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PISA 2009 Questionnaire Framework

This chapter describes the framework that led the design of the PISA 2009 questionnaires; the aim was to gather policy-relevant background information linked to student achievement from school principals, students and parents.

The chapter presents the types and purposes of the information collected at four different levels: the educational system as a whole; the school level; the instructional setting; and the student level. It also puts forward ideas for analysing the policy-relevance of the data collected, such as: investigating effective learning environments in reading; ensuring school effectiveness and management; promoting educational equity and cost effectiveness; and developing system-level indicators.

INTRODUCTION

Although PISA is probably best known for measuring and reporting the achievement of 15-year-olds in reading, mathematics, and science in a wide range of countries, it also serves a larger purpose for interpreting test results and assessing educational policies through its collection of background information. This chapter presents and discusses the purpose and usefulness of the Questionnaire Framework, which is used to gather the background information addressing policy issues linked to student achievement.

Clearly, interest in the academic performance of students is not limited to descriptions of performance levels and differences within and among countries. Reading the achievement results leads to questions such as: Why do 15-year-olds in some countries perform better than those in others? Why are some students high performers, many others average, and some low performers? Can these differences be explained by differences in societal characteristics, families, school resources, instructional practices, and communities? Being policy driven, not only must PISA provide policy makers with descriptions of the results, but also with the information and capacity to improve them. The test results alone cannot provide answers to these questions. Therefore, PISA's goal is to gather additional data that will enable policy makers to draw inferences about the patterns of achievement results and why they occur.

How can the additional data from questionnaires be used to interpret achievement differences? Their most important contribution is that they enrich the analysis by describing the characteristics of families and the organisation of education systems at different levels from the national level through to the classroom and home. PISA sets out to relate educational achievement to these characteristics in order to identify general patterns among countries and specific patterns within countries. Given that the PISA 2009 results can be compared with those of the earlier studies, (PISA 2000, PISA 2003 and PISA 2006) PISA can not only compare the trends in achievement over almost a decade for many countries, but also attempt to relate those trends to changes in policies, practices, and student populations.

PISA provides the possibility to speculate about the change in achievement outcomes. PISA is speculative because it is what is known as a yield study that attempts to ascertain the cumulative achievement of students towards the end of compulsory education. In other words, PISA is not an attempt to ascertain how much learning has taken place in the secondary school in which a student is enrolled. This would require comparing the achievement of students at entry into their present school to their achievement at that same school at age 15. This would provide a measure of progress or value-added in achievement associated with educational experiences in that particular school. PISA only tests the students once at age 15. A further challenge is the relatively short period of time that students in many countries have attended their present secondary schools, typically three years or less for most students. Therefore, only a portion of their level of achievement is due to educational characteristics of their present school and classroom, while some is due to previous educational experiences that may not be reflected in data from the present school.

In essence, PISA makes it possible to find patterns of statistical association between achievement, on the one hand, and family, school, and other educational influences, on the other. Some of these patterns will be strong and relatively consistent among countries, and those are most likely to tell an underlying story that may initiate a search for causal mechanisms. Others will be weaker and inconsistent from country to country and may or may not have important policy implications. Interpretation for policy purposes must be sensitive to these differences. When the patterns of association are strong, there is also a basis for further investigation by countries to confirm whether such a phenomenon exists when more direct research is applied. Such focused research can involve intensive qualitative studies of families, schools, and classrooms, or it can employ statistical models to measure achievement gains through value-added studies or even experimental investigations that focus on associations found in PISA.

Educational policy is complex and is not easily encapsulated by a single definition. In general, educational policy addresses the actions that families, government bodies, and other educational organisations take to shape and operate educational systems at all levels of education and all levels of government. Clearly, educational policy embraces the actions of many entities including those who occupy positions of educational leadership such as ministers and secretaries of education, those who make laws, technical staff who make operative and concrete decisions, and administrators and teachers who must implement specific educational actions. In addition, educational policy may include the activities of families through mandates or guidelines that influence their behaviour.

> In terms of some of the general uses of the results, policy makers are using PISA findings to gauge the knowledge and skills of students in their own country in comparison with those of the other participating countries; establish benchmarks for education improvement, for example, in terms of the mean scores achieved by other countries or their capacity to provide high levels of equity in educational outcomes and opportunities; and understand relative strengths and weaknesses of their education systems. (OECD, 2007)

Good educational policy is informed educational policy in which all of the responsible actors (policy makers, school principals, teachers, students and parents), are provided with the knowledge that they need to make good educational decisions. Although the test results from PISA may inform and motivate these actors to seek ways of improving the levels and equality of educational performance, they need considerable further information that will assist them in formulating strategies to achieve those ends.

For this reason PISA has made a concerted effort to gather background information on educational systems, schools, families, and students that might inform the potential sources of differences in achievement, both within and among countries, and that might be used to formulate strategies for improvement of overall academic performance and educational equity.

Choosing and collecting the types of specific background information on families, students, and schools that might be linked to achievement is a daunting task. The reason is that there are many possible types of information that can be sought, especially those which may be pertinent in some countries and regional settings, but not in others. Further, there is the constraint on time of those who are asked to provide the information, where most of the specific information on schools and classrooms must be obtained from individual students and principals through survey questionnaires. In order to safeguard the time requested of both groups of informants and to increase the reliability of the information and the completeness of responses, it is important to limit the typical time required of respondents to provide questionnaire information. Principals are usually very busy, so it is essential to ask them for information on key questions that help to understand school policies and operations. Students will not only be asked to fill out background information on their families and school experiences, but will also take PISA tests in the subject areas - a taxing demand on time and effort. To gather background information, only about 30 minutes can be allotted to the questions asked of students on their personal background, their learning habits, characteristics of their school and classrooms, and their attitudes to learning as well as their engagement and motivation. This is in addition to two hours devoted to the testing in the three subject areas.

It is well known that as the length and difficulty of a questionnaire increase, the accuracy of responses tends to decrease, and it is increasingly likely that some questions will be skipped completely. Accordingly, the goal of designing surveys to obtain useful interpretive information is to prioritise the information sought and to obtain it accurately, subject to the time constraint for questionnaires set by the PISA Governing Board. The section below describes the strategy for reaching this goal.

TYPES OF BACKGROUND INFORMATION AND THEIR PURPOSES

The types of background information collected on the questionnaires are purpose-driven in that they aim to provide interpretive frameworks and data for analysing PISA results. The challenge of collecting such information is complicated by the fact that educational systems have many actors at different levels. For most systems there is a national or federal entity that sets country policy and is instrumental in allocating resources. Many countries also sponsor regional agencies that are partially accountable for these functions. Some schools are embedded in districts that monitor and enforce policies as well as distribute and contribute to school resources. It is possible to consider this level as the educational system as a whole, which describes the overall national or federal system and its supporting and regulatory elements for governing and providing education. In some countries the system is highly centralised under a ministry with ultimate authority, and in other countries the national responsibility for education is decentralised through shared responsibilities at different levels of government. However the overall system is organised, it ultimately must interact and support the key learning organisational site: the school.

It is at the school level where the educational system interacts directly with communities, parents, and children. At school the students receive their formal educational experience. Individual schools are responsible for educating all children efficiently and meeting the goals and educational requirements set by higher levels of governance. They must recruit personnel and acquire the materials that will enable the educational process to proceed. In addition, they

must respond to national and regional systems of accountability for educational results in terms of accommodating student enrolments and producing achievement and ultimate educational attainments. They encompass what is known as the educational core, where the teaching and learning takes place, and they must be organised to do that effectively. School policies are central to this mission in terms of the time that is devoted to learning, including the length of the school day and school year, the organisation of the curriculum, teacher selection, retention and professional development, parental involvement, school leadership, and the internal allocation of resources.

Schools are organised into subunits of grade levels and classrooms. Although the overall school environment and practices clearly have an impact on a child's education, the most intensive educational experiences take place within his or her grade level in classrooms. Within the school, learning objectives and practices must be articulated among grade levels so that the requirements for success at higher grades are satisfied by learning at the preceding grade levels. Regardless of the educational requirements set by nations, regions, and schools, these must be translated into specific practices which often differ in significant ways in application from teacher to teacher and classroom to classroom. In recent decades educators have recognised that it is not only the guiding policies which determine the quality and depth of instruction and its focus, but also the implementation of those principles. Research studies have found remarkable variance both among and within schools that are governed under the same regulations and overall decisions on practice (Fullan, 2007). It is therefore important to understand the classroom practices employed by teachers in such instructional settings, as well as their beliefs, attitudes, skills, and training experiences to establish links with student achievement.

The first round of the new OECD Teaching and Learning International Survey (TALIS; OECD, 2009), focused on policies and practices that shape the teaching and learning environment in schools, providing policy-relevant insights on teachers' professional development, appraisal and feedback to teachers, teaching beliefs and classroom practices and school leadership. In future cycles of PISA and TALIS, a potential linkage of the two programmes on the school level could lead to analytical gains in a country. First, the student background and student performance information from PISA would provide an important context for analysing and better understanding the teacher responses in TALIS (*e.g.* understanding the extent to which teachers' professional development needs being met vary between high and low performing schools or schools facing more or less challenging circumstances). Second, teacher information, such as that collected through TALIS, could improve the measurement of the instructional environment in schools and enhance the explanatory power within PISA both in terms of school performance and the attitudes of students.

Finally, the level which is perhaps the most complex of all is the student level. National and regional entities set goals, institutional arrangements, financing, and licensing requirements for educational personnel. Schools operate within these parameters to create learning organisations. Most implementation of learning takes place within instructional units within the school, typically classrooms. But, learning takes place because all of these arrangements create opportunities, incentives, and expectations for individual students and student groups to learn. What is reflected in the achievement measures is the product of how these specific provisions operate to enable students to succeed. Therefore at the individual student level, it is important to document the student backgrounds, student expectations and attitudes, available resources and practices that affect educational outcomes.

Knowing a student's educational experiences in the school or classroom is not adequate for understanding all student influences on learning. Fifteen-year-old students have spent the vast majority of their waking hours outside of school. This means that differences in home and community environments such as parental educational resources in the home and other learning opportunities are crucial determinants of student learning and achievement. Furthermore, family influences are likely to affect student motivations and attitudes towards learning overall and in specific subjects and can have profound effects on performance, particularly in reading. Since most out-of-school learning depends on parental and community resources, such background information is crucial in interpreting achievement patterns as well as students' capacity and attitudes towards learning.

What is described here is a constellation of institutions and actors at different levels that constitute an educational system. The interactions among these are complex and not fully understood, yet each level is important in shaping educational policy and probable education outcomes. The principal challenge of obtaining useful background information to help interpret achievement results and relate these to educational policy is determining the types and form of information to be collected and how to relate it to student achievement in what appears to be a swamp of complexity. To add to the challenge, most of the information must be collected directly from principals and students in a highly time-constrained setting where their time is precious and for which only very limited demands can be made.

The strategy is to begin with some of the major relevant questions at each level of the educational system and to use those questions to focus on important data categories that are central to the later analysis of achievement. These must be translated into specific questions that appear on the questionnaires, or for which answers are available from other sources, and that the respondents understand so that accurate answers will be provided within time constraints. Since this process begins with some overall policy questions and some knowledge of the general literature that establishes relationships between this information and student achievement, it is important to establish the required types of information at each of the four levels of the system. The four levels are:

- educational system as a whole
- school level
- instructional settings
- individual student level

Educational system as a whole

The purpose of information at the highest level is to provide comparative descriptions of educational systems and to allow for the exploration of a large range of educational outcomes as they relate to the overall conditions that characterise the educational system. Examples of descriptive information include:

- measures of wealth and income of the country and region
- overall status of teachers
- community involvement in schooling
- level of decision-making
- public versus private schools
- measures of societal inequality
- forms of accountability

What is unique about this list of information is that much of it can be obtained from sources other than questionnaires because it is available as administrative data from the countries themselves as well as international organisations such as the OECD, UNESCO and the World Bank (OECD, 2008; UNESCO, 2005; World Bank, 2008).

Each category of information is related to social science studies that show a relation between student achievement and the information category. For example, studies of educational achievement among societies find that both within and among nations the amount of per-capita income is a strong predictor of student achievement (Baker, Goesling & Letendre, 2002). The overall status of teachers is important because it affects the attractiveness of the teaching profession (Darling-Hammond, 1997). Active community and parental involvement in schooling has been linked to student educational outcomes (Ho & Willms, 1996). Measures of societal inequality are linked to educational inequality in terms of family resources and learning conditions (Rothstein, 2004). And, the measurement, visibility, and sanctioning of student and school success are believed to provide inducements to better performance (Hanushek & Raymond, 2004).

These are antecedents of educational policy, operations, and outcomes in the sense that they exist in a larger societal context which may affect educational results. For example, measures such as Gross Domestic Product (GDP) per capita reflect family resources that influence education as well as societal investments in education. Heterogeneity of the population through immigrants, and particularly immigrants from other language, cultural, and economic backgrounds, will determine the educational challenges in classrooms as well as the preparedness of students to succeed in a mainstream environment that may differ significantly from that of their population subgroups. Community involvement in schooling can provide greater effectiveness through educational adaptation to the needs of local populations. Throughout the world many countries are establishing different approaches to decentralising decision-making, differences that might have a bearing on educational achievement in terms of the level of the educational system where such matters as curriculum, teacher salaries, and student policies are established. Although the centralisation versus decentralisation of decision-making will be addressed more fully when its impact at the school level is discussed, it is important to note that the authority to make decisions at each level is usually established by national, federal or regional governments, and schools are expected to follow these laws, regulations, and conventions.

Another form of decentralisation is the degree to which non-government schools are relied upon to provide education. The use of a market of choice among non-governmental (private or independent schools) is an important form of decentralisation of decision-making. Although such schools exist within a government regulatory framework, they generally have considerably more freedom than public schools to make educational decisions. Indeed, in some countries the private schools are fully funded from government sources (government-dependent private schools) and must meet certain government standards (James, 1984). Since families can choose among such schools, they also express their preferences, a particularly strong form of involvement in educational decisions. Choice among public and private schools (whether independent or government-dependent) is championed as a mechanism to create incentives for schools to compete for students and improve the overall performance of the educational system (UNESCO, 2005). By providing background information on the organisation of schools, it is hoped to gain insights into the impact of alternative structural arrangements on achievement. Accountability systems are another focus of educational systems in most countries where the attempt is to put in place systems of school and student assessment that will ensure that students meet important educational standards (Carnoy, Elmore & Siskin, 2003). In some countries the passing of examinations at the end of courses or end of the school year are required to move to the next level of study. In other cases, tests are given to establish how well individual students and schools are learning, but the results are simply used to provide evaluation information without individual consequences. Examination policies also differ with respect to whether the tests are developed by classroom teachers and schools for their own students or by regional, federal or national authorities. That is, some examinations are internal to the school and focus on classroom or school objectives, and others are external where the national, federal or regional authorities set a standard. Different forms of examination may have different consequences for providing incentives to learn, uniformity of what is taught, and educational results.

Specific patterns of educational investment among regions, schools, and students may have important consequences as well. In some countries policy provides for similar funding per student for all students, regardless of the economic circumstances of their families. In others there are additional resources for students from rural, impoverished or immigrant backgrounds or for those with learning or physical difficulties. How spending is allocated may have implications for both the level of achievement as well as equity in achievement outcomes.

Overall, information on the educational system as a whole can provide a picture of how the overall resources and practices of a society impact educational achievement. For example, to what degree do differences in the overall wealth of a society and its distribution affect the level and distribution of achievement? Do the impacts differ by subject and population group such as natives and immigrants? To what degree does the schooling system serve to equalise educational outcomes, and to what degree do the outcomes simply reflect existing inequalities. How attractive is the teaching profession relative to other professions in the country, and how does this affect the ability to maintain a quality teaching force? How does the organisation of schools, school decision-making and investment policies among different groups of students and regions affect educational results? All of these are questions that can only be addressed if background information is available that supplements the data on achievement.

Table 4.1 **Examples of data items for educational system as a whole**

Title	Description/measure
Measures of wealth and income of country and region	Gross domestic product per capita
Overall status of teachers	Teacher salaries and benefits relative to other occupations with similar education
Community involvement in schooling	Extent of influence of parents and school governing board on decision-making
Level of decision-making	Government levels or constituencies that influence directly decisions in staffing, budgeting, instructional content, and assessment practices
Public versus private schools	Is school public or private?
Measures of social inequality	Summary measures of income distribution
Forms of accountability	Are achievement data used to monitor accountability?

(OECD, 2008; UNESCO, 2005; The World Bank, 2008)

School level

As emphasised earlier, the organisation of schools is complex and varies considerably, not only from country to country, but also among internal educational sub-divisions such as federal states or provinces, regions, school districts, and individual schools. PISA aims to identify the types of differences that are most likely to impact student achievement and selects the differences to be measured in a limited time frame for questionnaire administration.

Since PISA is concerned with relating school characteristics to their probable efficacy in improving student achievement, in most cases measures of actual school operations are sought rather than the formal policies under which they are supposed to operate. In recent decades it has become widely recognised that the formal descriptions of educational operations in schools are often misleading because implementation differs so widely (Fullan & Stiegelbauer, 1991; Fullan, 1992). Implementation refers to the actual application of schooling procedures, and researchers have found that under the same descriptive rubrics the actual behaviour can differ markedly. This means that official lists of educational goals, requirements, and procedures are not adequate to describe the operational behaviour of schools and must be supplemented by information from the respondents on the actual ways in which their schools operate. Accordingly, the questionnaire surveys attempt to obtain information directly on operations from the participants, and especially the school principal.

Within this context, some of the main categories in which PISA 2009 attempts to gather background information on schools are:

- school leadership
- composition of student enrolments
- curricular emphasis
- extra-curricular activities
- school size
- support for teaching and learning

School leadership is a particularly important variable that might be altered by policy in directions that support learning. Some success has been found in research on this issue where attempts have been made to measure principals' activities in key dimensions of a school's instructional programme and to relate these to student outcomes such as reading achievement (Hallinger, Bickman & Davis, 1996). The goal is to obtain information

on principals who are devoted to and active in attending to those dimensions that seem effective in improving student learning.

Furthermore, it is worthwhile to ascertain whether the important dimensions of school leadership that affect achievement are relatively universal in nature or differ according to educational system and type of student. This is relatively new research in the educational policy area, but establishing an international database is the first step in using it.

A related component of school leadership is imposed on the school by the degree of decentralisation of decision-making set out for schools. In recent years there has been considerable focus on school autonomy as a way of overcoming bureaucratic rigidity and potentially having an impact on learning outcomes (Bottani & Favre, 2001; Chubb & Moe, 1990). In some societies the hiring of teachers, establishing curriculum, and assessing students is carried out at a central level where the school is merely expected to follow the directions set out for school routine operations. At the opposite end of the spectrum the school is largely autonomous and expected to choose its own teachers, to influence teacher compensation, to choose curriculum and undertake its own academic assessment of students. Of course, when school is referred to in this sense, it is not only referring to the head administrators at school sites, but also to the roles that teachers, parents, and students might play in educational decision-making. Whether decisions should be centralised or decentralised and which ones should be placed at different levels is still a subject for debate. However, by getting measures of centralisation and decentralisation for different functions, it may be possible to ascertain the impact of such policies on achievement.

The type of student body is likely to have an impact on educational achievement. Not only does the individual socio-economic status of students have an impact on the performance of individual students, but also the overall socio-economic composition of school enrolments. Schools with students of higher socio-economic status tend to create an overall school environment of high aspirations and support for academic learning which provides advantages for all students, regardless of high or low socio-economic status, who are enrolled in those schools. This is known as a compositional or peer effect. But, even beyond the matter of how student composition affects individual students, such schools may attract better teachers, those who seek school environments where they will experience success in student learning. Furthermore, teachers in schools with higher socio-economic enrolments know that the overall academic level of performance is higher and are likely to respond by setting a faster pace for the curriculum and higher performance expectations for all students. For these reasons it is important to assess the overall socio-economic composition of students to explore its impact on achievement (Zimmer & Toma, 2000).

A somewhat different dimension of the student body is the proportion of immigrants and their origins. In general, immigrants face a number of disadvantages such as having a mother tongue different from the official language of the school and the resident society. In addition, they often have to adjust to an unfamiliar cultural context and they may face discrimination. Immigrants who have emigrated from low income countries, where educational opportunities are slim and standards low, face a particularly harsh educational challenge. When a relatively high proportion of school enrolment is comprised of children of immigrants, the overall learning environment of the school may be challenged for all students by a slower curriculum pace, language deficiencies of fellow students, and differential educational aspirations. Therefore not only is it important to take into account the socio-economic composition of student enrolments, but also the concentration of immigrant students and especially those from countries with low income and poor educational opportunities.

Two other conditions that may have an impact on determining the supportive nature of the school environment are the affluence of the surrounding community and the degree of parental involvement. Affluent communities tend to have more positive educational influences and support systems in comparison to poorer communities. First, they tend to be safer with less crime and violence. They are therefore less preoccupied than poor communities with the possible effects of crime and violence on students. Second, such neighbourhoods have more resources to support schools in informal ways through volunteering and the occasional provision of extra resources that may be needed. Reciprocally, good schools reflect on the quality of neighbourhoods, setting out incentives for neighbourhoods to assist in their maintenance and support.

Parental involvement has an even more direct effect on student achievement (Epstein, 2001). When schools encourage and make a provision for parental involvement, parents can become more effective in supporting both school programmes and the educational progress of their own children. Furthermore, parents who participate in

school activities are more likely to volunteer their efforts in assisting the school, therefore increasing available resources. Once parents are involved in addressing the needs of a school, they may also seek other ways to assist the school in acquiring resources and assisting those children in academic need. Parents who know what schools expect through familiarity with the school programme and teacher expectations are better able to assist their own children in learning. In some schools, parental involvement can take the form of teaching parents the skills that they need to support their children's learning.

Finally, the act of attracting parents to participate actively in educational and school endeavours can serve to form social networks where parents get to know and help each other. That is, parents become a community of resources that can assist each other to address a wider range of child and family needs, a resource that is particularly important for those who would otherwise be isolated and with fewer resources to draw upon. It has been argued that such social networks built around schools raise overall achievement through the accumulation of what is known as social capital (Coleman, 1988).

Beyond what happens in the classroom, schools as a whole can also put curricular emphasis on particular subjects such as reading. Some schools require all teachers at each grade level to devote a certain amount of time to both the teaching of reading and the allocation of reading as part of assignments and school activities. Others even schedule independent reading time during the school day or coordinate school work with library resources and services. The prevalence of other literacy activities such as writing, listening, and requiring oral presentations also reinforces reading skills. Clearly it is expected that more time would be devoted to reading assignments and literacy activities to contribute to reading proficiencies. The same is true with regard to an emphasis on critical reading skills that require more sophisticated comprehension and understanding of written materials. When the curriculum approach requires critical analysis of readings through questioning a point of view, understanding the different sides of an argument and the evidence supporting each side, analysing the literary styles and meaning, and other deeper approaches to meaning in reading, the student is exposed to a richer understanding of written material and thought. Above all it is not only the specific amount of reading and assessment of narrow components of reading that constitute differences in school curriculum, but also the emphasis placed on preparing students for a wide array of literacy tasks such as writing, debating, problem-solving, and discussion. New demands are also set by media. Proficiency in reading is not limited to printed text but also to the texts in the electronic media, which are becoming a more important part of student life and societal communication in general. PISA 2009 has included an assessment of literacy in the reading of electronic texts in addition to printed texts (see Chapter 1).

On a broader level, the variety and quality of extra-curricular activities can also contribute to reading proficiencies. Some extra-curricular opportunities depend intrinsically on reading and literacy such as drama and theatre, journalism, creative writing, the school newspaper and professional clubs such as those devoted to science, history, communication technologies or a foreign language and culture. To the degree that these require reading activities as part of the extra-curricular offerings, reading ability should be enhanced as a by-product.

School size is viewed widely as having some relation to achievement, although the overall relationship is not clear. With larger enrolments, schools can offer their students a greater variety of courses and electives as well as extra-curricular activities. This means that individual students have more options when choosing courses and also, possibly, a greater choice of teachers for particular subjects. By increasing the possibility of electing more courses of their choice, students can select those that are most meaningful to them educationally and for which they are most motivated.

But, larger schools also tend to be more impersonal where students may not feel supported as much by teachers and other personnel. Research has found that smaller high schools demonstrate a greater and more equitable distribution of student engagement and achievement among 15-year-olds (Lee & Smith, 1995). Thus, the size relation goes in both directions, and there is no overall consensus in the literature on where the balance lies. In fact, some research suggests that size affects different groups of students (*e.g.* socio-economic groups) differentially, so the best size policy depends upon the characteristics of the students (Lee & Smith, 1997).

Finally, a highly supportive teaching and learning environment at the school level enhances the teaching and learning of all subjects. Studies of effective schools find that an academic focus on school culture is positively related to student achievement. In such an environment it is clear what is valued by both teachers and students. Academic activities and student academic performance are considered to be a central feature of a successful school. This literature has also identified a range of other features of schools that are associated with greater success on academic measures (Scheerens & Bosker, 1997; Sammons, 1999; Taylor, Pressley & Pearson, 2002).

Table 4.2 **Examples of data items for school level (see Annex B)**

Title	Description
School leadership	Principal's activities and behaviours
Composition of student enrolments	Percentage of students whose first language is not the test language
Curricular emphasis	Time spent in school on specific subjects
Extra-curricular activities	Inventory of school activities offered to students
School size	Total school enrolment
Support for teaching and learning	Principal's activities and behaviours on teaching and instruction

These school features are important dimensions of the overall learning environment that have been linked to student achievement generally and reading achievement specifically. Each has been refined into specific questions which are used in the questionnaire of the school principal. With the aim of obtaining high quality data on schools, it is hoped that a range of school policies can be reviewed in many countries to ascertain their potential links to student reading achievement in PISA 2009. But, within the school it is the instructional setting in which the most intensive teaching and learning activities take place.

Instructional Settings

There are two principal instructional settings: the home and the classroom. Obviously the home is an instructional setting where parents provide opportunities in the broader language area by interacting with their children, and in a narrower sense by promoting literacy and reading skills and reading and discussion opportunities. Often the availability of reading materials in the home or the use of public libraries is included as an indicator of support for the opportunity to read outside of school. But, governments typically have less policy leverage over family activities that promote reading.

The more prominent instructional setting over which governments and educators have policy discretion is the school. Although students can be viewed as having received their schooling in a particular school, most of a student's educational experiences at school occur in the classroom. In the classroom the student has been exposed to subject content, curriculum materials, and instructional strategies of specific teachers. Typically, each teacher is specialised by subject area at the secondary level and focused on teaching courses in their specialised areas of the curriculum. Given that so much time is spent in the classroom and the experience is intense, it is likely that the strongest influences of a school on a student's experiences and achievement could be found in this smaller instructional setting. It is therefore important to document the characteristics of teaching and learning and the interactions that take place within the classroom. This section identifies some of the characteristics of the instructional setting that are believed to influence achievement.

Some principal categories in which PISA 2009 has attempted to obtain information on instructional settings include:

- class size
- composition of class enrolments
- teacher quality
- opportunity to learn
- orderliness of classroom environment
- supportive teaching and learning conditions

Although there are many dimensions of instructional settings that may affect educational outcomes, the most important features are usually thought of as the classroom context, the teacher, the curriculum, and instructional strategies. The classroom context refers to the size of classes and instructional groupings as well

as the characteristics of fellow students. It could also extend to the suitability and condition of the physical environment of the classroom. The teacher is characterised by: education and training; teaching experience; pedagogical and subject knowledge and skills; and attitudes towards students, subjects, and instructional approaches. The curriculum refers to the content of the subject that is taught as well as the supportive materials. Instructional approaches refer to methods of pedagogy such as the balance that teachers establish between: teacher lectures and whole group instruction; individual student practice and reinforcement; group activities; and independent projects.

Previous research has found that the complexity of each of these areas limits the comprehensiveness and accuracy of information obtained by any single data collection strategy. Information by survey questionnaires is further reduced by the time constraints imposed by PISA to avoid excessive time demands on respondents. More detailed information would require long individual classroom observations as well as interpretive interviews with teachers and students: techniques that are costly and time-consuming and beyond the resources available. Nevertheless, considerable valuable information that appears to be linked to student achievement can be obtained through PISA's principal and student surveys. Furthermore, it is possible for individual countries to do more intensive studies of classrooms and schools when merited by strong findings from PISA (LeCompte, 1999; Creswell, 2009).

One of the most common measures of academic quality believed to affect student achievement is the size of the class. Parents prefer their children to be placed in small classes, and class size is widely used to assess the quality of a school. Logically, if a teacher has fewer students in the class, more time can be devoted to the educational needs of each student. Furthermore, fewer students mean fewer assignments to evaluate, so a teacher can provide more feedback and assign richer activities and assessments. Smaller classes also enable greater opportunities to participate in class. Teachers can call on more students within a given time period, and students are more likely to be called upon when they offer to respond to questions. If teachers adapt their instruction from teacher lectures to more participative forms of instructions with students, they might get further gains from smaller classes than from maintaining traditional instruction approaches used with larger groups of students. This illustrates the difficulties of separating out the distinct effects of class size from those of instructional approaches.

An important feature of the classroom context is the composition of students in the class. At least two dimensions are significant, the socio-economic and immigrant composition and the levels of ability. The concern about the socio-economic and immigrant composition of students at the classroom level is similar to that at the school level in terms of its impact on learning. When a class has a greater proportion of students from more advantaged families and with fewer immigrants, especially those from lower-income countries where the mother tongue differs from the instructional language, there are positive contextual impacts on achievement that even help the few immigrant or lower socio-economic students in the class. The best teachers often seek these teaching opportunities and set high expectations and a more demanding curriculum with deeper focus and richer content to meet the perception of highly capable students, providing positive academic advantages for all students in the class. In a class with higher proportions of immigrants and students from lower socio-economic backgrounds, teachers adjust expectations and curriculum challenge downward, often in subtle ways. At the same time, there are peer interactions among students through shared ideas, vocabulary and aspirations that influence each other.

However, one could question why the peer composition of a classroom should differ from peer composition of the school as a whole. This applies to schools at all levels of the socio-economic spectrum. Therefore it might seem that schools with a student composition that is largely lower socio-economic in nature might have similar student composition in its classes. But, schools follow different policies with respect to the assignment of students to classes. Some schools stream or track students into classes with other students of similar background and academic performance. In those cases, the school sorts students into classes of different academic ability or native language proficiency - usually a measure of achievement rather than innate ability or immigrant status. Although the rationale is to enable each teacher to improve instruction by tailoring it specifically to student ability, there is considerable evidence that the educational impact of such grouping may widen the gap in achievement among such groups (Oakes, 2005; Gamoran, 1992).

A central concern in explaining differences in student achievement is the quality of the teacher (Wayne & Youngs, 2003). The most obvious characteristics that are assumed to determine teacher effectiveness are the quality and depth of their education, experience, and other teaching qualifications such as knowledge of subject matter and effective pedagogy, particularly as they contribute to proficiency among students. However,

the teacher's approach to instruction and attitudes towards their students and subject are also central. There are many other dimensions of classroom activity that are under the control of the teacher and can contribute to learning such as maximising the active learning time of students, using a variety of approaches, setting high expectations, and providing necessary support for different types of learners. These, and related aspects of teacher behaviour, are obtained through the student and principal questionnaires.

PISA 2009 also makes a special effort to ascertain the opportunity for students to learn. If they are given fewer opportunities to learn a subject, they are less likely to learn as much than if they were given more opportunities. There is therefore a focus on whether students have been exposed to different types of reading tasks and in different subjects. Student opportunity to improve reading depends not only on opportunities in the classroom, but also on those outside of school, and, especially, in the home. These types of opportunities are also likely to be influenced by the priority for reading development set by the school and imposed at the school level.

An orderly classroom environment has been identified as a key condition of learning in the many studies on effective schools. Such an environment is relatively free of disruption, has many predictable aspects in terms of activities and expectations, and is focused on student achievement.

Teaching and learning conditions with respect to reading are also central, though most of the knowledge base on this subject has been developed at the elementary school level. Because students are introduced to reading and reading development at the elementary level, the subject is often taken for granted at the secondary level as one that has already been accomplished. What this assumption ignores is that text at the secondary level is more complex and demanding with respect to achieving meaningful comprehension, and it is also more varied in its demands on the student from subject to subject. For example, reading skills for science, history, mathematics, and foreign languages may differ significantly in the structure of the material, the concepts that must be mastered, and the vocabulary.

To further complicate matters, there is not always agreement on whether reading is even a subject at the secondary school level or whether it is just part of all subjects, in which case many of the subject-matter teachers have not been trained to diagnose or focus on reading development. Accordingly, PISA 2009 has set out several dimensions to evaluate specifically the teaching and learning conditions in the instructional setting.

A different dimension of classroom learning is whether the instructional strategies take meta-cognition into account: the fact that individuals have different ways of learning, and pursue different subjects and tasks that call for different ways of learning (Baker & Brown, 1984; Flavell, 1979; Artelt, Schiefele & Schneider, 2001; see also Chapter 1). Meta-cognition or knowledge of one's usual or most appropriate learning strategies is not only helpful for students to learn efficiently, but appropriate for teachers to use in creating effective strategies for different groups of students according to their meta-cognitive processes. It is also believed that students can be oriented towards different approaches to meta-cognition that can broaden their own approaches to learning. When meta-cognition is taken account of, teachers and students consider the most appropriate learning strategies for achieving.

Other dimensions of the classroom that should be taken into account are the challenge of the learning environment and the modes and media that are used in activating students to undertake reading activities. Along with these are issues of monitoring and feedback with regard to providing teachers and students with information on how well students are performing academically and how to intervene to improve learning. Such feedback must be timely and sufficiently frequent so that both are informed and can continue or change strategies.

Table 4.3 **Examples of data items for instructional settings (see Annex B)**

Title	Description
Class size	Number of students in class of test subject
Composition of class enrolments	Aggregation of student reports on family background
Teacher quality	Teacher's instructional activities, as described by students
Opportunity to learn	Frequency of different reading activities
Orderliness of classroom environment	Frequency of disruption or disorder in class
Supportive teaching and learning conditions	Perceptions by student of teacher interest and support

Student level

Finally, PISA obtains information at the student level to ascertain individual differences among students that can account for differences in educational achievement.

Principal categories of information include:

- socio-economic background of students
- immigration status of students
- student learning styles
- student attitudes and reading activities

It is well-known that students of different socio-economic backgrounds enter schools with different levels of literacy and vary in their preparedness for learning to read and acquiring a high level of reading skills. Since PISA students are 15 years old, these socio-economic differences have had a historical impact reflected in different literacy levels at the time of school entry as well as in their influence on potentially differential rates of learning in the years prior to sitting the PISA test. More educated parents are able to provide a richer set of oral and written literary experiences which contribute to the education of their children both before their children begin school and during school. They are also able to provide more access to written materials for reading as well as travel and other resources that engage their child's curiosity. By the age of 15 it is not only the accumulated effects of schooling that contribute to their children's reading proficiencies, but also the experiences that take place in the home. One of the main purposes of gathering student data on family background is to take into account these influences on learning which are not attributable to the school.

Even so, it is often difficult to separate out the educational influence of family background from school variables for several reasons. Schools in different countries tend to be highly segregated by social class. That is, families of higher socio-economic origin typically select schools for their children that have better resources and educational reputation as well as a high concentration of peers with similar socio-economic backgrounds. In contrast, students of lower socio-economic origin are more typically found in schools with fewer educational resources and a high concentration of students with fewer socio-economic advantages. Since the characteristics of schools and those of families overlap substantially, it is difficult to separate their unique influences. And, to complicate matters there are often interactions between family and school resources that, in combination, have larger effects than when each is considered separately.

PISA attempts to collect extensive background data on students regarding socio-economic measures such as parents' occupations and education, home resources, immigration status, and reading engagement outside of school. This information is used to adjust for differences in achievement that may be due to opportunities outside of the school to attempt to more closely identify school and classroom outcomes. Student attitudes and

activities towards learning in general and reading in particular - how they use their opportunities and interest in reading and how they value the importance of reading - are important interpretive measures for assessing differences in reading achievement. It is not always known how to establish policies to alter these attitudes and reading activities, but with greater knowledge of which are important, it may be possible to consider approaches to alter student perspectives on learning and, consequently, to raise their level of achievement.

Table 4.4 **Examples of data items for student level (see Annex B)**

Title	Description
Socio-economic background of student	Highest levels of schooling completed by parents
Immigration status of student	Country of birth of student and parents
Student learning styles	Information on how student studies
Student attitudes and reading activities	Student preference and behaviour for specific reading activities

CONTENTS OF THE QUESTIONNAIRES

The extensive focus on the four levels of the educational system enables an informed search for statistical patterns that are linked to differences in achievement among countries, schools, classrooms, and individual students. But to reach this goal, the pertinent data that will inform these relationships is needed. PISA 2009 obtains appropriate background information through two questionnaires, one for schools (filled in by the principal or designate) and one for students. These two survey instruments are administered in all participating countries and economies. In addition, three survey questionnaires are provided as international options that countries can elect to have administered to enrich the information base for their schools and students.

- School questionnaire
- Student questionnaire
- Parent questionnaire (international option)
- Educational career questionnaire (international option)
- Questionnaire on student familiarity with ICT or information and communication technology (international option)

Annex B provides a complete list of the items of each questionnaire, but the purpose of this section is to present a brief summary of their contents.

It is important to note that most background items sought in the questionnaires were also used in previous PISA surveys, establishing continuity of data collection for comparison and the ability to search for trends over time. Additional items were created to explore new theoretical and policy dimensions of the achievement relationship, and the new items were subject to field testing to ensure that they were understandable to the respondent and measured the intended information goal. The field testing led to reconsideration and refinement of some of the new measures and omission of those that did not seem to serve their purpose.

School questionnaire

The respondent who is responsible for providing information on the school questionnaire is the school principal or designate, presumably the most knowledgeable person on school characteristics and functioning. This instrument was designed to take about 30 minutes to complete and is the key source of information on all dimensions of the school with additional information provided by students. Questionnaire items have been designed for transparency and to provide a format which simplifies its administration. It seeks to obtain a comprehensive picture with questions on the:

- structure and organisation of the school
- student and teacher body
- school's resources
- school's instruction, curriculum and assessment
- school climate
- school's policies and practices
- characteristics of the principal or designate

Student questionnaire

The student is responsible for providing the information in this questionnaire with an estimated 30 minutes for completion. Although obtaining more information in more detail from students would be desirable, the fact that they must also sit two hours of assessments is an important reason for limiting the length of the questionnaire. The specific categories of information that this questionnaire tries to assess are the student's:

- educational background
- family and home situation
- reading activities
- learning time
- school characteristics
- classroom and school climate
- language classes
- library access and activities
- strategies for reading and understanding texts

Parent questionnaire (international option)

This optional questionnaire is adopted by some countries and economies and delivered to parents by their 15-year-old child. The purpose is to gain considerable additional information on both parents and their children that could be used for more detailed and deeper statistical analysis of achievement patterns. Particular detail is sought on:

- basic parent characteristics
- child's past reading engagement
- parents' own reading engagement
- home reading resources and support
- parents' background
- parents perceptions of and involvement in child's school
- extent of school choice

Questionnaire on educational career (international option)

This brief questionnaire is comprised of only six student questions:

- extended absences
- frequency of changing schools
- expected educational attainment
- lessons or tutoring outside of school
- marks received in language

Questionnaire on student familiarity with ICT (international option)

This questionnaire is designed to ascertain a student's access to computer technologies as well as the extent of use and capabilities for different educational applications. Specific dimensions are:

- availability of ICT devices at home
- availability of ICT equipment at school
- use of computers for educational activities in school
- use of computers for educational activities outside of school
- student capability at computer tasks
- attitudes towards computer use

The first two questionnaires, *i.e.* the student and school questionnaires, are used to provide background information to interpret the achievement results in all participating countries and economies. The last three can only be used for countries and economies which incorporated them as international options. However, the overall collection of detailed information on background variables at all levels of education makes it possible to inquire into particular policy themes which may contribute to better educational achievement in reading and other subjects. PISA 2009 is dedicated to collecting empirical evidence and informing policy making in a variety of relevant areas. To illustrate the use of the questionnaire information for improving educational policy, the following section provides examples of the types of policy themes that might be chosen for in-depth investigation using PISA results.

INFORMATION FOR IN-DEPTH INVESTIGATIONS

Based upon what has been learned from the analysis of earlier PISA studies, the information collected to assist in the interpretation of student performance in PISA 2009 has been enhanced in two ways. First, the accumulated experience acquired from the earlier PISA studies and the more recent scientific progress (Bransford, 2000) on the knowledge base for learning has informed which variables and questions are most essential for further analysis. More specifically, the PISA 2009 questionnaires attempt to capture background dimensions affecting reading performance that are reflected in the increasingly sophisticated literature on reading development that has emerged since the first effort to address reading in PISA 2000. Second, the increased focus on using PISA results to improve educational policy has identified several specific policy themes for which it is hoped that PISA 2009 data might be informative.

PISA 2009 will provide a rich data base to seek information on a variety of topics that are of importance to individual countries or provide an overall assessment of educational performance patterns across countries. Among the many policy themes that could be addressed, five are outlined below. Although considerable information has been collected in previous PISA cycles that bear on these themes, a special effort has been made in PISA 2009 to gain more refined detail about:

- system level indicators
- effective learning environments in reading
- school effectiveness and school management
- educational equity
- cost effectiveness

For each of these themes an attempt has been made to identify specific policy concerns that might be the focus of subsequent inquiry and to provide additional information that might help reply to those questions.

System level indicators

Most analyses addressing patterns of educational performance have focused on differences in features among individual students, classrooms, and schools that contribute to educational achievement. This is understandable because a plethora of educational studies shows that differences in instruction, curriculum, and school and home resources account for important differences in educational experiences and achievement results. However, national, federal or regional governments have relatively limited influence on the finer details of what happens in homes and schools. Rather, they are able to establish the larger organisational and resource framework in which education takes place and that might ultimately influence school and family behaviour. In particular, there are three dimensions at the system level which are both an active topic of educational policy and which might affect the educational performance at the system level. These are the degree of centralisation or decentralisation of decision-making authority, evaluation and accountability, and the degree to which secondary education is comprehensive or specialised.

In recent years many countries have been addressing the issue of how their schools can be more responsive to the needs of specific students, groups of students, and communities. When decision-making is vested in a central authority such as the national government, it is argued that teacher hiring and training and curriculum are too rigid to accommodate the types of differences in student learning found in the schools, and especially in countries with different social conditions and ethnicities. For this reason, many nations have established a variety of reforms to decentralise their schools that place educational decisions closer to the students and communities being served with the hope that this will improve school performance (Hannaway & Carnoy, 1993). Questions on centralisation and decentralisation of school finances, curriculum, teacher staffing, and other areas of school operations have been included in previous PISA surveys, but for PISA 2009 more decision areas are addressed to enable analysis of the impacts of different types of decentralisation on student performance.

Different forms of educational evaluation and accountability have also become more prominent over time. Educational entities at all levels from students and their families to classrooms, schools, regions and nations wish to ascertain the degree to which they are experiencing educational success. At the same time the measurement of educational outcomes provides indicators of accountability of the different decision-making entities in education. That is, the placement of authority and responsibility for decision-making at any particular level implies responsibility for results at that level, and the concern for accountability.

Countries and their regions have established different approaches to evaluation and accountability. Some sponsor periodic systems of testing to gain standardised information on student and school performance at national, federal and highly decentralised levels. Others require such evaluations, but leave it to the regional and local authorities to carry out testing and assessment. Others however lack systematic evaluations. But, accountability also extends to the consequences carried by evaluation results (Koretz, 2008; Carnoy, Elmore & Siskin, 2003). Some countries simply use their surveys of educational performance to inform the general public and the various educational entities. Others use it to provide rewards to schools and teachers for good results and create incentives for better performance. Evaluations can also include school inspections and various forms of individual schools' evaluation activities. They can be used to fix educational performance objectives for students. For example, end-of-course or other external exams might be required for course credit or graduation. Other countries add resources and technical assistance to improve schools where performance is low. The information on evaluation and accountability collected in PISA 2009 has been refined to consider the types of approaches that have been adopted and their possible consequences.

A much bigger debate has taken place over the structure of secondary education. Traditionally countries divided secondary schools between those with an academic focus and those with a vocational, professional, or technical focus. Academic secondary schools were designed to accommodate students who were preparing for further study at university. The other types of schools focused on students who would be entering the labour force directly or undertaking work apprenticeships or short courses to prepare for life in the labour force. At the end of secondary school, students would be divided between the two types of schools according to both their academic performance and their preferences or orientations. Typically academic secondary schools would choose only the higher performing students.

A historic debate has taken place within and among countries on whether such educational separation at a relatively early age denies academic opportunities for those who develop intellectually at a later age, and whether opportunities are determined according to the socio-economic status of the student's family with those of lower status relegated to the vocational institutions (Levin, 1978). Accordingly, many countries have considered establishing and maintaining comprehensive high schools that offer both academic and vocational courses where all students are required to undertake at least a common core of academic work. Even within such schools there are debates about whether academic classes should be heterogeneous in enrolments or streamed by ability. Since students enter educational systems characterised by different structures regarding comprehensiveness of curriculum and student enrolments, it is useful to provide measures of these differences to ascertain both their patterns and potential impact on achievement. Information is gathered in PISA 2009 with the goal of relating it to both overall achievement levels as well as equity in the distribution of achievement.

An in-depth report on this subject would pose a range of research questions and statistical methods to evaluate the potential impacts of decentralisation, evaluation and accountability, and secondary school structure. They would be constructed to explore the impact of these types of arrangements on the achievement of educational systems, schools, classrooms, and individual students. Whether causal relations can be inferred may be problematic, but consistency of patterns should be identified for further investigation.

Effective learning environments in reading

A great deal of research on learning effectiveness in reading has been undertaken since the publication of the PISA 2000 results which focused on reading (Kamil, 2010). In part this research activity was induced by the PISA reading results and the data that were made available in that report on opportunities to learn and improve reading. There have also been more general attempts in recent years to both produce and summarise the results on how to create reading success. All of the previous PISA surveys have gathered considerable information on the instructional strategies, curriculum, teaching resources, and home opportunities for enhancing student achievement. While not all of these survey questions are pertinent strictly to reading, it should be noted that even mathematics and science build on capable reading skills.

A major shift has taken place in the last decade in the student populations that are of interest for studying reading achievement. Most research on reading in the past was focused on the elementary school on the assumption that reading is so fundamental to further learning that it is considered to be a basic skill that must be acquired in the early years of schooling. Thus adolescents were considered to have developed their reading skills in the elementary school, and reading was not a subject of high priority at the secondary level.

In this respect two OECD surveys have shifted much of the focus to the entire educational system. The OECD's International Assessment of Adult Literacy Survey (IALS) found that many adults lacked fundamental literacy skills in understanding reading and applied mathematics, even among those who had attended or completed secondary school. But more recently, and largely as a result of the findings of PISA 2000, it became recognised that a substantial number of 15-year-olds are not proficient readers for the knowledge society. It seems reasonable to assume that reading still is a basic skill which should be acquired in early years, but this skill needs to be further supported and developed throughout life. Students who for some reason do not acquire good reading skills early in elementary school are disadvantaged in many ways in comparison to those who obtained those skills early on. Thus, the challenges of reading performance at the secondary level have been widely confirmed and have become topics of educational concern. This concern has been exacerbated by the growth of immigrant populations whose mother tongue differs from the official language of their adopted society and schools. But, even among native students, PISA 2000 and individual country studies have raised concerns about the status of struggling adolescent readers, ones who can, perhaps, identify and pronounce most words and sentences, but who have difficulties fully understanding content and meaning of what they are able to decipher (Deshler *et al.*, 2007). Because reading is so fundamental to overall literacy and the learning of the other subjects, poor reading performance is an obstacle, in itself, to secondary school academic achievement and further education.

Accordingly, an in-depth investigation of effective learning environments in reading would collect information in PISA 2009 that would enable further research and study for improving the conditions to advance reading performance. That report would contain considerable insights into teaching and learning conditions and their possible relationships to achievement in reading and other subjects. It would enable a deeper range of research that would explore descriptive patterns as well as those that come closer to attempts to model the relationships in a causal manner and to test various hypotheses about the conditions that lead to greater achievement.

This report would address the influence of variables at the level of the system, the school, the classroom, and the individual student and family environment by drawing on the considerable information collected at each level. What is particularly unique about the approach in PISA 2009 is that it advances the types of background and explanatory information collected in the earlier survey on reading for PISA 2000 by building on subsequent research. Thus, it adds more information on teachers that has been identified as potentially pertinent to learning. It places greater emphasis on students' higher order skills, self-regulated learning, and constructivist approaches to learning, all which have been investigated and found to show great promise in raising student understanding and knowledge. It also places more stress on learning facilitation and the student role in learning, including levels of student interest, motivation, and engagement. And in considering the opportunity to learn, it explores more fully the content of reading activities at home and at school.

To address policy relevant concerns, an in-depth report on effective learning environments in reading could incorporate questionnaire items on teacher characteristics such as professional knowledge, teaching motivation, and instructional methods; on classroom characteristics such as class size, student composition, and classroom climate; and the teaching processes that are incorporated into the learning environment. In addition, it could take account of background variables on students such as socio-economic, immigrant status, gender, and their learning approaches and attitudes towards learning. An attempt could be made to uncover both salient patterns of relations between these variables, many of which can be altered or partially changed, and the apparent achievement results.

School effectiveness and school management

A considerable amount of research has been carried out in an attempt to differentiate the characteristics of effective schools from those of ineffective schools. The purpose is to identify the characteristics of schools that are effective in raising student achievement and to apply this knowledge to improve schools. Certainly, this is a potentially important application of information collected by PISA 2009 for guiding school improvement in the participating countries and economies. However, it is important to note that PISA data only captures the situation of students at one point in time in a year.

In general, research on effective schools develops statistical contrasts among successful schools enrolling students of lower socio-economic status in the same geographical area with schools that are not successful academically. Schools with considerably higher academic achievement for the same types of students are considered to be effective schools , and those with poor results are considered to be ineffective schools . The two groups of schools are then compared for their operational features and resources to ascertain how they seem to differ in such areas as goals, leadership, teachers, curriculum, organisational climate, instruction, and evaluation. Substantial differences along these dimensions are noted between effective and ineffective schools serving the same types of students, and these effective school dimensions become the focus of policy attempts to improve schools (Scheerens, 2000; Teddlie & Reynolds, 2000).

Research on effective schools using PISA 2009 data can help to identify potential features of schools that have shown previous connections to student achievement. An in-depth report on school effectiveness and school management could attempt to include information on all of these effectiveness dimensions in studies of the determinants of educational achievement for PISA 2009. That is, using the effective school correlates as a guide, it could construct variables and potential relationships to attempt to explain statistically the differences in student achievement among and within countries. Since many of these variables will be ones amenable to policy manipulation, it should be possible to suggest generally among countries and for individual countries the most promising policy levers for raising achievement.

A particularly important feature of effective schools is that of the school leadership. Virtually all studies of effective schools find that school leadership is central to school effectiveness and identify specific features of such leadership that appear to be particularly important. Effective school leaders put particular effort into establishing and maintaining academic goals among students and school staff as well as maintaining a safe and orderly environment and providing the teaching support and instructional policies that create academic growth among students. They are also attentive to evaluating results and using evaluations to improve the school operations.

The PISA 2009 questionnaires contain considerable data that would be useful for assessing both school effectiveness and school management and leadership. For example, they reflect questions on the specific leadership activities undertaken by the principals of participating schools, activities that have been linked to student achievement

(Hallinger & Heck, 1998). Thus, in addition to the overall attempt to discern policy influences of schools on achievement, a special effort could be devoted to that of school management and leadership.

Since school effectiveness research attempts to either uncover or infer causal relations between school characteristics and student achievement, there are a number of challenges that must be undertaken in PISA 2009 in order to be able to provide meaningful outcomes. One challenge is that significant numbers of 15-year-olds among countries have just begun to attend secondary schools or have attended them for only one or two years. Thus, their present achievement as measured in PISA 2009 is likely to be more closely connected to their previous years of schooling than to the characteristics of their present schools. However, this can be partially addressed by choosing countries for the analysis where the students have attended their present schools for many years. In addition to the findings that are developed from PISA 2009 on effective schooling and school management directly, it is likely that this report could develop a future design for value-added measures where prior achievement is accounted for in exploring how much achievement takes place in the present school.

Educational equity

A central pre-occupation of PISA is that of fairness or justice in access to education and the opportunity to learn. Virtually all countries participating in PISA 2009 recognise that the fullest development of all of their human resources possible is crucial to a just and prosperous society. An in-depth investigation of educational equity and equality requires delineation of two criteria (Coleman, 1993). The first criterion is the identification of population subunits that are to be scrutinised for equity. Although different societies may identify different groups for comparative study, the common population categories that are often used to study equity in education are: gender, socio-economic status, race, religion, ethnicity, degree and type of disability, immigrant status, language, geography (*e.g.* regions or urban/rural distinctions), and public/private school enrolment.

The second concern is that of how to measure equity. Equity can be assessed in terms of the distribution of access to schooling, learning resources and opportunities, and educational outcomes. The richness of PISA 2009 is that most of the population comparison categories are available in the data, and versions of each equity criterion can be used for investigations on educational equity. Other than religion, ethnicity, and detailed data on disabilities, the background questionnaires collect information on the other sub-population groups as well as abundant measures of schooling characteristics and achievement outcomes in all three subjects.

Analyses could be done on linking school effectiveness variables to their distribution. For example, home opportunities, school organisation, instructional strategies, curriculum, class size, and other opportunity-to-learn variables, leadership, and teacher characteristics that have been linked to student achievement could be evaluated for their distribution across different sub-populations of students. Thus, these variables could be examined not only for their apparent influence on the overall level of achievement, but also on equity in their own distribution and the implications for equity in achievement. Specific resources that are used for compensatory education, that is to compensate for educational disadvantage, could be assessed for their distribution across needy populations (Field, Kuczera & Pont, 2007). Analyses could also be undertaken to ascertain if there is a loss of effectiveness when equity policies are implemented, that is, if overall school effectiveness suffers when inequities are addressed. Of particular policy importance, public interventions for reducing inequities such as adding resources to classrooms and schools and providing other compensatory policies could be evaluated for their efficacy at improving equity. And, a specific attempt could be made to ascertain the impact of student composition or segregation of student subgroups on educational performance, a topic of great currency for addressing equity in education.

Finally, an in-depth investigation on this issue would represent a unique opportunity to explore how educational equity has changed since 2000. The previous PISA reports contain many of the same background questions found in PISA 2009. This means that trends in educational resources, opportunities, and outcomes could be assessed for countries as a whole as well as for their subpopulations. In particular, socio-economic and gender differences in achievement results could be compared with changes in educational policy as evidenced by the responses to similar questions that have been used in the four administrations of the PISA studies from 2000 to 2009. This type of longitudinal analysis could also be carried out for other subgroups of students. Thus, such an in-depth investigation would be able to provide concrete information on how equity has changed both among and within countries over almost a decade.

Cost-effectiveness

All educational systems are constrained by available resources. In the quest for improving both levels of academic performance and educational equity, choices must be made among different educational policies in terms of their contributions to effectiveness. But, such choices also have important consequences for costs. That is, there may be considerable differences in costs of educational strategies with similar effectiveness requiring larger budgets and greater resources for some strategies of equal effectiveness than others. Cost-effectiveness analysis takes into account not only the educational impact of any particular approach, but also its costs (Levin & McEwan, 2001). Its application enables the adoption of educational practices that provide the greatest improvement relative to their cost by accounting for both the effectiveness of different alternatives and the resources that they require. In so doing, all resources can be used most efficiently and a given budget and other resources not reflected in the budget can produce the largest possible gain in student achievement and equity consistent with resource constraints.

The effectiveness component of the cost-effectiveness method could be derived from the previous analyses of school effectiveness and effective learning environments, as outlined above. Equity results could be summarised as outlined above. Cost-effectiveness analysis combines this information on effectiveness of alternatives with costs to compare the productivity of alternatives relative to their resource requirements. Resource measures include the value of both public and private costs, measures which are not normally summarised in government expenditures. Public budgets use their own accounting practices which often distort costs of government outlays and ignore costs paid by families, other government agencies, and non-governmental organisations. Accordingly, the most appropriate method for estimating costs according to economists is to set out the specific personnel, facilities, and other resources that are required for each alternative and to estimate their costs directly, a full cost accounting process known as the ingredients or resource method.

An in-depth investigation of cost-effectiveness could then begin with a summary of the achievement and equity consequences of different policy alternatives and a description of the resources required for each one. Data on costs of programmes is not collected in PISA 2009, so the data would have to be collected independently for each country included in the analysis. The total costs of each alternative that has shown educational advantages in raising achievement or improving equity would then be estimated and compared with the magnitude of expected educational results. These comparisons would allow a ranking of alternatives for raising achievement or providing greater equity by their efficiency in the use of resources.

It must be noted that although such an analysis can be done among countries, the averages in terms of both effectiveness and costs tend to hide important differences in both costs and effectiveness that are unique to individual countries. Further, educational policy is set on a country-by-country basis, so that it makes sense to carry out the cost-effectiveness analysis for each country to guide its policy decisions.

Cost-effectiveness analysis can be applied to any policy which yields effectiveness results. For example, to the degree that decentralisation, accountability, school structure, school choice, teacher selection, class size, curriculum, instructional strategies, desegregation, and other educational policies are associated with improved school and student performance, it is possible to match the results for such improvement with the costs of obtaining the gains. Then the educational outcomes relative to their costs could be compared for each of the feasible policy alternatives. The goals of an in-depth investigation on cost-effectiveness would be to elaborate on the method and apply it to the analytic results on effectiveness, relying primarily on information collected for PISA 2009 in the questionnaires.

The systematic attempt to use the research findings on learning and conceptual linkages in interpreting PISA 2009 achievement results requires considerable background information on educational systems, schools, classrooms, and students and their families. Obtaining this information is made possible through the survey questionnaires which have been carefully designed to collect the pertinent interpretive information. Through this most comprehensive approach to pertinent data collection, PISA 2009 will make its most extensive effort to address the policy inferences and consequences of its findings.

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