

Monitoring School Performance: A Guide for Educators

by

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Design of a Monitoring System

The purpose of this chapter is to present a design for a monitoring system for assessing elementary and secondary school performance in a school district or education authority (EA). Between 1988 and 1990 I assisted in the design of two monitoring systems, one for the assessment of secondary schools in the Fife Regional Authority in Scotland, the other for the assessment of elementary and secondary schools in a medium-sized school district in Canada. Recently, I have been involved in the analysis of data from the California Assessment Program (see Rumberger and Willms, 1991). The design presented here is largely based on these experiences. There are several important differences between schooling systems in North America and the UK and the purposes of monitoring differ substantially between countries and across districts and EAs (see Chapter 2). However, there were enough similarities in the designs of the monitoring systems that I felt a separate presentation for each type of system would entail too much redundant material. Thus the chapter offers a single design, but includes discussion pertaining to both types of systems.

The design is not fully comprehensive. My intention is to provide some starting points for a district or EA that is in the early stages of developing a monitoring system. The proposed design emphasizes the collection of indicators that would be used mainly for diagnostic and performance monitoring by district and school administrators, rather than classroom teachers, or state and national administrators. The design presumes that data suitable for general assessment and for diagnosing learning problems at the individual level would be collected at the school level. Part of the district's role in monitoring would be to support school-level monitoring activities. Also, the proposed design does not entail the collection of qualitative data through classroom and school observations, interviews, or teacher logs and diaries (see Porter, 1991). As such, the design only constitutes a shell for a more comprehensive system. Because the collection of qualitative data is usually more expensive, I recommend that it be collected to examine issues relevant to the needs of individual schools and districts.

The chapter includes three sections. The first specifies the kind of data that might be collected routinely by a district or EA, and the indicators that could be derived from the data. The second section describes issues pertaining to confidentiality. The third section discusses how indicators for a

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Figure 8-1 Proposed Tests and Questionnaires

	K	Primary/Intermediate							Secondary				
		P1	P2	P3	P4	P5	P6	P7	S1	S2	S3	S4	S5
School Records (SR)	•	•	•	•	•	•	•	•	•	•	•	•	•
Entry Screening Battery (ESB)	•												
Student Questionnaires (SQ)					•			•		•			
School-Leaver Questionnaires (SLO)												•	•
Parent Questionnaires (PQ)	•				•			•		•			•
Vertically-Equated Achievement Tests (AT)		•	•	•	•	•	•	•	•	•	•	•	•
Affective Measures (AM)					•			•		•		•	
Fitness Tests (FT)		•	•	•	•	•	•	•	•	•	•	•	•
Teacher Questionnaires (TQ)	•	•	•	•	•	•	•	•	•	•	•	•	•

district or EA can be contextualized and informed by data collected at the classroom, school, state and national levels. The last section provides an approximate time line.

Data to be Collected

The proposed design entails intensive data collection from pupils and their parents at five critical 'transition points': the end of kindergarten and the beginning of grade 1; the end of primary schooling (end of grade 4); the end of intermediate schooling (end of grade 7); the end of the second year of secondary school; the end of secondary school. I have assumed the system includes seven years of primary and intermediate schooling, and five to six years of secondary schooling. [I use the alpha-numeric labels K for kindergarten, P1 through P4 for the primary grades, P5 through P7 for the intermediate grades, and S1 through S5 (or S6) for the secondary grades.] The design entails annual achievement testing in a number of areas, pupil surveys at critical transition points, regular tests of physical fitness, and an annual survey of all teachers. Figure 8-1 outlines the various tests and surveys that would be administered at each grade level. Figure 8-2 specifies the indicators of schooling inputs, processes, and outcomes that would be derived from the tests and questionnaires. The kinds of data to be collected from school records and the tests and questionnaires are discussed below.

School Records

School records are the primary source of demographic information and information on attendance and truancy. School records are useful also for keeping accurate track of pupils as they move from school to school, or leave the district.

Entry Screening Battery

Several school districts in Canada and the US routinely administer batteries of screening instruments in an attempt to identify pupils who require special

Figure 8-2 Indicators Derived from Tests and Questionnaires

Schooling Inputs

- Age at Entry (SR)
- Sex (SR)
- Indicators of Socioeconomic Status (PQ4, PQ7, PQ10)
 - Mother's and Father's Occupation
 - Mother's and Father's Education
 - Number of Siblings
 - Family Composition
- Race and Ethnicity (PQ4, SQ7)
- English as a First Language (PQ4)

School Process

- Ecology and Milieu (SR)
 - Class, School, and District Size
 - Per-pupil Expenditures
 - Age and Appearance of Building
- Segregation (SR, TQ)
- Disciplinary Climate (SQ, TQ)
- Academic Press (SQ, TQ)
- Student Attitudes (SQ, SR)
 - Sense of Academic Futility
 - Satisfaction with School
 - Attendance and Truancy
- Teacher Commitment and Morale (TQ)
 - Efficacy
 - Meaningfulness
 - Acceptance of School Goals and Values
 - Working Conditions
- Instructional Leadership of Principals (TQ)
 - Shaping Attitudes and Behaviors
 - Establishing Policies and Procedures

Schooling Outcomes

- Academic Achievement (AT)
 - Mathematics
 - Reading
 - Language Arts
 - Science
 - Personal and Social (SQ, FT)
 - Self-Concept
 - Locus of Control
 - Participation in Sports
 - Physical Fitness
 - Participation in Extra-Curricular Activities
 - Vocational (SQ, SLQ)
 - Work Experience
 - Skills in Vocational Subjects
 - Attitudes towards Work
 - Post-School Destinations
-

educational services. The practice of screening is based on the assumption that school-related problems can be alleviated if treatment is begun early (Mercer, Algozzine, and Trifiletti, 1988). However, poor screening systems can be costly: if children are mistakenly classified as being 'at risk', district resources are wasted, and children and their families may suffer the negative

consequences of labelling (Salvia, Clarke, and Ysseldyke, 1973). Also, poor screening techniques can result in some children being denied early remediation when they may be candidates who would benefit. Not surprisingly, many policy-makers and legislators are calling for better documentation of the costs and benefits of early screening and intervention (White, 1986).

Evidence pertaining to the efficacy of screening measures for predicting later achievement is contradictory, and it is difficult to compare studies because of the variety of screening instruments and outcome measures used. Jacobsen's (1990) study of the validity of kindergarten screening found that considerable improvement in identifying children 'at risk' could be attained by administering several measures at different times during the kindergarten year. I recommend using a battery of measures covering skills in the following domains: language, motor skills, social-emotional development, and pre-academic skills.

Pupil Questionnaires

The pupil questionnaires would include a number of items covering schooling inputs, processes, and non-cognitive schooling outcomes. The design includes the administration of pupil questionnaires to all pupils in P4, P7, and S2. These grade levels were chosen for at least three reasons. First, they coincide with the years that state or national examinations are given in many systems, and thus allow for more detailed reporting of pupils' progress at these levels. Second, these levels to some extent represent transition points in the pupils' schooling careers. Therefore data derived from the questionnaires can be used as 'posttest' data for one stage, and 'pretest' data for the next stage. Third, after three years the P4 and P7 cohorts will be administered the questionnaire again, when the majority of the pupils are in P7 and S2. This design therefore provides longitudinal data on individual pupils, which are useful for some types of analyses.

School-Leaver Questionnaires

This questionnaire would be administered as a postal survey to pupils approximately eight months after leaving school. It would ask a number of questions about their reasons for leaving school, and their post-secondary school or employment experiences. It could also ask pupils to reflect on some of their high school experiences. The questionnaire could be modelled after the school-leaving questionnaires used in England, Scotland, and Ireland, and the Follow-up Student Questionnaire used in the *High School and Beyond* study.

Parent Questionnaires

The parent questionnaires would be administered at roughly the same time as the pupil questionnaires. They would emphasize parents' satisfaction with their children's schools and their support for school activities. Information on family socioeconomic status too could be gathered with these questionnaires. The questionnaires could include also a number of items about home processes relevant to schooling outcomes, such as norms for academic achievement, and time spent on homework and watching television. They might incorporate questions pertaining to styles of parenting, similar to those asked of adolescents by Dornbusch, Ritter, Leiderman, Roberts, and Fraleigh (1987).

Vertically-Equated Achievement Tests

There are several types of achievement tests which are commercially available in North America and the UK, such as the Stanford Achievement Test and the Iowa Test of Basic Skills. Many Canadian school districts use either the Canadian Test of Basic Skills (CTBS) or the Canadian Achievement Test (CAT), which cover a number of academic skills for pupils in grades 1 through 12. Both tests are well suited to monitoring because their items were based on objectives stated in a number of curriculum guides and textbooks used in Canadian schools.¹ Also, scores from these tests can be placed on a vertically-equated scale. This means that the tests at each level include items that overlap in their content and difficulty with some of the items in the tests set for previous and subsequent grades. This makes it possible to map scores onto one long continuous scale that covers the twelve years of schooling. With scores on a vertically-equated scale, one can make more accurate estimates of pupils' rates of growth in academic achievement, rather than simply check their status at a particular point in time (see Willms and Jacobsen, 1990). As mentioned earlier, the use of growth scores is a more reliable and valid means for assessing school effects.

One of the advantages of the CAT over other achievement tests is that it includes eight overlapping levels. Each level of the test includes a larger number of items covering material at each grade level than is typical of most norm-referenced achievement tests. In other words, the tests attempt to strike a balance in the coverage *versus* test length dilemma discussed in Chapter 7. The tradeoff, however, is that a single level of the test will not cover the entire ability range of all pupils at a particular grade level. For example, suppose a teacher uses the Level 15 battery to test a class of grade 5 pupils. The Level 15 battery covers skills for grades 4.6 to 5.9. Recall that the range of achievement scores in a typical grade 5 classroom spans about four grade levels. Therefore, it is likely that several pupils would attain scores at or near the 'floor' of the Level 15 tests (e.g., at grade level 4.6), when their 'true' levels of achievement were actually lower. Similarly, several pupils would score at or near the 'ceiling' of the tests (e.g., at grade level 5.9), when their 'true' levels of achievement were considerably higher. This problem can be circumvented by using the 'locator' tests that accompany the battery. The locator tests are brief tests which aid in the selection of the best level of test. This two-stage process makes administration more difficult, but it affords advantages in terms of enhanced curriculum coverage.

Affective Measures

The literature includes a number of measures of various social-psychological constructs such as self-concept, locus of control, loneliness, academic motivation, and attitudes towards school. Some of these measures can be administered in a separate session or included as part of the pupil questionnaires. There are also a few commercially available tests that have separate subtests for a number of constructs.

¹ However, note the limitations of these tests, which are discussed briefly in Chapter 7, and in detail by Wolf *et al.* (1991)

The construct 'self concept' is described in the literature as an individual's perception of self in relationship to his or her environment (Shavelson, Hubner, and Stanton, 1976). People form their concept of self through an interpretation of hundreds of life experiences; the formation is influenced particularly by significant others in their environment, such as parents, teachers, and peers. Because a person's environment is complex and includes a multiplicity of interactions, the construct of self concept is considered to be multidimensional (Marsh and Shavelson, 1985). One of the best instruments for the measurement of self concept, and one which has been used widely in academic research, is the Self-Description Questionnaire (SDQ). There are three levels of the instrument designed for pupils at elementary, intermediate, and secondary levels. The SDQ measures thirteen separate components of self concept: academic, verbal, mathematics, problem-solving, physical ability, physical appearance, relations with same-sex peers, relations with opposite-sex peers, relations with parents, honesty, emotional stability, religion, and general self concept. The SDQ includes separate subscales for measuring each component; Marsh and O'Neill (1984) describe the reliability and validity of the subscales and the total test.

Fitness Tests

There are a number of short, easy-to-administer tests of physical fitness measuring various components of fitness such as strength, flexibility, speed, and cardio-vascular endurance. The Canada Fitness Award Test and the American Alliance Health, Physical Education, Recreation and Dance Test are two measures that provide good coverage. Many pupils enjoy doing these tests and charting their own progress. It would be preferable to administer them at least twice per year to all pupils. The analysis of the data from these tests would emphasize pupils' growth on various aspects of physical fitness.

Teacher Questionnaires

This questionnaire would be administered annually to all teachers in the district. It would address questions about between- and within-classroom segregation, disciplinary climate, academic press, and instructional leadership of the principal. It would include also several questions pertaining to the measurement of teacher morale and commitment. I recommend the development of separate versions of the questionnaire for primary, intermediate, and secondary teachers.

Confidentiality Issues

The identification of individual pupils is necessary for matching questionnaire data to data from other sources, such as parent questionnaire data, achievement test data, and data from school records. But it is essential that individuals cannot be identified on data that are made public. The thorny issue is whether pupils, parents, and teachers should have access to achievement test scores. On the one hand, they would likely see more value in the exercise if they were privy to the results. However, the argument against

revealing test scores from tests like the CTBS or CAT is that *at the individual level* they do not provide as reliable and valid an indication of a child's progress as many other forms of assessment. There is the argument that some teachers may use the data to make judgements about the potential of some children, and these judgements may become self-fulfilling prophecies. On balance, I recommend not to reveal this type of data at the individual level. It would be preferable to direct energy towards other forms of assessment that are valid and reliable at the individual level. However, I would make class-level and school-level results available to teachers and principals. Also, the achievement test results could be used for screening purposes to identify children who require additional testing.

It is essential that the questionnaires be administered within the school during a class period. Preferably, they should be administered by someone other than the classroom teacher. If they are sent home with the pupils it is likely that the response rate will be low and the achieved sample will be biased. However, because some parents would not want their children disclosing information on their occupation or level of education, it may be necessary to send parents a copy of the questionnaire, a letter explaining its purpose, and a form for requesting exemption. The letter can state that if they do not want their child to answer the questionnaire they can return the exemption form to the principal. Also, the questionnaires should contain a statement at the beginning telling pupils what will be done to ensure confidentiality, and offering them the option to leave blank any questions they do not wish to answer.

The Center for Educational Sociology has taken the issue of confidentiality seriously. They have developed procedures for maintaining confidentiality of their school-leaver survey data that could serve as a model for school districts and EAs. Upon receipt of the questionnaires, the staff assign identification numbers and remove the pupils' names. The link between identification numbers and pupils' names and addresses is maintained on a secure identification file to which only the Head Programmer and the Directors have access.

The anonymity of schools is also potentially contentious. Generally, districts and EAs want data on individual schools, and would not want to implement a monitoring program if the identification of individual schools were not possible. The question becomes whether data describing schools' results are made available to principals, teachers, and parents. My position is that if monitoring data are to enhance the process of school renewal, principals and teachers need to have access to the information. However, the kind of information that will be available to parents and the wider public needs to be carefully negotiated, and clear to all parties at the outset.

Data Collection at Other Levels

Data collected at the state or national level can augment the district information system, and similarly district data can complement and extend the monitoring activities of individual schools.

State- and National-Level Data

Data collected routinely by the state or national education agencies, or by other government bodies at these levels, can add to the district's monitoring system. Some examples are discussed below.

National Census Data Data from the National Census can be linked in some countries to pupil-level data via postal codes or enumeration districts. The census data include information relevant to the socioeconomic status and living conditions of families in each postal-code area. Data describing the proportion of single-parent families, the proportion of youth who are unemployed, or the extent of overcrowding or amenity deficiency can be used to construct variables that describe local neighbourhoods. For example, Garner and Raudenbush (1991) constructed an index of neighbourhood deprivation for Scottish Education Authorities based on analyses conducted by the Scottish Housing Association. They found that the level of neighbourhood deprivation had an effect on pupils' SCE examination attainment over and above the effects of their family background or the schools they attended.

Young Peoples Surveys Large-scale surveys of pupils who are in their senior years of secondary school, or who have recently left school, are conducted in Scotland, England, and Wales. In the US there are the national surveys conducted by the National Center for Education Statistics. One of the chief strengths of the national surveys is that they have better coverage of course-taking patterns and post-secondary destinations than is usually obtained by education authorities or school districts. Education authorities in Scotland have made use of the Scottish Young Peoples Survey (SYPS) conducted by the Centre for Educational Sociology by paying for enhanced coverage of the survey in certain schools, contracting specific analyses of the SYPS data relevant to EA needs, and merging SYPS data with EA data to examine particular policy issues. Raffe's (1991) evaluation of the Technical and Vocational Education Initiative and Echols *et al.*'s (1990) examination of parental choice of schools are examples where data from the SYPS were used in conjunction with EA data. During the early 1980s the Centre for Educational Sociology conducted a successful program of collaborative research whereby teachers and administrators contributed items to the questionnaire, and participated in the analysis and writing of research monographs.

Another useful strategy is to include items in the district questionnaires that are identical to those used in national surveys. This allows the district to situate the results of their surveys in a national context. For example, the pupil, parent, and teacher questionnaires administered by the district could include some of the school process questions used in the 1988 National Education Longitudinal Study.

State or National School Census Some state and national education agencies conduct an annual school census. For example, the Scottish Education Department collects school-level information on levels of staffing and resources, subjects taught, and enrolments. Their data also include information on each subject area, including the time allocated to that subject per

week, the type of class organization, the number of teaching groups, and the size of each group. These data can easily be merged with district school-level data, and used in analyses to help explain some of the variation between schools in their performance in particular subject areas.

Classroom- and School-Level Data

Much of the data collected by teachers is obtained for the purpose of monitoring the performance of individual pupils, and diagnosing particular learning problems. Sometimes it is used for certification and accreditation. Teachers also use data to inform their teaching — to determine which areas require further instruction, the kinds of errors pupils are making, and how a topic can best be taught. Assessment at the classroom- or school-level might include the following:

- criterion-referenced tests in each subject area;
- diagnostic tests to assess particular learning problems;
- pupil dossiers of critical incidents and special events in the pupil's life, athletic awards, academic accomplishments, letters of recognition, and other noteworthy items;
- regular classroom tests, unit tests, marks on assignments;
- other informal assessment such as teachers' appraisals of reading logs, writing folders, and notebooks;
- pupil self-assessment.

The district-level monitoring system can inform school-level monitoring efforts by identifying general areas of academic strengths and weaknesses that might be assessed in greater detail. The assessment of school processes at the district level can enable the school to assess more accurately whether its local interventions and action plans are having an impact on the social and learning climate of the school. District monitoring can also contextualize the schools' criterion-referenced results by determining district norms for particular sets of items. This avoids the danger that the schools' local norms are unduly affected by factors such as the history of the school or its social-class and ability intake. Contextualizing school-level results can best be accomplished if there are items in the CRTs used by the schools that are common to the NRTs used by the district. Also, some of the district-level tests can serve as screening instruments to identify pupils who require further testing. The district instruments will likely be too blunt for adequate diagnosis of specific learning difficulties, but can serve as a first filter so that school-level testing efforts can be directed towards pupils who are at the greatest risk of school failure.

Stages in the Development of a Monitoring System

The specification of a schedule for the development of a monitoring system is difficult, because it depends largely on its priority amongst other projects, and the amount of district resources that can be allocated to monitoring. Outlined below are three of the main tasks required for the first stages of its development.

Pupil Identification System

The first requirement in the development of the monitoring system is to establish a means of tracking all elementary and secondary pupils. The task is not as easy as one would envisage, because some pupils change their name for various reasons, sometimes there are duplicate names, many pupils change schools, and pupils are continually entering and leaving the district. The point at which pupils drop out or complete school varies, and for many the time of leaving is not well defined.

I recommend that the identification system be defined in terms of 'age cohorts'. For example, the set of pupils with birthdates in 1985 would comprise the '1985 cohort', irrespective of their current grade placement or when they entered the first grade. I prefer age cohorts over grade or entry cohorts for two reasons. One is that the age and ability composition of grade cohorts can vary across schools because of differences between schools in their policies regarding grade retention and acceleration. If estimates of school effects are based on grade cohorts, then a school which tends to retain more pupils than average for the district, and accelerate fewer pupils than average, would have a better chance of showing above-average performance. Another reason is that a pupil's age relative to his or her classmates is related to achievement: after accounting for pupils who have repeated or accelerated a grade, pupils who are older than their average classmate tend to have above-average achievement scores (Willms and Jacobsen, 1990). These two reasons are particularly important in systems with dual or variable entry dates into primary school. For example, the British Columbia government instituted a dual-entry program in 1990–91, which allowed pupils to begin their primary schooling in either September or January. The time spent in primary school was to vary from three to four years, depending on the child's rate of development.

For each cohort, schools could collect basic demographic information: full name, birthdate, sex, address, postal code, and the date that the pupil began schooling in the district. All pupils would be assigned a pupil ID number that would be used for administration purposes throughout their schooling years in the district. The first two digits of the ID would designate the year of their cohort. The schools could then fill in an entry or exit form for any pupils that entered or left the system. In the first year of the development of the system, this information would need to be collected for all pupils, kindergarten through 12, but thereafter only for pupils entering the district.

Data Management System

The costs of data management and analysis are usually underestimated. After data from tests or questionnaires are entered into computer files, considerable work is required to 'clean' the data (check for incorrect entries, set codes for missing data) and to prepare the data for analysis (prepare labels for each value of each variable, examine frequency distributions of each variable, and merge the data with existing files). Analyses are seldom as straightforward as one expects; I have known even the most experienced researchers to underestimate the time required by a factor of two or three. For many purposes, graphics are useful, and these too are time-consuming.

Some of the costs of data preparation and analysis can be reduced by

starting with a computer program that is capable of both data management and analysis, and by setting some standards for the construction of the data base. I have found that monitoring data for districts with about 10,000 pupils can be adequately handled with a 386 IBM-compatible PC (with 5K extended memory, a math co-processor, and an 80 MB hard drive). Data entry and cleaning can be done on less powerful machines, but one of this capacity is necessary for analyses.

Construction and Piloting of Questionnaires

One of the most costly and time-consuming aspects of getting started is the construction and development of questionnaires. Although many of the items can be based on those available in the literature, time is required to obtain permission for their use. Also, in most cases the district will want to construct several items relevant to its particular needs. A rough estimate is that it requires two person-months for the development and piloting of each questionnaire. However, not all of the questionnaires need to be constructed in the first year.

Time Line for the First Two Years

A time line for the first two years of the development of a monitoring system is described below:

First School Year (July to June)

July to September

- Establish pupil identification system
- Purchase of computing equipment and software
- Develop and pilot grade 7 questionnaire

October to December

- Develop grade 4 and grade 10 questionnaires
- Develop parent questionnaires
- Construct data management system

January to March

- Pilot grade 4 and grade 10 questionnaires
- Pilot parent questionnaire

April to June

- First administration of grade 7 questionnaire
- First administration of Self-Description Questionnaire
- First administration of CAT, all grades
- Develop data base for measuring CAT growth scores

Second Year (July to June)

July to December

- Develop school-leaver questionnaire
- First estimates of school effects, adjusted for SES
- Integrate data from other sources (e.g., provincial tests, school records)

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January to June

- First administration of parent questionnaire
- Second administration of grade 7 questionnaire
- First administration of grade 4 and 10 questionnaires
- Pilot school-leaver questionnaire

A Unique Design

The proposed design was based on designs previously set out for two medium-sized districts, one in Scotland and one in Canada. These districts are in the process of developing their monitoring systems. There are several features of the design which distinguish it from other district-level monitoring systems. They are as follows:

- **The use of entire age cohorts rather than grade cohorts.** The use of age cohorts provides a more accurate means for assessing schools, and allows for the assessment of the effects of school, district, state, or national interventions.
- **Measurement of personal, vocational, social, and academic outcomes.** Most performance monitoring systems include information describing only pupils' academic performance. The inclusion of data describing non-cognitive outcomes provides a more comprehensive picture of the performance of schools.
- **Measurement of pupil growth.** Estimates of the effects of schools on academic achievement will be based, in part, on pupils' rates of growth, rather than on a cross-section of scores taken at one time point. Although educational researchers strongly advocate the use of growth scores, few monitoring systems use them.
- **Estimates of school effects adjusted for family background.** Most monitoring systems compare schools without controlling for pupils' family backgrounds. Some systems use crude techniques for adjustment based on data aggregated to the school level. The proposed system entails the collection of individual-level data, which allow the analyst to employ the recently-developed multilevel modelling techniques. These techniques take account of pupil background and adjust for measurement and sampling error.
- **Measurement and analysis of data on school policies and processes.** The system will be capable not only of assessing how much schools vary in their performance, but also of addressing questions about why they vary. The analytical approach assesses how much of the variation in school performance is attributable to differences between schools in their policies and practices.
- **Complements monitoring efforts at higher and lower levels.** The proposed monitoring system uses data collected at higher levels of the schooling system to provide a wider context for data collected at the district and school levels. The district monitoring system also enhances the information systems of individual schools.