Dynamic Database for Quality Indicators Comparison in Education

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INVALSI

01/06/2010

Abstract

The purpose of this study is to explore aspects and indicators most commonly used to assess the quality of education systems in different countries through the comparison of 12 national publications describing the state of the educational system.

To compare indicators the CIPP model was chosen. This model is organized in four main parts: Context, Input, Process and Product. Each main part was then divided into categories based on the research literature (e.g., Input is divided into human, financial and material resources).

Based on the CIPP model an electronic database for quality indicators comparison has been designed and implemented. This system is dynamic and easy to update.

Using the database it is possible to compare countries according to several criteria (e.g., main parts and categories of the CIPP model, ISCED level, level of data collection).

The database is available to the public and is designed for researchers and scholastic decision makers.

A first comparison shows that processes at the classroom level are rarely considered, whereas public financial resources as well as achievement results are always included.

The study concludes with a discussion of the findings of the comparison, as well as suggestions for future research aimed at further defining relevant indicators for the assessment of education quality.

Keywords: Educational Indicators, Educational Assessment, Comparative Education, School Statistics, Databases.

Introduction

In many countries both in Europe and elsewhere it is customary to publish a summary framework outlining the state of the education system for the purpose of bringing to light information on the most important aspects of this system – key figures – and making this information accessible to the public, assembling material from different sources and at the same time providing clear and specific reading pathways. An examination of publications from 12 European and non-European countries with a view of assessing the quality of school systems by means of indicators has made it possible to compare the choices made by the various countries, be they methodological and conceptual (theoretical frames of reference, indicators, etc.), or technical and practical (type and frequency of publication, issues discussed, etc.). The project shows how each country, starting from processed information already present in an institutional data-base, has moved on to the construction of a wider theoretical framework capable of organizing the data, whether already collected or gathered ad hoc, in such a way as to allow the identification of aspects bearing on the description and assessment of the quality of scholastic systems in their various organizational configurations (national, local, single school, individual student).

The aspects / indicators identified by each country in its own context permit both spatial and temporal comparisons. Comparisons over time show how different education systems have developed and changed and reveal any effects of reforms or other administrative measures. Territorial comparisons expose differences and similarities among the education systems of different countries and at the same time facilitate an analysis of the 'distribution' of the educational possibilities within each country at all levels (national, local, single school, individual student). The goals of Lisbon regarding education are an example of a joint temporal and spatial analysis. In 2004 the Ministers of Education of the countries of the EU adopted a set of common objectives for the improvement of their education and training systems and a work program for achieving them, known as *Education and Training 2010* (Council of the European Union, 2004). A constantly updated series of indicators and benchmarks was developed for monitoring the progress of each country toward the common objectives established.

In conclusion, assessing the quality of school systems using indicators addresses the goals of making summary information about the most important aspects of the education system transparent and accessible to the public, while at the same time providing policy makers with objective evidence for evaluating the health of their country's system of education and training.

1. Assessing the quality of education systems using 'systems of indicators'

The utilization of systems of indicators is today internationally regarded as the main tool for collecting objective information for the evaluation of school systems. These tools allow comparisons in time and space, making it possible to monitor changes in single phenomena observed over time and in specific contexts (different education systems, different geographical areas, different scholastic institutions, etc.).

1.1. What is an indicator?

In the field of education research, an indicator may be considered as a means of supplying information on the state of an educational system, a device that indicates whether it is working correctly or not (analogous to what happens on the dashboard of a car, where the various instruments allow the driver to check that everything is working properly). The indicator does not in itself say anything about the cause of a particular problem or point to a solution; it simply serves as a symptom that draws attention to one or more aspects of the education system's condition of health (Castoldi, 1996). The definitions of indicators[1] focusing on the education system, must be integrated with the perspective of the individual school in a context of school-based management – that is, of decentralization of the educational decision-making process through the involvement in the schools of both the parents and the community (International Bank for Reconstruction and Development, 2008). The metaphor of the dashboard of a car has often been utilized – and often referred to – in scholastic language. From a strategic point of view the use of indicators reinforces the 'logic of the dashboard', creating conditions in which the school can keep the efficiency and effectiveness of the curriculum under control (Romei, 1999).

The indicators used by different countries are reducible to three main typologies:

- In some cases countries simply supply information that doesn't form a basis for any particular judgment: number of scholastic units, number of students, etc. Information like this is used to design a service, not to evaluate it.
- In other cases, indicators are tapped to study certain aspects more thoroughly (such as incoming or ongoing training of teachers), i.e., they have a descriptive value.
- Other indicators are instead linked to variables which are assigned a value or quality criterion – positive if the variable seems to promote learning and negative if it seems to represent an impediment (for example teachers' transfer requests). In some cases it is enough to know if

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[1] For a more technical definition of indicators in a scholastic setting, see Oakes (1986) and Shavelson and McDonnel (1987)

such a criterion exists or not (whether a laboratory is used for educational purposes, for example), but in most cases this is not enough – it will be important to know the degree to which a criterion exists and, above all, to what extent this is considered acceptable.

Indicators are closely connected to the concept of standards. It is not enough to know how high or low a value is for a certain indicator, but it is also important how close such a value is to the standard established as reasonable in the situation.

Standards can be:

- minimum requirements such as those set by the authorities in each country (e.g., the minimum number of students per class);

- benchmark standards, whose actual level is set against what is considered to be their theoretical level (e.g., grouping together schools of the same type, or students in the same socio-economic range);

- standards concerning objectives – levels of excellence that can be set as goals.

1.2. What is a system of indicators?

Considering the complexity of the situation under analysis – that is, the educational system – it is usually insufficient to rely on a single indicator; it becomes necessary to put together a series of indicators, each of which is capable of focusing on one part of the system. Indicators are not simply juxtaposed measurements; they make up a coherent structure, a 'system' of data that can present a valid picture of a system of education. This is the sense in which the expression 'system of indicators' is preferable to 'single indicator'.

The continuing evolution of systems of indicators reflects the need to arrive at a list that is as sensitive as possible to the assessment requirements of different education systems. This process often coincides with a gradual decrease in the number of indicators themselves[2]. The experience of many European and non-European countries[3], along with that of the INES (*International Educational Indicators*) project dating back to 1987[4] shows that even after decades of experimentation, publications concerning the quality of the education system and the schools are

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[2] An example of this situation is the map of indicators published on the website of the Spanish Instituto de Evaluacion, at
http://www.institutodeevaluacion.mec.es/sistema_estatal_de_indicadores_de_la_educacion/indice_de_indicadores/
[Access date: April 2010]

[3] For example, a report has been published in France since 1991 in which the education system is described using indicators; in Spain a similar report has appeared since 2000; in New Zealand since 2006, while in England the quality of the education system and the schools has been under examination for almost a century.

[4] The INES Project is the most important international initiative involving the construction of a set of indicators capable of comparing the development of different school systems and assessing their effectiveness and qualitative depth. The project was developed in the annual publication *Education at a Glance*.

still reworked and updated, implying a serious commitment to the continuous revision of conceptual frameworks and related structures for gathering information.

Over the years there has been increased attention to educational results and the processes believed to be linked to them, and this has therefore been extended to the indicators required to measure them. The need for a comparison of various countries' approaches to the observation of their own school systems has grown as well.

1.3. Why a system of indicators?

The use of a theoretical frame of reference or framework underpins the structure and selection of the 'system of indicators' inasmuch as it offers a justification of the choices made – an explanation, that is, of the connections between the features described by the indicators and the procedures and techniques of data collection.

A system of indicators is not, or not completely, able to give definite answers regarding the direction and strength of the relationships between different aspects, but it offers the opportunity to explore these relationships and work out a complete picture of the effects and possible causes. As Fitz-Gibbon and Tymms (2002) put it, "An indicator system is only a step along the way to trying to understand what works, and how schooling can be improved. Consequently, some of our indicator systems include process variables such as descriptions of methods of teaching and learning [...]. Process indicators serve to generate hypotheses and most importantly, they stimulate discussion of teaching methods among staff in schools and as such are valuable. The important problems in trying to attribute cause and effect must, however, be continuously emphasised".

Amongst the variety of the indicators analyzed in the several countries considered, three main key points were focused.

The first point is that in most of the more developed education systems the frameworks adopted are structured matching a system perspective with a school perspective, often integrating quantitative and qualitative techniques to collect data.

The second point is related to the evaluation's objectives, which are findable on a continuum having his poles in the two different concepts of 'develop' and 'control': the 'develop' approach focuses on the role that evaluation can play in changing the education system, in a perspective of operators' involvement and constituting a real organizational learning; while the 'control' approach refers to the bureaucratic controls, that is the conformity with procedures and laws.

The third point deals with the definitions of the aspects investigated. While there's a wide convergence about dimensions and areas of research, more difficulties are to be faced up regarding the definition of those elements (indicators, aspects, variables, etc.) considered able to describe

those dimensions/areas. The most common strategy to avoid this obstacle is to publish the conceptual frameworks, in order to make clear aspects to be investigated and procedures chosen for measuring school characteristics.

2. Reports on the education systems of some European and non-European countries

The education systems of several European and non-European countries were studied along with their respective reports. The aim was to understand how information is presented, which framework is defined and used, and what aspects were chosen to describe, present or report to the community the state of the education system.

In some cases the reports are lengthy (Germany's, for example), while others present only brief summaries (as in the case of Finland). Many of the reports refer to a set of indicators, but only a few of these are organized on the basis of a clearly illustrated framework (for example the reports of New Zealand and Spain).

The data are almost always accompanied by graphs that are easy to read and understand, and are often supplemented with commentaries, international comparisons and information regarding more than just the education system.

The frequency of publication varies among the different countries, e.g., France publishes more annual reports, while in Spain they are biannual. Some countries have been systematically producing reports based on indicators for many years, for others this is a recent achievement, and still others (like Finland) have thus far produced only a single publication.

The following are brief descriptions of the reports examined up to now.

- In Australia, in 2000 the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) agreed to the development of a set of national key performance measures to ensure that the key indicators of the outcomes of schooling in Australia would be publicly available. Starting from 2000 the *National report on schooling in Australia* has been available yearly on the website http://www.mceecdya.edu.au/mceecdya/anr/. In 2008 the report provides informations about schools and student, teachers and teaching, resourcing, equity, students attendance, students national and international assessments.

- In Denmark, an annual publication presents a series of key figures in tables and graphs showing development trends, and illustrates these using Danish figures complemented by equivalent figures from selected countries. Key figures for education in Denmark are updated continuously, and in some cases previously published data is adjusted. *Facts and Figures 2007* gives an overview of the Danish education system and a quantitative description of

developments in most of the various fields of education. Most of the figures presented in the publication are also shown on the web site of the Danish Ministry of Education (www.uvm.dk).

- In England, an annual report presents evidence from inspections and regulatory visits undertaken by the Office for Standards in Education, Children's Services and Skills (Ofsted). Evidence is taken from inspection activity across the full range of Ofsted's remit, including childcare, children's social care, local authority services for children and provision for education and skills in schools, colleges and adult learning. The report draws upon the findings both of routine inspection visits and of the focused survey inspections through which inspectors collect more detailed evidence about subjects and aspects of provision in social care, education and skills.

- In Finland, Statistics Finland, the Finnish public authority specifically established for statistics, produces the vast majority of Finnish official statistics, including the field of education. The publication *Education in Finland 1999* provids basic information on the regular education system and other forms of Finnish education, such as enrolment, educational staff, educational expenditure, graduation, level of achievement, transition from school to work and social outcomes.

- In France, the Ministère de l'Éducation Nationale every year publishes *L'état de l'École de la maternelle à l'enseignement supérieur* (available also in English), a brief analysis of the main features of the French education system. This is a collection of 30 indicators concerning costs, activities and results of the school system, going from nursery school right up to university. In addition, the *Indicateurs generaux. Aide au diagnostic, au pilotage des académies et à la contractualisation* has been published since 2000, as a means of monitoring internal variations within the French school system. These indicators supply statistical information on the functions and services of the education system of each of the territorial areas that make up the French scholastic system (*académie*). Their use facilitates the analysis of situations in the *académie* and contributes to the development and monitoring of territorial action plans.

- In Germany, the report *Education in Germany 2008* presents the second comprehensive empirical account of the German education system. The volume analyses all stages of education ranging from early childhood education and care through the general education system, vocational education and training and higher education right up to the continuing education of adults. The report is based on a project which was funded by the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany and the Federal Ministry of Education and Research. The report, the

- In the Netherlands, the Dutch Ministry of Education, Culture and Science presents yearly the statistical publication *Key figures* regarding the results and status of its policy areas in education, culture and science in the last five years. The publication *Key figures 2004-2008* contains information for each educational sector regarding participants, institutions, staff, outcomes and expenditures, pre-school and early childhood education, early school-leaving, Lifelong Learning, the labour market for teaching staff and Dutch education in the international perspective.

- In New Zealand, the website *Education Counts* has been developed to simplify access to quantitative education information for Ministry of Education clients. *Education Counts* has published a set of education sector indicators (http://www.educationcounts.govt.nz/indicators). In order to be more than an *ad hoc* collection of statistics, an explicit framework for education indicators was built. There are six domains to the indicator framework: education and learning outcomes, effective teaching, student participation, family and community engagement in education, quality education providers, and resources.

- In Spain, the Instituto de Evaluacion, directly subordinate to the Ministerio de Educación, has the task of putting together the "State system of education indicators". Beginning in 2000, indicators have been updated every year. Since 2006, one group of indicators, called priority indicators, have been updated annually, while the rest are updated every two years. In the complete edition of 2006 and in the successive 2009 edition, 38 indicators were published, 15 of which were priority indicators. The dimensions according to which the indicators are grouped are: context, resources, schooling, processes and results. The reports and the map of indicators are available on the site of the Instituto de Evaluacion (http://www.institutodeevaluacion.mec.es/publicaciones/index.php).

- In Sweden, the publication *Descriptive data on preschool activities, school-age childcare, schools and adult education in Sweden 2006* gives an up-to-date and comprehensive picture of how pre-school activities, school-age childcare, schools and adult education are organised, including for example the number of pupils and of staff in different forms of schooling. It also gives an account of the expenditures of the different forms of schooling and of the results that are being achieved. It is based on the statistics supplied to the national monitoring system for the education sector.

- In Switzerland, the Confederation and the Cantons have committed themselves to a long-term program of education monitoring. In 2006 a pilot version of the education report was

published, followed in 2010 by the first official version. The Report on the Swiss Education System 2010 is a compilation of present knowledge regarding the Swiss system of education. It contains data from the research, statistical and administrative sectors covering the entire education system, from kindergarten to continuing education.

- In the United States, Congress has mandated that the National Center for Education Statistics (NCES) produce an annual report, *The Condition of Education*. The publication *The Condition of Education 2009* presents 46 indicators. These indicators focus on participation and persistence in education, student performance and other measures of achievement, the environment for learning, and resources for education. The indicators present the most recent available data. In many cases the data are from the last two or three years and in some cases from previous years (2004, 2005, 2006). The website presents an integrated collection of the indicators and analyses published in *The Condition of Education* 2000–2009 (http://nces.ed.gov/programs/coe/index.asp). Some indicators may have been updated since they appeared in print.

3. The model selected

The model chosen for reviewing and comparing the reports from the different countries in question is the CIPP model, *Context, Input, Process, Product*, (Stufflebeam, 1971; Stufflebeam & Shinkfield, 2007). The idea behind the model is simple – for a proper assessment of results (of a system, a program or a project), they must be linked to a preliminary assessment of the inputs, resources and processes activated in a determined context.

The CIPP is seen not so much as a model in which the results are linked by a deterministic relationship with the other variables, but as a schema or conceptual approach that permits, at least on a logical level, the presentation of a complete picture of effects and possible causes. The CIPP supplies information to the different theories that attempt to explain the complex of relations that exist among various phenomena in the field of education. The CIPP model allows a vast number of conceptions to be taken into account concerning school quality, from the traditional economic view based on the productivity of the service (primarily oriented toward outcomes and their social impact, given determined inputs and existing contextual conditions), to the idea of educational development, based mainly on the study of processes at the school and/or class level as a means of improving outputs.

Another way of using the model is to look at each element on its own, determining whether each indicator presents itself in a form that is 'acceptable' (or is at an 'acceptable' level). The OECD

publication *Education at a Glance* (Organisation for Economic Co-operation and Development, 2009)*,* represents the most authoritative example of this conceptual approach to the education system.

3.1 The dimensions of the model

The four dimensions of the CIPP model are:

- the Context the school operates in;
- the Inputs – that is, the resources the education system and the single school units have access to;
- the Processes in place – in other words, the activities undertaken by the school;
- the Results obtained – immediate, medium- and long-term.

Knowing the Context dimension is extremely important. This is what allows the school to adapt to local conditions. In general, the context is a structural fact that cannot be modified by educational action, although some situations may be considered 'malleable' to the extent that it is possible to do something about them, while others are "given conditions" that are harder to change and represent constraints to be taken into consideration.

The indicators in this dimension have been framed in five macro-areas:

- demographic and economic aspects of the population (e.g., *Levels of employment and unemployment*, *Gross domestic product per capita*);
- schooling (e.g., *Proportion of children in school for each level of education*, *Educational level of the Dutch population*);
- size and reach of the school system (e.g., *Number of institutions*, *Schools and pupils by types of school*);
- socio-economic and cultural background of families (e.g., *Level of education*, *Occupation of parents, Children living in low income households*);
- community involvement in a school (e.g., *Involvement of parents*, *Contribution of state and local governments to the implementation of additional services such as a dining hall*, *Institutional grants per participant*).

The Input dimension concerns the resources at a school's disposal. Such resources may consist of human capital (personnel and students), economic factors (financing and available funds) and material factors (available facilities and equipment).

This dimension includes information regarding:

- schools (e.g., *Average size of educational establishments*, *Average number of students per class*);
- economic resources (e.g., *Public spending for education*, *Spending per student*);
- material resources (e.g., *Number of computers per student*);
- human resources (e.g., *Number of teachers*, *Age of teachers*);
- students (e.g., *Students arriving at school early or late*, *Foreign students*).

Research into school effectiveness has over the years contributed to the identification of the processes most closely associated with results and thus to the students' level of learning and scholastic success. Process indicators normally fall into two large groups: processes at the school level and those at the class level. It was decided to recognize the autonomy of a third macro-area which includes processes involving cooperation between schools and local communities.

The macro-areas presently identified are:

- processes at the level of school and territory (e.g., *Participation and involvement of the local community and families in the activities of the school*);
- processes at the school level (e.g., *Hours of teaching offered*, *Time spent on various tasks by the head of the institute*, *Presence of teacher work groups*);
- processes at the class level (e.g., *Small-group projects*, *Support for students with special needs*).

The results produced by education systems take on an importance both in themselves and in relation to the processes put in practice to bring them about, to the resources invested, and to the context, which either does or does not promote scholastic success.

The Results dimension is divided into four macro-areas:

- knowledge and abilities acquired by the students (e.g., *Results emerging from standardized tests*);
- level of education and scholastic achievement reached (e.g., *Proportion of students who graduate*, *Rate of school-leaving*);
- social results (e.g., *Reduction in the unemployment rate among young people*, *Equal opportunity of men and women in access to higher education, Education and labour market status of age bracket 20-24 as a percentage of total,*);
- perceived quality of service (e.g., *User satisfaction*).

4. The structure used to categorize the indicators

As shown above, the framework adopted for the classification of the indicators developed by the different countries under study is the CIPP model, on the basis of which each indicator may be into a tree structure. Beginning with the 'dimensions' (Context, Input, Processes, Results) – within which 'macro-areas' were identified, in their turn containing 'areas' – we arrive at a detailed description of each indicator.

For each indicator, several distinguishing features have been highlighted so as to show how the indicator was constructed, what it is meant to illustrate, and the interpretation of it adopted by the country that uses it. In particular, we have chosen to call attention to features such as:

- the position of the indicator in the framework (the CIPP model);
- a description of the indicator;
- an explanation of its utility, its interpretation and the reason it is considered important by each country;
- technical information that gives details for example about how it was calculated;
- the ISCED[5] level of the indicator;
- the level of presentation of the data – that is, the scale according to which the data are processed / presented (by geographical / institutional area, or at a national level for comparison of different years or for international comparisons);
- the unit of data collection – that is, whether the data were gathered at the level of the single individual (student, parent, teacher), or at the level of the class or the school.

In addition to these, some functional indications were included for each indicator to help trace its origin, such as:

- the country that defined it;
- its original name;
- its original code (if available);
- the macro-area and the area in the original framework (if identified by the country of origin);
- the source, referring to the original document where it was found.

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[5] ISCED (International Standard Classification of Education) is a standard created by UNESCO as an international system of classification for education.

5. A dynamic database for quality indicators comparison in education

The indicators studied have been organized in a dynamic public on-line archive (Dynamic Database) that can be accessed and explored and is structured following the CIPP model.

A functioning database was designed in such a way as to promote the widest possible utilization of its contents[6]. The dynamic structure of the database allows constant updating, it can be expanded and upgraded in keeping with new or more recent publications.

The dynamic database serves as a tool for comparing systems of indicators according to several criteria (e.g., main parts and categories of the CIPP model, ISCED level, level of data collection) and identifying the indicators most used by different countries to portray their own education systems. The database is available to the public and is designed for researchers and scholastic decision makers.

In appendix are shown the on-line archive's structure (*main display*, *custom view, specific indicator file*) and its functions (*filtering* and/or *ordering* the indicators).

6. Comparing indicators from different countries – some results

An initial overall reading of the main display of the on-line Database reveals the priorities used by countries such as Spain, the Netherlands, France and New Zealand in selecting aspects to include in official publications concerning the assessment of school system quality by means of indicators.

For example, a look at the Context dimension for different countries shows that the macro-area *Schooling* (and the two sub-areas *Schooling at each level of education* and *Education level in the adult population*) is a high-priority aspect for all countries. By contrast, the macro-area *Community involvement in schools* is described using different areas by different countries – Spain uses indicators concerning *Involvement*, France those regarding *Additional services*, while for the Netherlands the area explored is *Study grants*. The indicators for *Socio-economic and cultural background of families* of students are widely used – they are in fact frequently correlated with student achievement.

The macro-area *Economic / financial resources* is the one that mainly represents the Input dimension – in particular, the area *Public spending for education* is covered thoroughly by all the countries. Indeed, the indicator *Total education spending relative to GDP* is regularly used in international comparisons. The area *Characteristics of schools* is normally presented in publications

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[6] The home page of the archive of international indicators is http://valsisindpub.invalsi.it/

on education systems, with particular attention given to indicators concerning the number of students and teachers, data commonly used to produce ratios and relative measurements (e.g., *Student-teacher ratio*). The *Characteristics of students* are described using numerous indicators, the most common being those linked to situations requiring specific attention, such as the number of foreign students or repeating students.

Contrary to what might be expected, only Spain publishes data on computer equipment available to students – in general the different countries studied seem not to give much attention to *Resource materials*.

The Process dimension is generally speaking the one least commonly investigated through the use of indicators; it is often the case that countries that identify aspects to explore in this dimension are those with assessment systems that are either external to the school or internal but structured. Spain, for example, develops indicators for the exploration of *Teaching strategies*, the *School climate*, *Cooperation among teachers* and *Leadership/coordination styles*. Some aspects of process are considered by the Netherlands with regard to *Curriculum and didactic activity design* (for example with the indicator *Schools' autonomy in determining the content of their curriculum*).

Information in the Results dimension concerning *the Level of education reached and Scholastic achievement*, and concerning *Direct results of education* is found in the publications of all the countries considered; particularly *Rates of school-leaving* and *Student levels of knowledge and ability* explored on the basis of the results of standardized tests are always included both in territorial comparisons (international, national, local and by single school unit) and comparisons over time. Only the Netherlands also includes aspects regarding *Results of equal opportunity policy*. Some countries choose to develop aspects specifically linked to their own social context; New Zealand for example highlights the difficulties of its young people by exploring themes such as *Youth suicide*, maintaining that themes such as these have implications for both families and schools.

One interpretation of the French indicators regarding *ISCED levels* highlights the concentration of attention on lower and upper secondary schools (ISCED levels 2 and 3) compared with primary schools (ISCED level 1). For secondary education, in fact, numerous indicators are included both for Input (especially under *Characteristics of students and schools*) and for Results. One of the most detailed studies in this dimension shows how the French system concerns itself much more with indicators of *Scholastic achievement* (23 indicators) than with those concerning *Student levels of knowledge and ability* (4 indicators), by contrast with other countries. New Zealand, Spain and the Netherlands, for example, have more or less the same the number of indicators of *Scholastic*

achievement as they have for *Student levels of knowledge and ability*, the latter including results from the international tests PISA, TIMSS and PIRLS.

Another key to interpretation concerns data collection units; it is notable that in all the countries studied most of the indicators are developed from databases already established by various ministries of education or institutes for evaluation (data collected at a centralized level). Indicators collected at the class level are much less frequent.

In the case of data collected at the level of the individual, a comparison of various countries reveals a difference between French and Dutch publications on one hand, and those from Spain on the other. In the first two countries, information collected at the individual level almost always regards the students' results, while Spain integrates these with information on students' aptitudes and behaviour.

This first review of results shows the potential of the online database. The goal for the future is to explore, expand and define new keys to interpretation, providing insights to policy makers and educators and, more generally, to the public.

Appendix - The on-line database: structure and functions

The home page of the archive of international indicators is http://valsisindpub.invalsi.it .

The database is available to the public in Italian language. The English version is in progress.

Fig. 1. Main page

As shown below the on-line archive can be browse in three ways:

a. *Main display*

In the main display a navigable webpage presents the four main dimensions of the CIPP model. For each dimension it is possible to expand the view in order to explore the complete contents, including all the macro-areas, areas and indicators it contains, following the tree structure defined by the model.

It is possible to view one or more dimensions on the same page.

Fig. 2. Main display
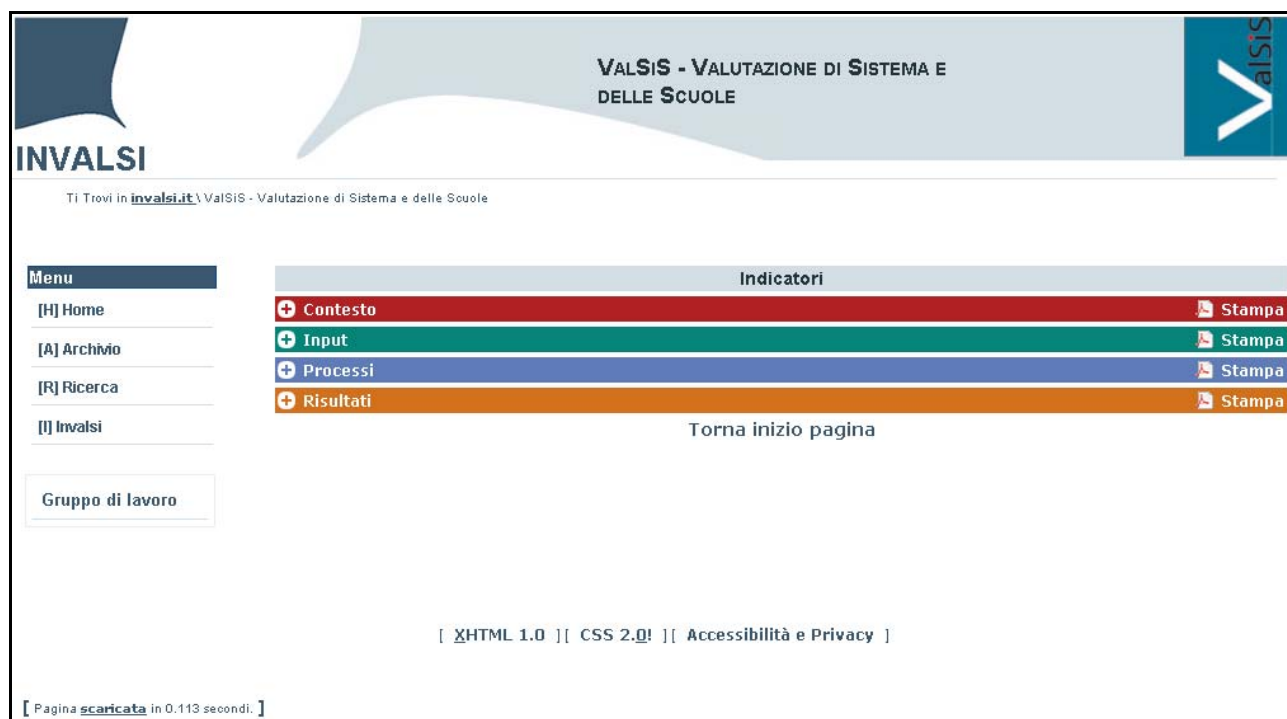
b. Custom view

In the section of the site labelled 'Ricerca'[7] (*Research*) the user can move from the default main display to custom views by filtering and/or ordering the indicators in the database according to a series of criteria:

- the identification code for each indicator, inserted in the database through an open field – knowing the code of an indicator allows the user to identify it directly;
- the dimension – choosing one of the pre-defined dimensions allows the display of all the indicators it contains;
- the macro-area – the user may select one of the macro-areas already specified or perform a search based on a key word;
- the area – it is possible to enter a specific word and then filter the indicators only for those areas that contain it (e.g., if the word "resources" is entered, indicators will be displayed from the areas *Resources of schools*, *Economic / financial resources*, *Resource materials*, *Human resources*);
- the name of an indicator – it is possible to enter a key word and view only the indicators that contain it (e.g., entering the word "spending" will show indicators such as *Total spending for*

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[7] http://valsisindpub.invalsi.it/search.php

education as a percentage of GDP, *Total public spending for education*, *Education spending per student*, etc.);

- the ISCED level – indicators may be selected on the basis of one or more of the levels of education that the user wants to look at (e.g., level 1 – primary school, level 1 and 2 – primary and lower secondary school);

- the data presentation level – the user can select indicators on the basis of the territorial level at which they were presented by the different countries (e.g., only indicators compared at the international level, or only indicators compared at the regional level);

- the unit of collection – indicators may be selected on the basis of the unit for which the information was collected (e.g., for the individual or for the school).

Fig. 3. Custom view

In addition, several pre-defined reading pathways will be put in place, for example, it will be possible to view the set of indicators related to the Lisbon objectives, or a set that includes indicators helpful in the development of a school progress report.

c. The specific indicator file

However the contents of the database are displayed, whether it be the main or the personalized display, it is possible to select an individual indicator and open a file containing the following details:

- Id – a unique identity code for each indicator.

- Country – the country that defined it.

- Dimension – the dimension under which each indicator is classified by the CIPP model.

- Macro-area – the macro-area in which each indicator is entered according to the reference framework.

- Area – the area in which the indicator is entered according to the CIPP model.

- Indicator name – the name of the indicator translated into Italian.

- Original name – the name of the indicator in the original language.

- Description – a brief description of the indicator (e.g., percentage of the adult population between 25 and 64 years of age who have completed a certain level of education).

- Explanation – introductory or explanatory comments on the use and interpretation of the indicator (e.g., this indicator presents data on young people with a school education between 0 and 29 […]).

- Technical information – any available technical information on the construction of the indicator, whether from a document or the original website (e.g., the definition of levels of education lower than primary school refers both to citizens who are illiterate and to those who know how to read and write but have not had at least 5 years of schooling […]).

- ISCED level – the international codes that indicate the level of education that the indicator refers to. The ISCED levels are: 0 – pre-primary school, 1 – primary school, 2 – lower secondary school, 3 – upper secondary school, 4 – post-secondary training (non-university), 5 – tertiary education (university degree) 6 – advanced tertiary education (doctorate).

- Data presentation – the level at which the data are processed / presented. This can be international if the data are used for comparison with similar data from other countries (e.g., *Public spending for education*), national if the data are presented in aggregate for the whole country (e.g., *Number of institutions*), by territorial / institutional divisions (e.g., *Number of students in each region*) if the data are presented and compared following the organization of a country's internal territorial or administrative units. An indicator can be presented in several ways at the same time.

- Units of collection – the physical unit used in data collection. Data present in existing databases can be collected at a centralized level (e.g., *Gross domestic product per capita*), at the level of the school (e.g., *Profile of the school principal*), at the class level (e.g., *Students per class*), and/or at the level of the single individual (e.g., *Mathematics results from a standardized learning test*).

The same file goes on to present data that allow the user to trace the indicator to its original document:

- Document source – the source (document or website) where all the information in the file was found.
- Data source – the official source of the data used in the creation of the indicator (if available).
- Code – the original reference code used by the country (if available).
- Macro-area – origin – the macro-area where the indicator is classified by the country that defined / used it (e.g., New Zealand classifies the indicators in 6 macro-areas: *Education and learning*, *Student participation*, *Family and community*, […]).
- Area – origin – the area where the indicator is classified by the country that defined / used it (e.g., Spain puts the indicators for schooling in different areas, such as *Schooling at each educational level*, *Schooling and population*, *Evolution of school attendance rates* […], *Access to higher education*, *Foreign students*, *Recognition of diversity* […], *Participation in lifelong learning*).

Fig. 4. The specific indicator file

Indicatore		Stampa
Indicatore	354	
Dimensione	Input	
Macroarea	Risorse economiche / finanziarie	
Area	Spesa pubblica per l'istruzione	
Nazione	Nuova Zelanda	
Livello ISCED(?)	1, 2, 3	
Nome Indicatore	Spesa annuale per studente	
Nome originale	Annual expenditure per student	
Descrizione	Spesa annuale per studente nella scuola primaria e secondaria (marzo 2010).	
Spiegazione	Un'analisi quantitativa effettuata utilizzando dati provenienti da scuole di lingua inglese (DFES, 2001), ha fornito prove di una positiva e statisticamente significativa relazione tra gli investimenti di capitale e i risultati degli alunni. La spesa pubblica per studente è di particolare importanza quando la situazione socio-economica della famiglia dello studente o della comunità scolastica è bassa. Maggiore risorse per studenti sono necessarie per superare le barriere di apprendimento connesse con l'accesso alle risorse ed alle tecnologie dell'informazione e della comunicazione (TIC), e fornire opportunità legate al capitale culturale e scolastico. Una scuola efficace richiede la giusta combinazione di formazione e di talento personale, attrezzature adeguate e moderne e studenti motivati pronti ad imparare. La domanda di un insegnamento di alta qualità, che può tradursi in un aumento dei costi per studente, deve essere bilanciato rispetto alla richiesta di oneri eccessivi per il contribuente. Anche se è difficile valutare il volume ottimale delle risorse necessarie per preparare ogni studente per tutta la vita e per il lavoro nella società moderna, i raffronti internazionali di spesa per l'istruzione per studente sono in grado di fornire un punto di partenza per valutare l'efficacia di diversi modelli di insegnamento.	
Note tecniche	**Numeratore**: spesa annuale totale per la scuola primaria e secondaria usando la parità del potere d'acquisto per il PIL. **Denominatore**: numero totale di studenti della scuola primaria e secondaria full-time.	
Presentazione dati(?)	Internazionale, Nazionale	
Unità di rilevazione(?)	-	

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[H] Home
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[R] Ricerca
[I] Invalsi
Gruppo di lavoro

Fig. 5. References to the original document

RIFERIMENTI AL DOCUMENTO ORIGINALE	
Codice	Resources 2
Macroarea - origine	Risorse
Area - origine	-
Fonte dati	OECD, Education at a Glance Ministry of Education: July School Roll Return
Fonte documento	Disponibile su: <http://www.educationcounts.govt.nz/indicators> <http://www.educationcounts.govt.nz/technical_info/indicator_definition> Data di accesso [anno 2009]

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