its textbooks, and its teacher education programmes.

There are two main reasons why this happens. In some cases, the content of the examination reflects the needs of the recruiting institutions, rather than the curriculum which the pupils should have been taught. This is especially common with examinations given at the end of secondary schooling and govern access to the universities. In a number of countries, university entrance examinations are set mainly or entirely by university staff, with the consequence that the questions are a better reflection of the requirements of first-year university courses than of final-year secondary courses. In England and Wales, the fact that the universities base selection decisions on just three subjects means that the majority of upper-secondary pupils specialise narrowly, in three subjects only, during their final two years at school. It is widely recognised that more broadly-based courses would be educationally advantageous, but few pupils are willing to undertake them because of the risk that their chances of gaining a university place might be jeopardised.

In a number of developing countries a more important reason for disjunction is that examination centres rarely have access to the considerable resources of money, time, and human skill that are needed to prepare question papers which match curriculum goals. In consequence, the examinations tend to be heavily loaded with questions that can be produced quickly and easily.

These kinds of examinations, for the most part, are composed of straightforward recall questions, which ask the candidate simply to reproduce learned material directly from memory, without reconstructing it or using it in any way. By contrast, questions testing more complex cognitive processes -- which require experience, ingenuity and time to prepare -- tend to be uncommon, or even absent from these examinations altogether. Such questions include those which test pupils' ability to apply what they have learned to new situations, or which require them to show that they

understand how facts link to each other, in meaningful patterns of cause and effect. These "higher order" questions focus on thinking skills, such as the ability to interpret and assimilate new information; the ability to develop a logical sequence of steps to solve a problem or reach a decision; the ability to produce imaginative or creative work that is expressive of the unique character of the learner. The development of these more complex, and more useful, competencies has, of course, been a major purpose of recent curriculum and teacher education intiatives in many countries. But unless the examination systems are included in these reforms, their *"backwash effects"* on classroom practice, can place the efforts of curriculum developers and teacher educators in severe jeopardy.

The impact of a major public examination on what teachers do is strongest in the two years preceding that examination. However, in systems where the examination has critical consequences for life chances, the backwash effects often penetrate right down through the school system. In one developing country, for example, where the university entrance examination is entirely in multiple-choice format, many primary school teachers rely heavily on multiple-choice questions for their class tests, even in the infant grades. By Grade 7 or 8, the format of the class test often mirrors closely the format of the university entrance examination.

In many countries, much more effort needs to be made to ensure that the examinations are of the highest possible quality. Apart from the psychometric qualities of validity and reliability, the following three criteria are suggested for judging the quality of examinations.

- *Active thinking.* Testing only recall information is to be avoided. Active ideas are held in the mind as pictures in which elements are linked to each other in patterns. Knowledge-based questions should test understanding of these patterns. Such questions should be concerned with causes, consequences, and reasons; with relationships, trends, and general ideas. In other words with *understanding.* The assimilation of the knowledge is a characteristic of active thinking. Examinations in some subject areas should include a number of data-based questions requiring students to read and interpret new information. Examinations should also include questions testing the *application of knowledge* to new situations including drawing inferences, making predictions,

or solving problems. There is always the problem that what is new to one student may not be new to another but, in general, it is possible to construct questions which are known not be in the major textbooks that have been used. The above points have been well known since Bloom's "Taxonomy of Educational Objectives" (Bloom et al, 1956) appeared but surprisingly are often ignored.

- *Equity*. The examination should, to the maximum extent possible, be fair to all groups: to girls, to students living in rural areas, particularly in remote parts of the country, and to those from less-privileged socioeconomic backgrounds. Biases in individual questions are often unavoidable (especially in questions which are experience-based). However the question setters should attempt to ensure that, over the examination as a whole, these biases counterbalance each other as much as possible. This is, however, no easy task. The performance of students in the remote and less privileged schools is nearly always adverserly affected by the quality of the education they receive and therefore it is important to ensure that avoidable biases in examination questions do not compound their disadvantage.

- *Open-ended questions*. Even when there is evidence to indicate that, from an assessment point of view, the examination of open-ended questions does not provide additional information for prediction purposes it is nevertheless desirable to include open-ended items simply to ensure that teachers do not only use multiple choice items. It must also be remembered that it is impossible to assess students' ability to develop a logical argument, to defend a point of view, to write essays and the like with multiple choice items.

Example 3: The use of examination results for monitoring the performance of schools and school districts

While examination results are often known at all of the decision-making levels described earlier in this chapter, they are rarely used for monitoring the changing performance of individual

schools and districts. This occurs because there is usually no link between the examinations center in a country and those responsible for monitoring the quality of education in the system as a whole.

Schools and districts (especially rural districts) often change their levels of achievement over a period of five years. It is perfectly possible to trace the differing achievement profiles of individual schools and districts and provinces in ways similar to those described earlier in this chapter. The profiles will not be as detailed because typically item results are not used. It is total scores which are used. But the rough estimates provided by exams will be sufficient to judge marked differences over time in terms of the rank order of schools or districts. Where the exams are of a multiple-choice kind then item data can be aggregated in different ways to provide the required profiles. If a sufficient number (about 20 percent) of the items are held common from one year's examinations to the next then a scaling exercise can be undertaken to yield comparable values. This all assumes that item data are recorded. Even though the necessity for recording item data has been well-known in examination centers for a long time, there are still instances of only total scores being recorded.

For examination results to be used at each of the levels it is, of course, incumbent on the examinations center to take the trouble to rank schools, districts, and provinces and feed the information to the appropriate units, education officers, inspectors and advisors. Until this is done, examination data are not being fully used. Perhaps this is a case for top Ministry officials being aware of how such data can be used and then ensuring that the data are produced. The Kenya Certificate of Primary Education Examination provides a particularly interesting example of a well adapted and useful feedback system (see Somerset, 1987).

Example 4: The use of information from well-designed research studies to improve teacher education

Information on effective teaching practices needs to be incorporated in teacher education programmes in every country. In ministries of education the Research and Development Center as well as the Department of Teacher Education often conduct studies to identify the "average" teaching practices in their nation's schools as well as those practices which are particularly conducive to good student learning. In the 1980s, several countries combined in an international study with similar aims (Anderson *et al*, 1989). All of these studies have produced results which are of interest. These include poor questioning techniques, few examples used by teachers which are not in the textbooks, poor teacher subject matter knowledge, insufficient use of feedback and correctives, poor structuring and the like. It is obvious that such results have direct implications for the modification (in terms of shifting emphasis) of various components of pre-service and in-service teacher training programmes. However, it seems to take several years for such findings to be incorporated into teachers education programmes. One problem is that the communication of such results is slow and apparently, ineffective.

Good teaching has often been characterized as being like an elephant -- easy to recognize but difficult to describe. Research work in the area is not easy and there have been many poor studies. But, the quality of such research studies is improving. More and more small experimental studies are needed, and the research skills among the researchers working in this area need to be improved. Much can be done at the district and provincial levels in terms of replicated experimental studies which are brought together at the national level. In some countries the departments of teacher education in ministries of education are in charge of the teacher training colleges and the members of these departments spend time as principals of the teacher training colleges. One would expect that this situation would result in the implementation of new research findings being a relatively simple and rapid process but, sadly, even in these countries the rate of implementing new and effective ideas about teaching is extremely slow.

Conclusion

This chapter commenced with a review of the four main decision-making levels that operate in most education systems. It was argued that each of these levels -- teacher/parent, school principal, state/provincial official, national official -- required different kinds of data to be presented at different levels of aggregation. Some established sources for obtaining appropriate information were then discussed in association with some examples of the type of information that is required at each decision-making level. It was emphasized that, in order for information to be employed in educational planning, the format and delivery of the information had to be adjusted to the specific needs of the different decision-making levels. The chapter concluded with a discussion of the ways in which the collection of information associated with curriculum design, examinations, and effective teaching may be used to improve the quality of education and also discussed some strategies for school improvement.

It is important to note that in order to address the information needs of decision-makers in education systems there needs to be effective procedures for the dissemination of information both vertically and horizontally within educational systems. For example, there needs to be a mechanism in each country by which good practices initiated by schools and felt needs expressed by schools are passed "up the education system" and are seen to be dealt with. Similarly, communication "down the education system" needs to be attended to -- with special emphasis being given to matching the format of information to the communication styles of practitioners.

The horizontal dissemination of information, particularly at the national level, among the various units involved in planning education systems also presents problems for many education systems. There are numerous examples of examinations centres not accepting the curriculum blueprint for the construction of examinations, examples of important research on effective teaching not being communicated to planning and teacher training units, and examples of the separation of "long term" and "short term" (often called "strategic") planning units. Perhaps the most widespread example of difficulties in this area occurs when research units operate independently from all major administrative units with the inevitable result that potentially important research findings are communicated

in technical language that is impenetrable for the non-research-trained heads of other units that are responsible for formulating policy.

In summary, there needs to be a complete rethink of the modes of communication, both vertically and horizontally, within educational administrations. The work involved in this represents a major undertaking -- particularly when many of the "solutions" to problems are likely to be culture specific. In the first instance, the most effective point of attack on the area would be for international agencies to take up this challenge by initiating some case study research on several education systems in different cultures that have confronted, and found solutions to, information dissemination problems. The reports of these studies could be shared among countries experiencing similar problems and used as stimulus materials for training programmes in this area.