Getting SMART with data in schools: Lessons from NSW

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Abstract

Lifting the performance of New South Wales (NSW) students in literacy, numeracy and other key outcome areas to world-class standards is a central priority of this Government. The crucial responsibilities, shared between schools and the system, for effective educational provision are articulated in the most recent Framework for School Development and Accountability for NSW government schools. The role of 108 very senior officers, School Education Directors, recently appointed to regions across the state, is to ensure the effective implementation of this framework. The aim is to consolidate and focus existing accountability, improvement and reporting policies to improve and enrich student outcomes.

Essential to this framework is the vast store of information available within the system and its schools on student outcomes: academic, social and affective. Accessing, managing, analysing and interpreting this store of information are tasks fundamental to the success of the Department, its schools, and for high quality provision for the students in their care. Significant challenges have been overcome through the development of state-of-the-art information and communication systems (ICT) that bring complex data to the finger tips of staff in schools and regions in highly usable forms. An outstanding example is the School Measurement, Assessment and Reporting Toolkit (SMART) that facilitates the gathering, monitoring, analysis and reporting of data in NSW public schools.

This paper looks at the strengths of the SMART package, its role in engendering educational progress in NSW and the plans the Department has for its future development. The paper will describe how SMART can play a crucial part in striking a balance between internal and external assessment, and between assessment for instruction and assessment for accountability.

Introduction

Governments everywhere are seeking reassurance that their school systems are delivering the results students need to succeed in an increasingly complex society. At the same time, schools have been given greater autonomy and freedom to manage their own affairs and develop school-specific instructional and improvement strategies. These two sets of forces have given rise to more sophisticated monitoring and analysis systems to ensure that standards are improving and that schools are being adequately supported in their work.

A consolidated school development and accountability framework, the Framework for Development and Accountability, has been devised by the NSW Department of Education and Training to bring together elements contained in existing departmental policies and agreements.

The Department's accountability and improvement functions have been supplemented in successive restructures, most recently and explicitly through the appointment of 78 School Education Directors with line management responsibility for principals, both formally through annual review and professionally in terms of leadership support and professional growth. Thirty School Development Officers attached to regions have also been recently appointed to provide additional leadership and guidance to schools in self-evaluation, planning, development, data analysis and reporting.

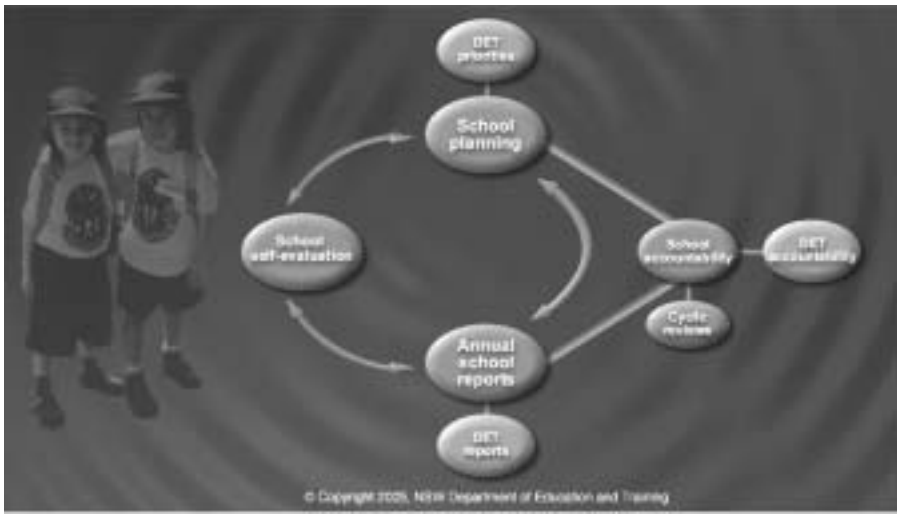

Figure 1 NSW framework for school development and accountability

The framework for school development and accountability

The Framework for School Development and Accountability is based upon the following principles:

- the need for accurate, reliable data about each school
- supplementation of student outcomes data with the results of in-school evaluation
- evaluation of school performance as the first step in a process of school development and improvement
- effective school planning to stimulate the development cycle
- school planning will suggest goals that form the basis for reporting to the community
- balance between school accountability and development activities
- evaluation of school performance to provide the foundation for reporting on accountability.

A framework based on these principles will necessarily lean heavily on the vast store of information held by schools and the system on the achievements and demographic features of students. The paper will now consider more closely the role of testing and assessment in NSW.

Testing and assessment

The tension between the twin goals of development and accountability is reflected in the imperative to strike a balance between *instructional assessment* and *performance measurement* at both the school and system levels. Cizek (2005) regards high stakes [accountability] tests as incapable of providing high-quality information for instructional purposes and queries if relative group performances have anything meaningful to say at the school level. The NSW experience is that testing and assessment programs can effectively serve these two purposes at once but only if the design of the tests is appropriate and there are mechanisms in place to convey the critical diagnostic and performance-related messages to the right people in a flexible and timely manner.

The design for equitable testing, assessment and monitoring tools involves clarifying the purpose and underlying constructs for the assessment, and identifying the sorts of inferences that can be drawn from the assessment (Willingham & Cole, 1997). The use of instruments developed using modern measurement theory, based on concepts of cognitive processes in learning and inferential methods, provides a foundation for testing that permits a more meaningful interpretation of achievement in relation to a defined latent trait (Mislevy, 1993). As Cunningham (2005) points out, these tests have the potential to incorporate both multiple-choice and constructed response items so long as both components are contributing to the measurement of the same construct. The strength of this approach is seen across the test development process, in item analysis and reporting and in establishing a set of linked tests to report in relation to set standards across time (Thissen & Wainer, 2001). There is greater scope for such instruments to serve the needs of macro-reporting while providing more useable information at more local levels.

The experience in NSW is that the right sort of tests and support materials can strike a balance between the micro and macro reporting levels and win support from the profession for state-wide testing. In a wide-reaching evaluation of assessment practices in NSW, Eltis (2003) found surprisingly little hostility remaining amongst teachers towards the expanded level of state-wide testing in NSW. State-wide tests have come to be valued by school leaders, teachers and parents for their diagnostic scope, as well as for their ability to locate the performance of the school's students relative to other

students across the State. Eltis found the availability of quality diagnostic information from the testing programs and professional learning opportunities for teachers and school leaders were major contributors to the growing success of these tests.

Internal and external assessments

Parker and Rennie (1998) raise the issue of the relative value placed on internal and external assessments. Clearly, both forms of assessment can provide measures of achievement; however, external (most often test-based) measures remain the focus of many, but no longer all, tertiary institutions and employers. Assessments based on a wider sampling of the curriculum over a greater period of time are arguably a more valid but under-reported construct compared with one-off external tests. Nevertheless, lower value is often placed on the internal school-based assessment, even within education systems and schools themselves. The origins of this perception probably lie in the perceived limitations of school-based assessments as expressed in the concern for consistency of teacher judgements, between teachers and over time, and between students, and hence concern for the fairness of the assessment (Linn & Gronlund, 2000). Eltis (2003) suggests a closer alignment is needed between internal and external assessments, using external assessments as a part of a broader framework for reporting and cross-validating internal school-based assessments.

In NSW, the provision of high quality tests and ICT systems to align internal and external assessments are seen as crucial to effective assessment practice and a key development in the State's school improvement and accountability systems. The ICT systems will now be discussed.

School Measurement, Assessment and Reporting Toolkit (SMART)

The NSW Department's Data on Disk software was developed in 1997 following recommendations put forward by schools in the 1995 Review of the Basic Skills Test for software to be developed that would enable schools to analyse their results electronically, freeing school staff from the many hours needed to analyse and copy data from the paper versions of the reports. Prototypes were developed and trialled in 150 schools across NSW in 1997 and 1998. Feedback from the trialling was used to strengthen the software's functionality and in 1999 the software was rolled out to schools. The software has undergone significant enhancements since 1999 and provides schools with what can be described as an outstanding set of analytical tools to support schools in making informed decisions on pedagogy, quality teaching and learning and improving student learning outcomes. The software has been widely accepted and used in all NSW government primary schools, and also by South Australian government and Catholic schools, NSW Catholic Education Commission schools, NSW Independent schools and many overseas International Schools, including one in PNG.

Until 2004 the software was only available to schools participating in the Basic Skills Testing Program. Since then the Educational Measurement and School Accountability Directorate has consolidated and streamlined the reporting software, now known as the *School Measurement, Assessment and Reporting Toolkit* (SMART for short), and made it available to all schools participating in all the NSW state-wide testing programs including the Basic Skills Test and Primary Writing Assessments in Years 3 and 5, the Computer Skills Assessment (CSA) in Year 6, and the English Language and Literacy Assessment (ELLA) and Secondary Numeracy Program (SNAP) in Years 7 and 8. The most recent additions to the package provide analysis of the School Certificate and Higher School Certificate examinations. NSW's innovative Essential Skills in Science Assessment will come on-line in trial form in 2006. Other modules under current development will see the package expanded to include teacher assessments of students, questionnaire and survey tools, and an assessment item data bank. Figure 2 presents the structure of the SMART package in graphical form.

Plate 1

SMART is an outstanding schooling outcomes analysis package. It offers Principals and senior teachers in NSW schools an innovative tool for analysing and comparing a school's learning achievement results by drawing on the most extensive student outcomes database in Australia. The sophistication of the package means that in-school and across-schools comparisons can be made easily, incorporating data drawn from a number of years across a variety of assessment situations. I believe the applicability of the package to

assist schools in a climate of evidenced based decision making is world class and as far as this writer is aware is not matched by equivalent software in any other state in Australia or country.

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NSW legislation protects privacy and personal information, and prevents the publication of test results for individuals or schools that could be used for the creation of league tables. One of the core functions of SMART is to ensure that all data is appropriately locked preventing unauthorised access to individual and school results. This has been achieved through a sophisticated process of data encryption and unique passwords that still enable backward compatibility to previous data sets. The passwords also manage permissions to access various levels of the data. Regional passwords allow access to all school data for the Region and its associated education areas, and school passwords only allow access to their data at administrative and class teacher levels.

The data and analysis functionality available to schools for the testing programs is impressive and includes:

- the ability to create Custom Groups of students such as class groups and students involved in special programs such as Reading Recovery
- tables in PDF format, including school summary information and the ability to regenerate detailed reports on individual student for the information of parents and teacher
- access to analysis for groups of students across the performance bands (skill bands) including the students in custom groups – this is particularly powerful for providing evidence of improved student learning outcomes and effective pedagogy
- schools can access information concerning the performance of students on individual items at the group or school levels – this includes patterns of student responses and additional distractor information detailing the reason why students chose particular options.

Plate 2

I firmly believe that for large-scale assessment programs there is a need to make an overt link that the data that emerge from such programs are part of a continuous stream of information that tracks the progress of students and programs over time. Another part of the stream is the data that emerges from the teaching and learning process that takes place on a day-to-day basis. Together they give a better picture of student progress than either of them individually.

SMART provides a conceptual link between the state-wide assessment programs and school-level use of the same data in promoting student learning. The Program is user-friendly and enables teachers and administrators to "drill-down" into the test results in a very systematic and logical way. The feedback is linked directly to the curriculum so; in that sense it reinforces the notion that the curriculum is the unifying construct underpinning teaching, learning and assessment.

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- Information investigating Individual Student Responses to various questions. Details provided include links to the relevant NSW Syllabus, to ESL scales and advice as to where to access teaching strategies to support teaching and learning.
- The most recent release of SMART includes linkages to teaching and learning strategies and resources with wide-reaching implications for professional learning and program development.
- Local area, customised comparative school groups, like school group and state trend data is available to all schools. Trends for various test aspects are also available disaggregated, for example, by gender.
- Item analysis enables schools to filter information on the performance of the school or for various groups of students for particular skills. This is an extremely powerful tool in filtering performance, for example, by literacy/numeracy, by subject and by sub-strands.

- A common reporting scale is used to map student progress between, for example, Year 3 and Year 5 or Year 7 and Year 8
- Student Progress Maps allow the user to identify individual students and drill down to the specific performance of the individual student directly from the graph.
- Important information on the overall progress of students within the school can be discovered when they are compared to the rest of the state in value added terms. Individual student performance can be compared to all other students of similar prior ability. Value- added measures are also prominent in the new packages developed for Years 10 and 12.
- Schools can export data from the software into various spreadsheet applications. This enables schools to add additional information to individual student data and then perform further analysis.

Other SMART modules

School-based assessment module

The most recent developments in SMART include a module for the capture, analysis and reporting of teacher school-based assessments. There is no universally available software in NSW to help with capturing data in schools on the achievements of students against standards frameworks. The module will facilitate data entry and data import, make links to external tests and examination results, allow schools to design biannual reports to parents on the achievement of students, allow analysis of the data and facilitate the accumulation and presentation of data for school and system planning, and for annual reporting to parents and the community.

The school-based assessment module will form the nexus between external and internal assessments and has the potential to see the consistency of teacher judgements and hence the significance placed on school-based assessments, greatly enhanced.

Survey module

SMART will soon have a fully functional module for accessing the Department's surveys and questionnaires, designing custom surveys and analysing and presenting these results. This important initiative makes explicit the connection between academic, social and affective outcomes. This part of the toolkit will facilitate the collection of data from students, teachers, parents and the community. It is planned for release by the end of the 2005 school year.

Assessment Item Data Bank

From test items created by the Educational Measurement and School Accountability Directorate we are constructing a databank of test items from those not required for current testing programs. At this stage, it is simply going under the title of 'Assessment Item Databank'.

As a classroom teacher, using released and aligned test items in our State's Assessment Item Databank, you will be able to select test items to assess how well your students are meeting syllabus outcomes. Once you select the assessment items, you will then be able to print out a test and answer key.

Now that you know how well your students have mastered the syllabus outcomes, you can then visit the linked teaching strategies site to identify best practices in education to teach and or re-teach specific outcomes.

NSW DET has a wealth of material and expertise to construct a test item databank. From our extensive testing activities we have a huge store of test items from which to construct an Assessment Item Databank. We estimate that we hold some 20,000 items if we include both published items and items that have been trialled but not published.

In the construction of the Assessment Item Databank we recognised three essential requirements. Firstly, the number and type of items authentically reflect the nature and emphases of the syllabus outcome to be measured. Secondly, the items meet accepted standards of content validity and psychometric quality. Thirdly, the item bank is easy to use and maintain. It is vital that classroom teachers can easily manage the test item database and build tests to their specifications.

Conclusion

NSW schools are taking more responsibility for their own performance, are subject to closer public scrutiny and are finding new ways of improving student outcomes in a world of ever-more demanding standards. In the context of the NSW Framework for School Development and Accountability, an effective school will be one that is constantly striving to enhance its educational provision through a process of self-evaluation, reporting, review and development within the resources available to it. A fundamental premise underlying the framework is that neither accountability nor school improvement efforts, on their own, will be sufficient to produce improved student outcomes.

NSW public schools are being presented with quantitative data

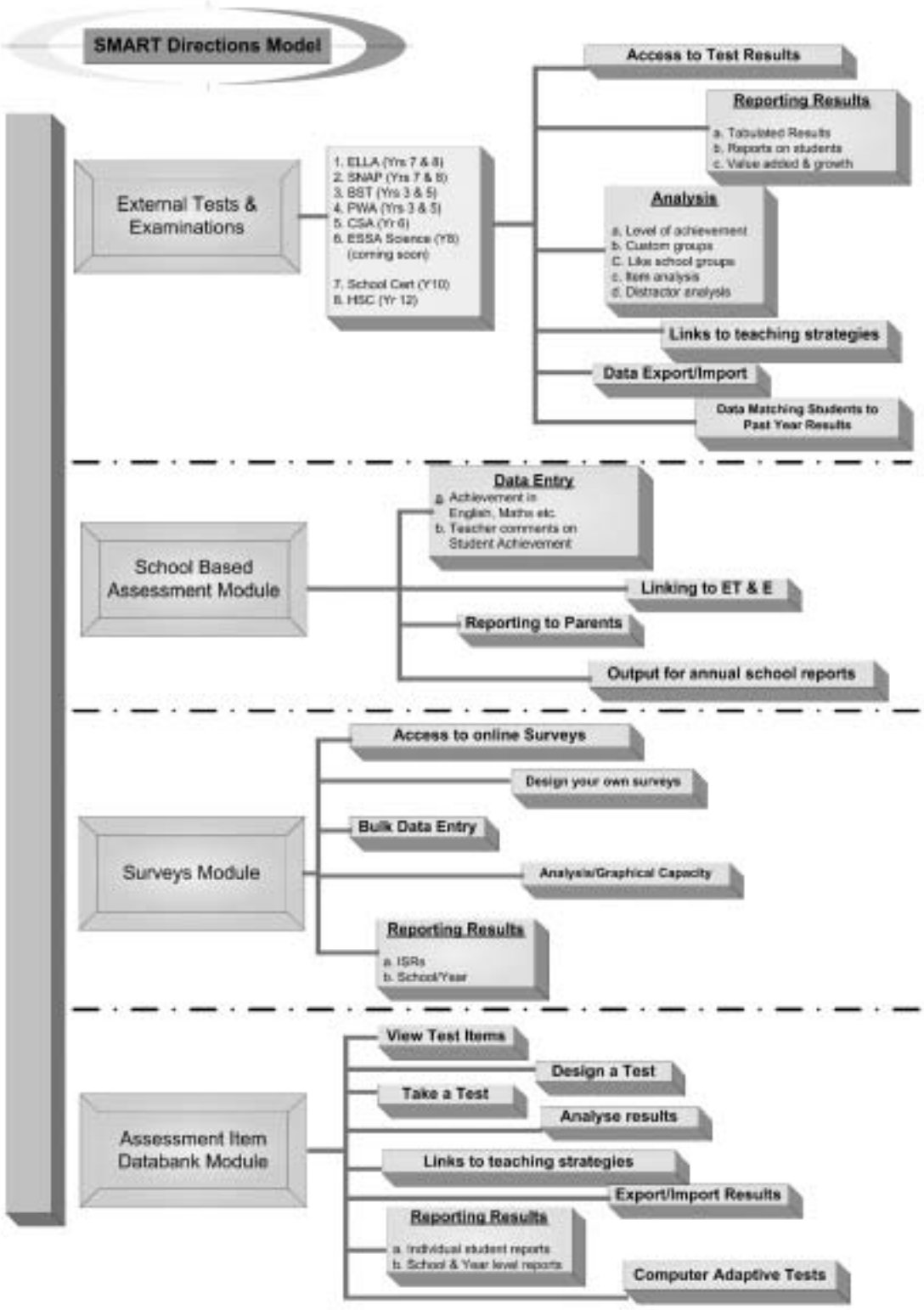
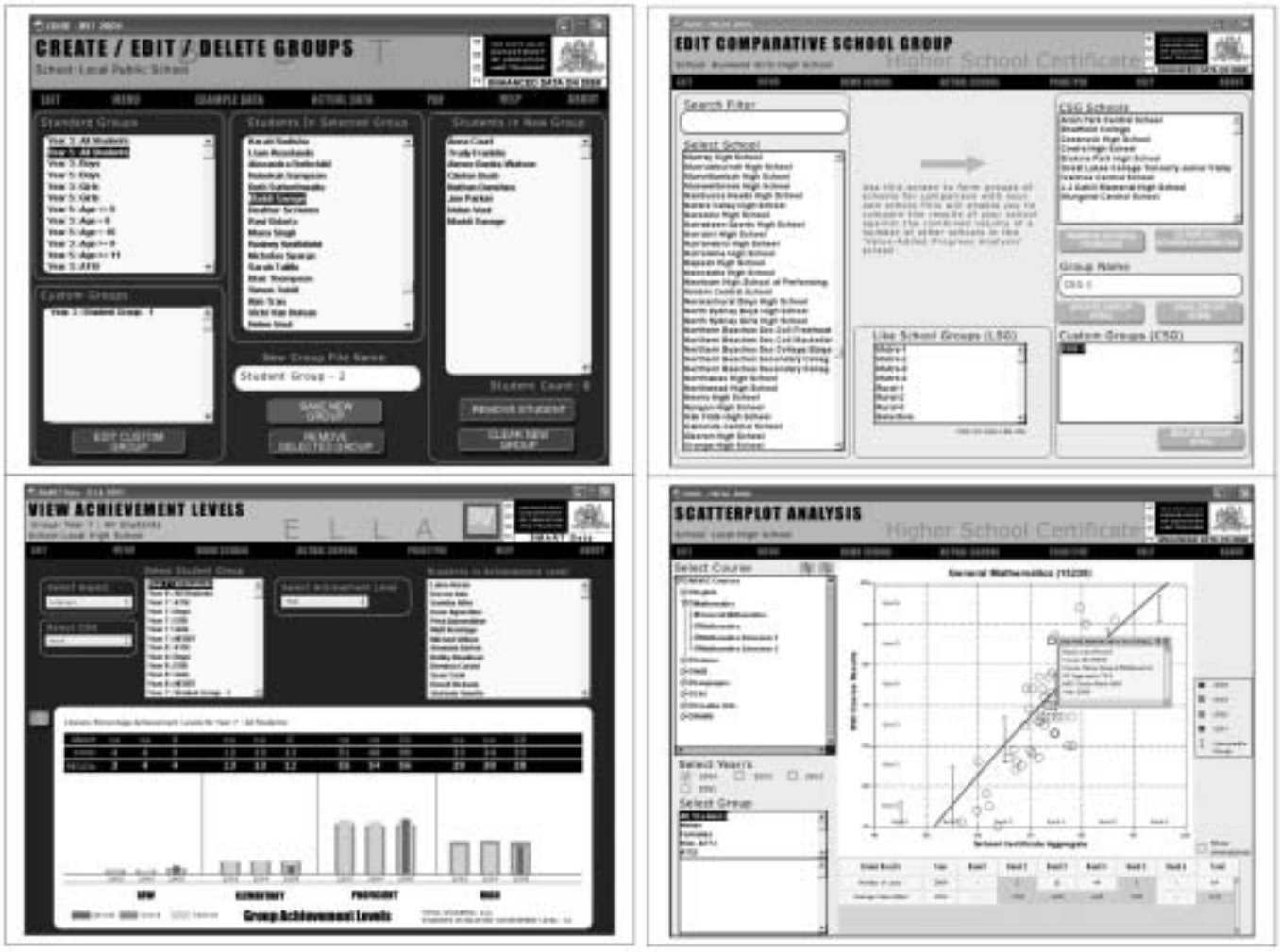


Figure 2 Structure and functions of the SMART package



comparing school performance with state-wide achievement levels, value-added measures generated from external tests and examinations, tools for the collection of both quantitative and qualitative data from within the school and its community, and highly flexible, diagnostic tools for the management, analysis and presentation of outcomes information. The availability of very senior staff in regions assisting each school to undertake self evaluation and planning in which the community plays a part, and which incorporates analysis of the statistics and the setting of targets for school development completes the framework.

The SMART toolkit is cutting edge technology for schools. Nowhere else nationally and perhaps internationally do schools have access to such a sophisticated analysis package that enables the manipulation and investigation of student performance. NSW schools are uniquely positioned through their access to the SMART package to consider detailed information to support specific and tailored intervention strategies for improving student learning outcomes.

References

Cizek, G. J. (2005). High-stakes testing: contexts, characteristics, critiques, and consequences. In R. P. Phelps (Ed.) *Defending Standardized Testing*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Cunningham, G. K. (2005). Must high-stakes mean low quality? Some testing program implementation issues. In R. P. Phelps (Ed.) *Defending Standardized Testing*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Eltis, K. (2003). *Time to Teach, Time to Learn: Report on the Evaluation of Outcomes Assessment and Reporting in NSW Government Schools*, State of NSW, Department of Education and Training.

Linn, R.L., & Gronlund N.E. (2000). *Measurement and assessment in teaching* (8th ed.). Upper Saddle River, New Jersey: Merill Prentice Hall.

Meisels, S.J., Dorfman, A., & Steele, D. (1995). Equity and Excellence in group-administered and performance-based assessments. In M.T. Nettles and A.L. Nettles (Eds), *Equity and Excellence in Educational Testing and Assessment*. Norwell, Massachusetts: Kluwer Academic Publishers.

Mislevy, R. (1993). Foundations of a new test theory. In N. Frederiksen, R.J. Mislevy and I.I. Bejar (Eds), *Test Theory for a New Generation of Tests*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Parker, & Rennie (1998). Equitable assessment strategies. In B.J. Fraser and K.G. Tobin (Eds), *International handbook of science education*. Great Britain: Kluwer Academic Publishers.

Thissen, & Wainer (2001). *Test scoring*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Willingham, W.W., & Cole, N.S. (1997). *Gender and fair assessment*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

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