Maths on the Move

Assessment, Recording & Reporting in Mathematics

Discussion Paper

This paper is sourced from **www.blackdouglas.com.au/mathematicscentre**. An earlier form of the paper, written by Doug. Williams, appeared in *The Classroom Connection*, Vol. 5 No. 2, April-June 1997, Research Publications, Vermont, Australia. Although some details have altered since this paper was written, key elements remain significant.

Education By Outcome?

Attempting to understand the complexities of children's learning by scribing a list of:

- Learning Outcomes (Australia)
- Attainment Targets (United Kingdom)
- Standards (United States)

is something equivalent to taking the opening speech from each of Shakespeare's plays, listing them in chronological order of conception (with a dot to begin each one of course), and expecting to comprehend the genius of The Bard.

However such documents, which are created by administrators and academics with minimum input from (or consideration of) teachers, are the current 'adminodemic' reality. These realities will always exist, but those of us who have been in education long enough recognise that, just like a string of documents before them, they will pass away.

The current documents are considerably more extensive than previous imposed curriculum documents, but are not, in themselves, 'bad' because of that. That is if you discount the first British attempt to produce one in the early 1990s, which turned out, among other things, to specify more time face to face teaching across the curriculum per week than the number of hours students were at school! They have had several tries at rewriting their document since.

Most, if not all, Australian states have also had at least two tries at writing their documents. The first was a national effort, the drafts of which appeared in 1990. It was prepared by appointees of the directors of education of all states. In our typically (and for myself, thankfully) partisan way, once these were published each state set about ignoring them to a greater or lesser extent and began writing their own.

Only the Americans (to the best of my knowledge) have kept their document largely unaltered since its original working draft in 1987. Perhaps that is because it was developed under the auspices of the national teachers' association (National Council of Teachers of Mathematics) rather than by an arm of government. At the time of writing this paper, about ten years on, that document it being reviewed under the auspices of that same association.

- It is not a problem that these documents exist.
- It is not a problem that these documents are 'big'.
- It is not a problem that these documents are predestined to be incomplete - since any attempt to list learning must leave something out.
- It is not a problem that these documents are likely to be invalid - since the nature of the exercise must make static and linear that which is dynamic and multi-faceted.

The problem with the documents occurs when the documents are seen as having more value than the practitioners who have to work with them.

When that *doesn't* occur, the practitioners are able to make sensible use of what, in spirit if not in appearance, has been an attempt to capture aspects of the best classroom practice from the last twenty years.

This article is based on work I have been fortunate to share with a number of schools which have struggled to sensibly integrate the use of the Curriculum & Standards Framework (CSF) Mathematics document from Victoria, Australia. As the following quotes indicate, this document is very clear about the purposes of its two main parts, which are the Curriculum Focus Statements (for planning) and the Learning Outcomes (for assessment).

- The CSF is to be understood primarily as a tool ... (to ensure that) all major areas of the curriculum and planned learning outcomes are attended to and ... some key elements are not omitted. (p.2)
- The Board recognises that the idea of curriculum encompasses many aspects of learning that are beyond the structure and range of the CSF. (p.7)
- The content of each key learning area is based on a commitment to the processes of rational enquiry and openness to evidence and opinions. (p.7)
- Schools need not and should not atomise their curriculum in order to achieve the learning outcomes described in the CSF. (p.8)
- Outcome statements cannot be used by themselves to report with precision on an individual student's achievement or progress. (p.4)
- The standard provides the basis but not a complete mechanism for reporting on student achievement. (p.5)
- (The learning outcomes in mathematics) are not intended to put limits on what is taught. (p.11)
- The learning outcomes are not intended to be used as a massive checklist against which progress of individual students is measured. The time required to do this would detract significantly from teaching and encourage the collection of only superficial information. (p.14)
- ... an atomistic outcome-by-outcome approach should not dominate. (p.14)

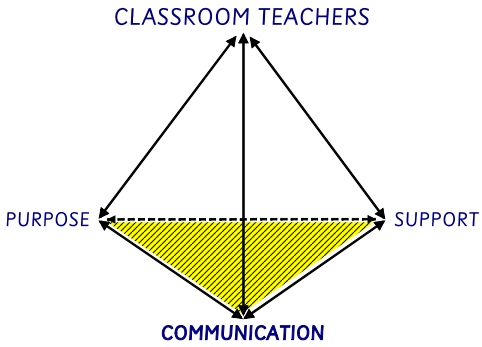
I would expect that similar intelligent comment can be found in the imposed curriculum documents used elsewhere.

Finding a Vision

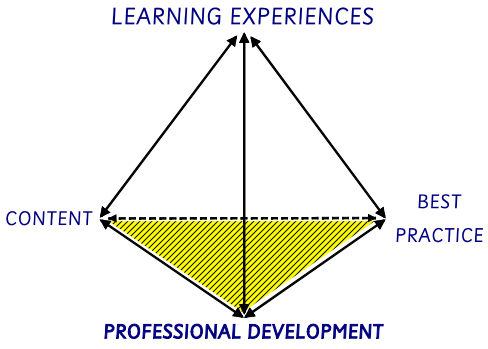
In my view, the best schools (and systems) operate on a model in which the school has:

- a clear, succinct purpose
- open, reflective communication
- practical, efficient support

developed to sustain and confirm the teacher in the classroom.



Similarly, the best teachers (and thankfully their existence is not restricted to the best schools) operate on a model



where the teacher chooses each major classroom learning task in the knowledge that:

- there are many ways of teaching any aspect of mathematics
- some of these result in better learning than others
- in making a choice between them, consideration is given to:
  - on-going curriculum planning
  - personal professional development
  - quality of assessment information

The aim is to try to achieve the richest learning for each student.

The focus of this paper is on managing assessment, recording and reporting rather than guidelines for making choices of task. I have addressed the choice of a rich curriculum in *The Classroom Connection*, Vol. 3 No. 1. However developing a broad assessment picture of a learner is a likely consequence of choosing rich learning tasks.

It is more likely that a task which offers students an opportunity to display the breadth of their knowledge and reasoning skills will yield more information than a more closed and specific task. It is also important to remember that, although any task has the potential to supply assessment information, what you choose to assess demonstrates what you value.

This is not to say that tasks are chosen in order to gather assessment. Gathering assessment is a by-product of a choice made to promote learning. But it is a by-product which is a part of our professional responsibility deserving of more serious and contemplated attention than last minute thought just prior to writing reports.

Assessment needs to be a planned component of each lesson.

Planning for Assessment

Some teachers have found the following principles helpful in moving toward that practice. They simply ask:

What will I assess with this task?

- A rich learning task provides opportunities to gain information about many things from many strands. But you're not super-person; you decide which particular aspect(s) you will focus on. You have all year and many other learning tasks to use to inform yourself about other aspects.

Who will I assess with this task?

- If you find yourself planning assessment which attempts to assess all the students every time, reconsider. You are undoubtedly giving yourself too much work. Learning occurs in fits, starts, steps and stages, so sampling your students regularly is more likely to give important information than is uniform assessment at the one time, which, by its nature, must show that many students haven't achieved the desired outcome.

How will I assess with this task?

- There are many assessment strategies and more than one of them is applicable to any learning task. A variety of assessment strategies provides opportunity for a variety of students to 'shine'.

When will I assess with this task?

- During or after the lesson? Following a certain step in the lesson? Continuously through the lesson? Usually the answer to how will imply the answer to when.

The key to success in managing current document demands and still feeling that you are successfully teaching rather than paper pushing appears to be to realise that *you do have choices*.

Exploring Assessment Choices

The aim of assessment is to build a *developmental picture of each learner* to both improve the student's learning and to increase the effectiveness of instruction.

Choices - Assessment Tools

Just as the choice of classroom task may affect the way a particular student performs, and thereby affect the developmental picture of that learner, so the choice of assessment tool may prescribe to some degree the way a particular student performs, and also contribute to an inaccurate developmental picture. Using a broad range of Assessment Tools is more likely to produce a broader and more accurate developmental picture of the learner. Choices of Assessment Tools include:

- oral questioning
- observation
- children's written record
- practical test (ie: build something)
- children's self assessment
- project report (home/class)
- diagnostic test
- skill test

Self assessment could be generated as suggested in this picture, but there are other ways and some student self-assessment tools are included at the end of this article.

Choices - Recording Tools

Just as there are choices for classroom tasks and assessment tools, so all teachers can choose from a range of tools which allow them to *record their judgements*. Such tools include:

- class lists
- Post-It notes
- computer records
- task specific recording sheets such as the example at the end of the article which is used in conjunction with hands-on tasks from the Mathematics Task Centre Project.

Communicating Information from Choices

After a semester, a teacher may have:

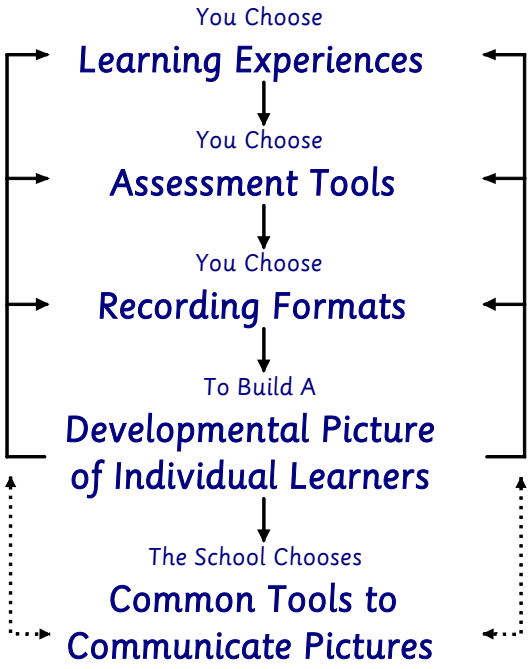
- an on-going list for the year such as the example
- student portfolios of material from other activities
- half a dozen class lists
- some test scores

which all contribute to the developmental picture of the learner. And all of which tend to be personal and idiosyncratic.

External curriculum documents offer an opportunity for all teachers to translate that information into a form based on a common framework which transports more readily from teacher to teacher. And this is where the responsibility to report begins to overlap with the responsibility to assess. So we could visualise the whole process like this:

The aim of reporting is to communicate the current developmental picture of the learner. There are several audiences which have a right to demand a look at that picture, and they include:

- the student
- the parent
- the school
- the ministry of education



Teachers are free to collect their assessment information as they wish.

But many teachers and schools are now realising that if they co-operatively develop a common tool for summarising this information (which fits in around Step 4 above), then each audience can be addressed, as their need requires, *from the same summary*, thereby reducing the work load.

Systems are also introducing computerised tools to (possibly) streamline that process. However, whether the school devises its own tools for this process or learns to use those offered by the systems, there is one criteria which needs to be applied regardless of the investment individuals may have in a particular form:

> *What is driving the teaching - better learning or the documentation system?*

For me, the answer must fall firmly on the teaching side.

Towards Managing the Task

Class 5W
Barbara
Billy
Catherine
Carly
and so on ...

I find a computerised class list invaluable here. At the beginning of the year I use a word processor or spreadsheet to make a table containing all my student names in the left hand column and I save this as a template. (For those who are unfamiliar with it, a template is like a pad of personalised letterhead stationery. You can tear off one sheet and annotate it, but other sheets remain on the pad to be used later.) Then I can readily produce class lists for any purpose by calling up the template and altering it to suit the purpose.

As the year progresses I am going to work on particular curriculum areas. In each area (and I might work on several simultaneously) I will include a *variety of professionally chosen tasks*, I will use a *variety of assessment tools* and gather and *record* a variety of evidence demonstrating the students' on-going learning.

Summarising Assessment Information

From my first template I can readily print a second which helps me summarise all that information. This is an on-going document since it will certainly take several sessions and a number of tasks to encourage the learning I am after. For example (using the type of language in external curriculum documents):

MATHS - LEVEL 3
Strand/Sub-strand: Number/Written computation
Focus: Exploring the relationship between simple common fractions

	Task A	Task B	Task C	Task C	Task D	Comments
Barbara	...	...	...	...	...	...
Billy	...	...	...	...	...	...
Catherine	...	...	...	...	...	...
Carly	...	...	...	...	...	...
and so on ...						

I might even add to this document a term later. So, over time, I build up an assortment of these summaries for a range of curriculum focus statements based on a variety of evidence which I collect based on my own best practice.
Once a term I transfer the *picture so far* to a summary of the *whole picture so far*. Hopefully this document has been devised as a whole school exercise and is the 'teacher talk' on which all reporting is based. An example of such a document is:

MATHS - LEVEL 3 - NUMBER
Use this code to summarise information from your personal records so it may be publicly reported:
S = e **S** tablished **C** = **C** onsolidating **M** = e **M** erging **N** = **N** ot apparent

-----> Enter focus statements from the external document ----->	***Exploring the relationship between simple common fractions***	...	...	...	...
Barbara	...	...	...	...	...
Billy	...	...	...	...	...
Catherine	...	...	...	...	...
Carly	...	...	...	...	...
and so on ...					

It is ***not*** necessary to have a column for every learning outcome. For example, such an atomised approach has been deemed inappropriate by the creators of the external document mentioned in the introduction. Learning outcomes are provided in these documents as examples of the sort of things students can do if the learning described by the curriculum focus statement has been achieved.

From the summary document above I can:

- review my curriculum planning
- write annual reports for officialdom
- prepare reports for parents

knowing that the document:

- directly links to the summary evidence pages I have collected
- which in turn, link to the actual evidence
- which in turn link to the tasks from which it was collected.

Smart Reporting

On the reporting side, the Transition Report Form at the end of this paper was used by one transition group as a report to Year 6 parents *and* was copied and personally passed to the secondary school maths teachers at a 'pleasant afternoon tea' transition meeting.

The document was devised by a team from the Lilydale College Transition Group, Victoria, Australia. All statements on it were checked for consistency against the external curriculum document. Active verbs were deliberately chosen to begin each statement to indicate an observable student action. The document is easily filled in from the information collected by the process described above.

A Possible Professional Development Exercise

Many lesson plans from Maths300 extend over more than one timetabled period. In this way they make a Lesson Set. There are also examples on the Mathematics Task Centre Home Base. Consider using printing a set and using it over several staff development sessions which include some private staff preparation and reflection time.

1. Print this article for your faculty.
2. Print a Lesson Set from Maths300 or the Mathematics Task Centre Home Base.
3. Provide time for the staff to review the written material.
4. Group the staff for discussion.
5. Each group chooses one of these Discussion Starters to pursue.
6. Decide action to trial as a result of your discussions

Discussion 1	**Discussion 2**
Consider the Lesson Set you have reviewed: What are the features of the lesson which are likely to produce learning? What content from your external document would be addressed by using this Lesson Set. What assessment tools would you plan to use with this Lesson Set? What recording tools would you plan to use to record information gathered with these tools?	Refer to the Lesson Set to illustrate your responses to these questions: What stops you assessing, recording or reporting in the professional manner you would like to use? How can you overcome these barriers?

A Final Word

The value of using a planned assessment approach such as that above becomes clearer over time. In fact the whole teaching/learning experience requires the time to become as complex, interwoven and thrilling as a Shakespeare play.

References

Curriculum & Standards Framework: Mathematics, Board of Studies, Carlton, Victoria, Australia, 1995
Williams, D. (1995), *Rich Curriculum - Your Choice*, The Classroom Connection, Vol 3 No. 1, The Education Support Group, Melbourne, Australia
Mathematics Task Centre Project, http://www.blackdouglas.com.au/taskcentre
Maths300, http://www.maths300.esa.edu.au

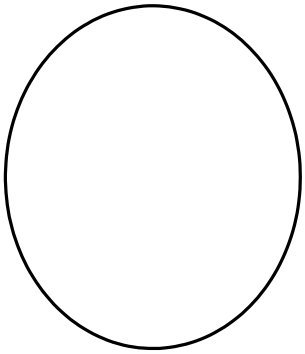
PROBLEM SOLVING **Student**

DATE: ..... NAME: .....

Task No.: ..... Task Name: .....

Draw your face here to show how you felt about this task.

Add a speech bubble if you wish.



What did you learn from this task?

What do you think you still need to learn?

Anything else?

PROBLEM SOLVING Teacher

STUDENT NAME: .....

The process of Working Mathematically draws on a toolbox of strategies.
Record here a picture of a student's developing independent use of these strategies.
Attach more pages if necessary.

/ = applied only after intervention

× = applied with assistance, producing some success

⊗ = applied independently with success

Task Name or Number --> **Strategy**									

Problem Posing									
Can I check it another way?									
What happens if...?									
How many solutions are there?									
How do I know I have found them all?									

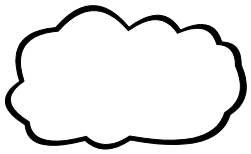
Problem Solving									
Do I know a similar problem?									
Guess, check and improve									
Try a simpler problem									
Write an equation									
Make a list or table									
Work backwards									
Act it out									
Draw a picture or graph									
Make a model									
Look for a pattern									
Try all possibilities									
Seek an exception									
Break the problem into smaller parts									

Additional Assessment Information

NAME: ..... CLASS: .....

Learning Clouds

1. Write the name of the unit or topic in the cloud.
2. Draw other clouds to show anything you think is connected to this topic. You can add more paper on the sides, bottom and top of this page with tape.
3. Connect the clouds with arrows IF you can explain WHY the clouds connect.
4. As the unit continues your teacher will give you a chance to add (or subtract) clouds and arrows. You can add more paper when you need to. Sometimes your teacher will ask you to EXPLAIN the arrows.



ABC PRIMARY SCHOOL - Year 6 Mathematics Report

NAME: .....

A = ...whatever wording is chosen by the school but Category A is the best
B =
C =
D =

NUMBER	**A**	**B**	**C**	**D**
1. Recalls tables and number facts				
2. Operates with addition and subtraction				
3. Operates with multiplication and short division				
4. Uses place value in whole numbers and decimals				
5. Recognises types of fractions and equivalent forms (vulgar, improper, decimal, percentage) ...				
6. Interprets and applies fractions in everyday situations				
7. Applies order of operations rules				
8. Recognises and describes number patterns				

SPACE	**A**	**B**	**C**	**D**
1. Recognises and names common 2D and 3D shapes				
2. Recognises and names angles				
3. Constructs simple 3D shapes from 2D plans				
4. Interprets maps using scale and grid references				

MEASUREMENT	**A**	**B**	**C**	**D**
1. Explains and uses standard units for length, weight, capacity, time, money & angle				
2. Uses simple measuring equipment				
3. Calculates the perimeter, area and volume of simple shapes				

CHANCE & DATA	**A**	**B**	**C**	**D**
1. Collects and organises data				
2. Represents and interprets data				
3. Understands the role of chance in everyday situations				
4. Describes chance events numerically for simple situations				

WORKING MATHEMATICALLY	**A**	**B**	**C**	**D**
1. Estimates answers using appropriate strategies				
2. Poses questions and gives reasons for answers				
3. Applies a range of problem solving strategies				
4. Records clear written answers to tasks				
5. Uses a simple calculator appropriately				

ADDITIONAL COMMENTS