

General or Process Methods

Most methods of assessment focus on assessing the written work produced by the student in a task although some do allow scope for the teacher's observations of, and conversations with, the student to be taken into account.

There are various ways of measuring what a student has achieved on an open task. Generally we shall call this 'assessment by outcome'.

Schemes for assessing open work vary in how much guidance they provide for the assessor.

At one extreme, a piece of work may be given a level of grade without any predetermined criteria being used. This is the case when a student does an investigation as part of SMILE¹ coursework. Using her knowledge of the SMILE network of materials and her own judgement, the teacher allocates a SMILE level for the work on the investigation.

At the other extreme, explicit criteria can be listed which refer to the particular task being assessed. This is the case with GAIM² coursework tasks. GAIM provides 80 of these to choose from, each one with its own detailed assessment scheme based on trialling.

Most methods of assessment fall somewhere between these two extremes.

Generally, some guidance is given on allocating a grade or marks. Usually, this guidance lists categories which help the assessor to look at different aspects of the work. These categories could be mathematical processes like *observing patterns* and *generalising*, or they could be more general processes like *planning* and *presentation*.

Often, when categories are given, there is a maximum number of marks which can be awarded within each category.

Example

One Mode 3 CSE provided the following categories:

- Knowledge
- Understanding
- Communication
- Inventiveness
- Techniques and skills

A maximum of four marks was available for each category, giving a possible total of 20 marks. If a category was considered to be irrelevant to a particular piece of work, the marks for the remaining four categories could be scaled up so that a maximum of 20 marks was still possible.

In more detailed assessment schemes you will find guidance on how to allocate marks *within* each category.

Example

A scheme which used the category *Communication* gave the following guidance on how to allocate marks within that category:

	<i>Marks</i>
Clear, full explanation, well argued	4
Clear explanations but incomplete in places	3
Attempts at explanations but frequently not clear	2
Muddled explanations, unconvincing	1
No work presented or no explanation attempted	0

¹SMILE: See *Resource List* (p.126)

²GAIM: See *Resource List* (p.124)

Assessment by Mathematical Content

Example

Some schemes provide detailed criteria for the award of a level or grade. The mathematics component of OCEA¹ provides nine categories which are suitable for the assessment of problem-solving:

- Starting
- Measuring
- Calculating
- Representing
- Checking
- Conjecturing
- Generalising
- Justifying
- Communicating

Within each category there are a number of criteria for assessment. For each criterion there is a label, an explanatory paragraph and examples of students' work. Each criterion is included in the training sessions for assessors.

The assessment scheme applies to the student's whole mathematics course. To be deemed satisfied, the criteria have to be met in a range of contexts.

More examples of assessment schemes appear in *Chapter 8*.

Another way of gauging the level of a student's work is to look at the mathematical content displayed in it. This could include mathematics which the student talked about or displayed while doing the task but which is not necessarily included in the written work.

There is much research evidence about how hard or how easy pupils find certain topics in mathematics. In particular, there is data from CSMS² and the APU³ mathematics team based at NFER².

Example

In response to the question 'Which of the numbers below has the smallest value?'

- A 0.625 D 0.125
 B 0.25 E 0.5
 C 0.375

38% of 15 year olds gave the correct response.

Schemes which indicate levels of attainment for particular items of mathematical content may have used such data in deciding on which levels to put items.

Example

GAIM provides a list of items of mathematical content at each of 15 levels of attainment.

The *Topic Criteria* for GAIM were influenced by both these sources. The National Curriculum, in giving 10 levels of difficulty, with all the items of mathematics being allocated a level, is using the same idea. However many of the items have been allocated levels on the basis of when they should be done rather than how hard they are.

It is possible, but not easy, to use the National Curriculum directly to allocate a piece of work to a level. To do this you could use the following procedure:

- 1) Identify which Attainment Targets are likely to be involved in this activity, i.e. if it is a survey, Attainment Targets 12 and 13 will be involved; if it is a number investigation Attainment Targets 2—6 will be involved.

NB: ATs 2—8 and 10—14 are used here as these are the targets which refer specifically to mathematical content.

¹ OCEA See *Resource List* (p.124)

² CSMS: See *Resource List* (p.124)

³ APU: D.D. Foxman, R.M. Martini, J.A. Tuson, M.Cresswell, *Assessment and Performance Unit: Mathematical Development, secondary survey report no.1*, HMSO, London, 1980
 D.D. Foxman, M.E. Badger, R.M. Martini, J.A. Tuson, P. Mitchell, *Assessment and Performance Unit: Mathematical Development, secondary survey report no.2*, HMSO, London, 1981

Assessment by Mathematical Content *continued*

- 2) See which attainment levels, within these targets, the student has demonstrated either whilst doing the task or in the written work.
- 3) Identify the level in which most of these attainments occur. This is deemed to be the level of the student's work in the activity being assessed.

The following exercise is an example of assessment by mathematical content. The National Curriculum is used to provide the list of mathematical content.

****(*) Exercise**

Collect together some students' work on *Dotty Triangles* (p.86) *Lift Regulations* (p.92) and *Star Signs* (p.109).

Use the National Curriculum to make a list of possible statements for each activity.

For each piece of student's work, list those statements which are satisfied. If the work is from your own students, you may include that which students said or demonstrated while they were doing the task which may not be evident in the written work.

For each piece of work, identify the level of most of the statements. This is deemed to be the level of the piece of work.

Student Involvement

Whatever method of assessment is used, students should be aware, from the outset, of what is being assessed. Where possible, share the method of assessment with the students. This can be done by encouraging the students to engage in self-assessment as they progress through a task—this self-assessment should be based on the same criteria as the assessment scheme in use. You may need to change the wording of the scheme to make it more appropriate for the students. Alternatively students could use the criteria to mark a piece of each others' work—they will often be much more critical than teachers of each other's work.

Students could keep their own records of how well they think they are doing. When the final assessment is made, take the students' own assessment into account—a useful way to do this is in discussion. By this means you can find out more about what students were thinking whilst doing a task, and this could lead to a better assessment. Time may not allow for this in all cases, but you should try to find time to do it if students' assessments are very different from your own.

Collaborative and Extended Work

Everything said in this Section applies to collaborative and extended work as much as to shorter tasks done individually. In fact most of the Coursework Tasks for GCSE assessment are extended pieces of work.

When students work collaboratively for a National Assessment they should always produce an individual report. The assessment of the individual will be based on this report. (If you are ever in any doubt about an individual's contribution to any collaborative task you should ask them to write a report of the activity.)

The following quote shows the attitude of one exam group to collaboration between students:

'We know that they (candidates) may get help from parents, just as they may get help from friends at school. We actually seek to encourage such interaction. What is important is that the candidate understands what is written in the report. Teachers can and should ascertain whether this is the case or not by asking questions.'

p.13, *Underway with GCSE Mathematics*, LEAG

It is even more important for extended work than for shorter tasks that students understand the assessment criteria. It is not fair to let students carry on with a project which will not do them credit. If necessary, give them a checklist of criteria, in language they can understand. They can use this as a reminder as they proceed.

When you begin extended work in the lower school you may wish to use this informal assessment scheme to focus discussion with the students.

<i>What is good about this piece of extended work:</i>	
— in terms of planning;	
— in terms of originality;	
— in terms of resources used;	
— in its presentation?	

<i>What should the students try to improve for next time?</i>	
● Were their plans adequate?	
● Was it clear what they were doing?	
● Did they make a reasonable effort?	
● Is the final presentation an adequate report of what they did?	