ASSESSMENT AND REPORTING PRACTICES IN MATHEMATICS - AN INTRODUCTION TO A NATIONAL SAMPLE STUDY FOR THE 1991 REPORT ON SCHOOLING

WILL MORONY AND KEVIN OLSSEN
Education Department of South Australia

This project was commissioned by D.E.E.T. for the Australian Education Council's Working Party on an Annual National Report on Schooling and conducted during 1991-2. Its aim was to document school assessment and reporting practices across Australian schools. A substantial survey instrument was developed and used to profile assessment and reporting practices - influences, decisions and actions. In addition, a national network enabled access to individuals and schools with acknowledged good practices and a number of these were supported to prepare case studies of their work in the areas of assessment and reporting.

The survey instrument and results are discussed, along with some suggestions about influences on and connections between aspects of practice. Of particular note is the general reluctance to value assessments made informally and/or involving students' self-assessment in comparison with more traditional means. Areas of difference between primary and secondary teachers' responses are noted and discussed. The strong links between teaching and learning mathematics and, particularly, assessment are evident. Consideration of some of the case study material illustrates how a balance of assessment styles can be achieved and how such an approach is intimately linked to a contemporary teaching and learning program.

Much of the recent history of mathematics education in the compulsory years has been characterised by efforts to inform teachers about contemporary thinking in the discipline, for example - and importantly - through the publication of *A National Statement on Mathematics for Australian Schools,* A.E.C. (1991). Efforts have been made to encourage teachers to change their practices in ways consistent with increasing understanding of mathematics and how it is learnt. National projects such as the *Mathematics Curriculum and Teaching Program* (M.C.T.P.) as well as a multitude of state and locally based projects have focussed on improving the teaching and learning of mathematics through an emphasis on teacher professional development.

There have recently been substantial changes in the mathematics of the post-compulsory years in several states. Syllabus changes have focussed on the development and implementation of senior courses which provide for the needs of the more diverse group of students being retained at school. Often these courses have emphasised applications of mathematics. Both within these courses and generally in some states, non-traditional assessment techniques have been made mandatory (for example the V.C.E. and S.A.C.E. Stage 1 courses). These techniques, while remaining formal assessment events given the context of the needs of senior secondary schooling, represent a major shift in thinking and practice for many teachers.

The recognition of the need for schools and school systems to be more accountable for what they do is significant in considering the context of this study. The use of the Mathematics Profile to report on student attainment is premised on teachers having access to an assessment information base sufficient for them to make professional judgements. The nature of the profile outcomes indicates the need for a range of assessment practices to be employed to build this information base.

The purpose of the Sample Study was to document school assessment and reporting practices across Australian schools. This topic was agreed by the Australian Education Council (A.E.C.) at its 1990 meeting as one of national interest. The study was commissioned by the Department of Employment, Education and Training (D.E.E.T.) for the A.E.C. Working Party on an Annual National Report on Schooling. The selection of a topic of interest to be the subject of study in this way has been normal practice for the A.E.C. in recent years.

The study included both the government and non-government sectors of primary and secondary schooling, with the major focus on the presentation of a national view of assessment and reporting in mathematics as they

operate at the school level. It operated under the direction of a Steering Committee comprising representatives of government and non-government educational authorities.

The full report of the Sample Study runs to some one hundred pages with appendices of a similar size. This paper presents the background and methodology of the study as well as some of the major findings.

THE SAMPLE STUDY DESIGN BRIEF

The study was in three stages:

Stage 1: Identification of the range of assessment and reporting practices operating in Australian schools and the development of a set of descriptors for documenting those practices.

Stage 2: Documenting the range of assessment and reporting practices in a small sample of schools identified by educational authorities.

Stage 3: Documenting the extent to which different assessment and reporting practices identified in Stage 1 are being used in government and non-government primary and secondary schools.

METHOD

Stage 1 - the descriptors

Some forty people from school, university and system backgrounds attended writing conferences (one or two days) in Melbourne, Sydney and Adelaide to develop the descriptors. On the basis of the 1988 study by Withers and Batten (1990), and because of the desire to report details of practices, a decision was made to avoid the use of generic assessment and reporting terms as mechanisms for describing practices. Table descriptors were developed to provide details. Major elements of assessment (and reporting), such as the purpose of the assessment, conditions under which the assessment took place, actions of those involved in the assessment process and how criteria for judging learning were established, were included in the descriptors.(see Appendix 1) These descriptor tables were the key means for gaining detailed information in the survey instrument.

Stage 2 - the survey

The teacher survey focussed on gaining details of teachers' assessment and reporting practices over two different periods of time, namely, the three to four week period immediately preceding the arrival of the survey in schools, and the whole of 1991. More detailed information was sought about practices in the shorter period. Five hundred and sixty-four teachers in years 2, 5, 9 and 12 in schools across Australia were surveyed. Approximately 80% of teachers responded.

The survey instrument for primary teachers was in six parts

1. Background information - personal contextual information
2. Teaching and learning - the style and focus of recent work in the class
3. Assessment - descriptor tables relating to Formal Assessment, Informal Assessment and Student Self-Assessment, as described in Clarke (1988).
4. Reporting - descriptor tables relating to Formal Reporting and Informal Reporting
5. A longer term view of assessment and reporting - a more general description of practices in 1991
6. Actual versus preferred practices - identification of desired changes, if any.

In addition, the secondary instrument contained an additional section entitled Different classes, Different approaches? which enabled respondents to identify whether and how they adjust the practices for different classes.

In addition to analysing the range of assessment and reporting practices, the study aimed to investigate differences between practices at different levels of schooling, factors affecting those practices, and the practices of various subgroups of teachers. These subgroups were organised on the basis of

- gender of teachers
- years of teaching experience
- secondary classes grouped on the basis of previous performance (or not)

- o single-sex and mixed classes
- o teacher attention to the development of positive attitudes to mathematics (or not)
- o teaching and learning situations existing in the teachers' classrooms.

Stage 3 - Case study writing

The case studies were used to amplify information from the teacher surveys and to highlight successful practices in a range of different educational settings. Also, links were made to teaching and learning approaches in the classrooms. Factors influencing the introduction, development and operation of particular assessment and reporting practices were identified, together with the purpose and modes of assessment and reporting, and aspects of mathematics under consideration. A particular focus of some of the case studies was designated to be documentation of practices that had been demonstrated to be successful for girls.

Individuals and schools known to be using assessment and reporting practices that were seen to be successful for students and, possibly, innovative or associated with emerging trends in mathematics education were identified by systemic contact people, advisory group members and writing conference participants. Case study materials were received from thirty-five teachers in twenty-one schools (nine primary and twelve secondary) representing all sectors and seven states and territories.

Given time and resourcing constraints it was not possible to personally support case study writing except in a few instances. A writing framework (Appendix 2) was developed to assist teachers in the writing process and to act as a guide for their writing, but not to constrain it, in the context of working without outside support. The framework (or open-ended questionnaire) consisted of some major focussing questions with minor focussing questions down the side. The intention and major thrust of the case studies was apparent for all to see and the guidance provided by the framework was appreciated by many of the case study writers.

RESULTS

The principal findings of the study are, in summary:

1. Both primary and secondary teachers indicated the use of a considerable amount of formal and informal assessment. Primary teachers tended to value formal and informal assessment equally, whereas the clear preference of secondary teachers was formal assessment. Despite the high incidence of informal assessment reported by secondary teachers, it is clear that when it "really counts" they overwhelmingly use formal methods. For most teachers student self-assessment seems less important. There is, however, growing interest in that category of assessment, with primary teachers identifying it as one of the most important areas for future professional development.
2. The incidence of informal reporting in the survey period was very high, with nearly 90% of primary and 71% of secondary teachers indicating its use. Formal reporting was also indicated at a reasonably high level by both groups, probably reflecting the timing of the survey, which was conducted at the end of term 1, 1992. As was the case for assessment, the range of informal reporting practices used by primary teachers was more varied than the range used by secondary teachers.
3. For many students the formal assessment process involved them working independently, with little in the way of resources beyond their own knowledge, on tasks predominantly requiring only written responses. Even calculators were indicated to be available to students in less than 60% of cases in secondary, and 25% in primary, formal assessment events. As for computers and appropriate software, less than 8% of responses included them. However, some primary teachers described a richer assessment environment in which substantial resources were available to students during the assessment event.
4. There was evidence that different teaching and learning situations result in different assessment practices. It was clear that many teachers who have undertaken the kinds of pedagogical changes promoted in recent times have found ways of making their assessment practices somewhat consistent with their teaching practices. With formal assessment there were substantial differences between responses from teachers whose teaching practice included students having access to and use of resources, active involvement in their learning and working

collaboratively, and those who described more traditional teaching and learning situations. The group using the more contemporary practices also indicated a higher incidence of student self-assessment.

5. Differences were noted between the assessment and reporting practices of teachers with different years of experience. The more experienced teachers described a broader range of assessment practices than those of less experience, who tended to use more formal assessment and reporting. Although this is reassuring in one way, it does raise a question about the nature of pre-service teacher education in matters of mathematics assessment and reporting.
6. There was evidence that for some teachers student self-assessment in a mathematics context does not have mathematics learning as its major focus. In contrast to this, some of the case study teacher/writers identified the reflective process of student self-assessment as a powerful element of effective mathematics learning.
7. Teacher gender differences were observed in the occurrence of informal reporting, where women teachers reported its use with a relative frequency much higher than men did.
8. Student self-assessment occurred with much higher frequency in single-sex classes than in mixed classes. A very marginal difference also showed in the practice of informal reporting. With those exceptions, there were no apparent differences between the assessment and reporting practices of teachers of single-sex classes and those of teachers of mixed classes.
9. Secondary teachers of all-girl classes were more likely to take specific actions to support the development of positive attitudes to mathematics or appreciations of the nature and scope of mathematics than secondary teachers of other classes, but there were no qualitative differences in the comments they made about the nature of these actions.
10. Those teachers engaging in the practice of actively supporting the development of positive attitudes in their students towards mathematics or developing in them appreciations of the nature and scope of mathematics have an expanded set of assessment practices compared with those who do not. This was more evident for secondary teachers than for primary teachers.
11. Teachers involved in the case studies presented a very encouraging picture of rich and successful practices. The primary teachers described a wide range of informal assessment practices, including those that actively involved their students in the assessment process through various forms of self-assessment. They were clear about the outcomes for their students as a result of their assessment practices and why they valued what they were doing. Assessment was integrated with learning and part of daily classroom procedures. The teachers conveyed the feeling that they have never known more about what their children know than they do now. In the main, the secondary teachers described a wide range of successful assessment practices too, but their practices would be more aptly described as formal assessment practices.
12. A significant difference existed between secondary and primary teachers in the case studies in that although the primary teachers had well-established criteria for judging learning, there was little evidence of documentation of those criteria. That was not the case for secondary teachers, where criteria and organisational structures are well documented and clearly influencing assessment and reporting. One of the major aspects reported by most of the secondary teacher/writers was the sharing of assessment criteria with their students and the value they all placed on that practice.
13. There was some evidence to suggest that teachers had more influence over their assessment and reporting practices in the short term rather than the long term. In the latter, school policy was the overwhelming influence for secondary teachers, while for primary teachers a balance of school policy, parental expectations and their own knowledge prevailed.
14. Although there were differences between the year levels surveyed some 60% of teachers indicated a traditional approach to mathematics teaching. By comparison, very few involved in case studies responded in that way.

CONCLUSION

The study has highlighted the fact that much of assessment practice in mathematics is formal, remains in the control of the teacher, requires written responses and occurs without access to much in the way of resources. On

the other hand, responses from teachers involved in case studies suggest that there is a growing cohort of teachers who have made a long term commitment to their own professional development and who, over time, have significantly changed their assessment and reporting practices, feel confident in what they are doing and are able to articulate the details of and rationale for their practice.

Teachers reported reasonably high levels of use of all assessment and reporting practices, suggesting that the need for teacher development lies not so much in the expansion of practices to include a wider range, but in expanding options within the range currently in place as well as valuing the information gained from that range. There is also evidence that teachers need support to develop strategies for student self-assessment.

A major challenge is to build on the progress that some teachers have made and, in so doing, shift the power of learning in the direction of the learner. There is no doubt that to involve students more actively in their learning and in the assessment of their learning is likely to result in classrooms like those described in most of the case studies, but it is important that any increase of the range of assessment practices recognises the need for it to be focussed on the whole range of valued mathematical outcomes.

REFERENCES

Australian Education Council, *A National Statement on Mathematics for Australian Schools*, Curriculum Corporation of Australia, Carlton, Vic., 1991.

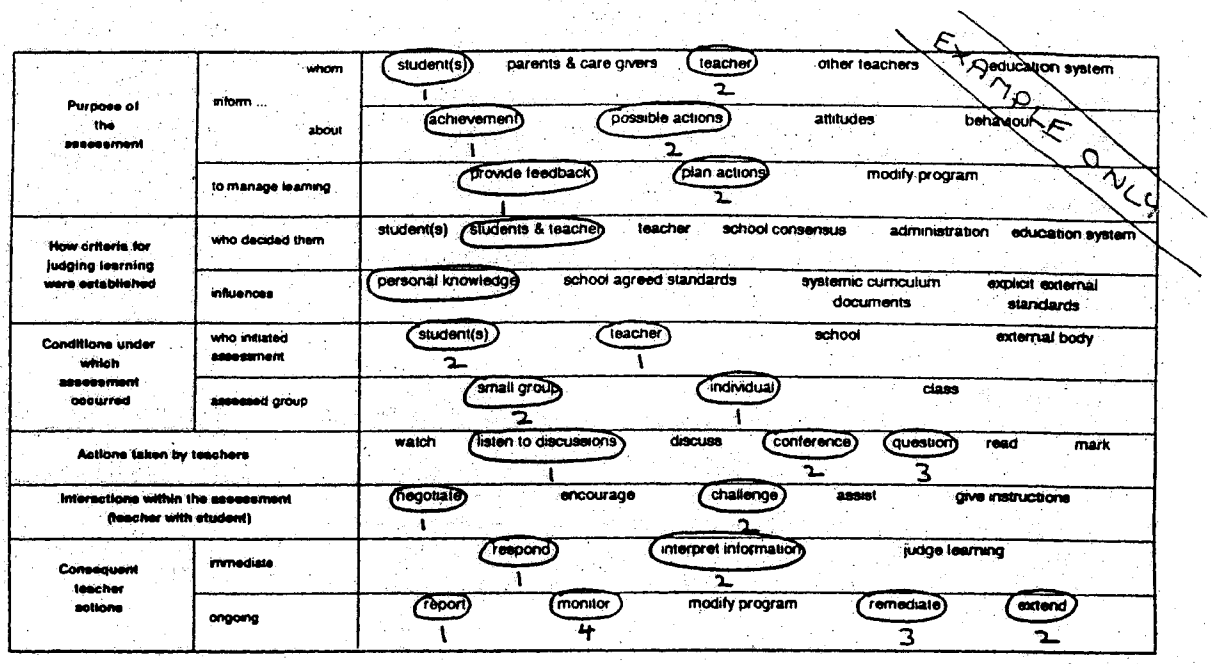
Clake, David, *Assessment Alternatives in Mathematics*< The Mathematics Curriculum and Teaching Program, CurriculumDevelopment Centre, Canberra, A.C.T., 1988.

Withers, Graeme, & Batten, Margaret, "Defining Types of Assessment" *in* Brian Low and Graeme Withers (eds), *Developments in School and Public Assessment*, Australian Education Review No. 31, A.C.E.R., Hawthorn, Vic., 1990.

Appendix 1 - Sample page from survey form showing descriptor table format

Example (Informal Assessment Descriptor):

On each line within the descriptor you may circle one or more words. If more than one word is circled *on a line* then the order of importance, relevance or frequency of use needs to be shown using numbers (**1** for most important ..., **2** for next most important ..., and so on).



Purpose of the assessment	inform ... whom	student(s) (1) parents & care givers teacher (2) other teachers education system
	inform ... about	achievement (1) possible actions (2) attitudes behaviour
	to manage learning	provide feedback (1) plan actions (2) modify program
How criteria for judging learning were established	who decided them	student(s) students & teacher teacher school consensus administration education system
	influences	personal knowledge school agreed standards systemic curriculum documents explicit external standards
Conditions under which assessment occurred	who initiated assessment	student(s) (2) teacher (1) school external body
	assessed group	small group (2) individual (1) class
Actions taken by teachers		watch listen to discussions (1) discuss conference (2) question (3) read mark
Interactions within the assessment (teacher with student)		negotiate (1) encourage challenge (2) assist give instructions
Consequent teacher actions	immediate	respond (1) interpret information (2) judge learning
	ongoing	report (1) monitor (4) modify program remediate (3) extend (2)

To explain further, consider two separate lines from the above table

Actions taken by teachers	watch listen to discussions (1) discuss conference (2) question (3) read mark
Interactions within the assessment (teacher with student)	negotiate (1) encourage challenge (2) assist give instructions

Explanation

The first line response means that the *most significant* **Actions taken by teachers** in the last 3-4 weeks within **informal assessment** were to

listen to discussions	1	(most important, relevant or frequent)
conference	2	(next most important, relevant or frequent)
question	3	(third most important, relevant or frequent)

while on the second line,

the response means that the *most significant* **Interactions within the assessment (teacher with student)** were to

negotiate	1	(most important, relevant or frequent)
challenge	2	(next most important, relevant or frequent)

When only one word is chosen on a line there is obviously no need to indicate a number because the order is self-evident.

3. Briefly describe the assessment (and/or reporting) practice.
(You may care to provide a range of practices, if that best describes your situation.)

What are the key elements?

What are the main purposes of the assessment (and/or reporting)?

Does this practice consist of one mode of assessment (or reporting) or a range of modes?

Does it consist of planned events? Is it an integral part of the learning process?

What information is provided to students about the nature of assessment tasks? How?

What evidence is used to indicate the development of skills, processes and knowledge in mathematics?

How are the criteria for judging learning established? Who decides?

What sorts of communication are involved in this practice? Oral? Written?

What are the actions of the teacher and students in this practice?

Who is the main focus of this practice? Individuals or groups? Which specific groups?

4. What are the significant features of this practice?

What are the strengths? Highlights?

Do students become actively involved? Are they part of the decision-making process?

What informs the actions of teachers and students to influence future learning as a result of this practice?

What are the opportunities for self-assessment and peer assess-ment?

5. What aspects of mathematics are being assessed (or reported)?

See table on page 5 based on *A National Statement on Mathematics for Australian Schools*

Use the terms in the table to help describe the aspects of mathematics being assessed (or reported).

Include detailed content if that is appropriate.