

Impact of Assessment on Learning and Teaching Mathematics

Some Evidence from MA, ATM and NANAMIC

MA, ATM and NANAMIC have gathered some evidence of the views of members on the impact of assessment on learning and teaching. A simple questionnaire was used to gather views from some members and their colleagues in schools and colleges.

There were 25 responses from teachers to the survey: 14 from 11 to 19 schools, 6 from 11 to 16 schools and 5 from 16 to 19 colleges. No responses were obtained from teachers of Key Stages 1 and 2. The underlying nature of the concerns expressed did not vary greatly between the various sectors represented and we would expect that they would be shared by many teachers of younger students. The questionnaire and a representative selection of responses to each of the questions 3 to 7 are given in the appendices.

This was a very small scale survey, but the depth of concern and the frequent mention of particular factors that contribute to it is a very striking feature of all the responses. It is likely that a significant proportion of those who responded are drawn from the more active and thoughtful members of the profession, because they are the ones who are most likely to be active members of subject associations. The strength and nature of the feelings does not come as a surprise to the three subject associations because it largely reflects comments that we have been making over at least the last ten years, as we have watched with increasing concern the growing dominance and ill effects of the assessment and accountability systems on the teaching and learning of mathematics.

The key issue that emerges from our small survey is a deep concern about the pressures that make it very difficult to resist 'teaching to the test', which focuses on short term goals and learning that is preoccupied with a narrow range of skills. This is to the detriment of longer term aims such as developing understanding, providing opportunities for skills and knowledge to be applied in a wide variety of ways, encouraging enjoyment and positive attitudes and providing a broader education which embraces but goes beyond the immediate requirements of the specified curriculum. Teachers find it increasingly difficult to be innovative and teach in ways which generate interest and enthusiasm amongst their students, and students are neither well prepared for the needs of employment and everyday life nor for further study of mathematics.

Each question provided evidence linked to these broad concerns:

Question 3

Comment on whether these examinations give a fair judgement of the students' capabilities.

They largely rank students correctly, but inflate statements of attainment.

There seems to be a general acceptance that tests and examinations put students in a rank order that is broadly 'correct', but that they do not provide much detailed evidence of attainment beyond that.

Doesn't tell you what they understand or what they can apply, only what they can memorise.

The exams give a judgement of the students' abilities to pass exams.

Current forms of summative assessment do not provide a reliable guide to what mathematics students genuinely understand or are able to use and apply with confidence. There is a strong feeling that they do not test the full range of knowledge and skills that should be part of a good mathematical education and that skills which cannot be tested readily are as a consequence neglected.

Question 4

In what ways does preparation for examinations detract from what you judge to be in the best long term interests of your students?

The push to achieve results means that students are provided with less and less opportunity to explore the subject beyond the rather limiting curriculum. This provides, even in the most able

students, an attitude that maths can be a dull, lifeless subject, whereas more freedom to explore would produce more motivated and thoughtful mathematicians.

There is a strong belief that preparation for examinations results in a narrow concentration on those aspects of the subject that are tested and that this has detrimental effects on students' attitudes towards the subject reinforcing the all too common image that mathematics is boring, difficult and irrelevant.

There is pressure to cover the entire syllabus at the expense of taking the time to understand the underlying concepts.

The pressure for the results leads to all topics in a syllabus being 'covered' with little scope for teachers to make judgements as to the relative emphasis to give to different topics. This is to the detriment of developing the genuine understanding and ability to use mathematical ideas with confidence in a variety of contexts in later study and beyond school and college.

Question 5

How do inspections, league tables and other performance measures influence the way in which you prepare students for examinations?

Teaching for exams is central to all activity.

The various accountability measures all have the effect of increasing the emphasis given to measures to boost results and the relative neglect of other desirable aspects of mathematical education, which are important to the long term development of individuals and to the real needs of society for mathematically literate citizens equipped with appropriate skills for employment.

Any performance measure will skew what we do – sadly – but we also need to be accountable!

However, there is a recognition that schools and teachers are accountable to society and that some forms of assessment are necessary. The concern is not that public accountability through some form of assessment system is inappropriate, but that the demands of the current system have become so dominant that it is seriously detrimental to the wider and longer term aims of teaching and learning mathematics.

It forces schools to concentrate resources mainly on C/D borderline at the expense of stronger and weaker students.

Very widespread concern was expressed about pressures to concentrate efforts and resources on those students who were at the C/D borderline in GCSE. These were considered to be both inappropriate in distorting the learning of individual students and unjust in leading to the relative neglect of other students. Whilst it is desirable to help students to achieve at the highest level possible, a sensible balance needs to be struck between providing effective learning, which is useful in the long term to students, and achieving a particular grade in order to satisfy the targets set for schools, departments and individual teachers. It is clear that many teachers feel that pressures are making such a balance impossible to achieve.

Question 6

What measures could be taken to reduce the 'burden of assessment' on students?

There is clearly no consensus on the measures that would be appropriate beyond the useful injunction from one respondent who said: *Do less of them*. That certainly provides a clear message about the way in which the system should develop in the future.

Many teachers are grateful for the demise of GCSE coursework, because it reduces the dominance of assessment, although the original intentions behind coursework as a form of assessment was to encourage facets of learning neglected by an examination based system. Key Stage 3 tests are often considered to be better than GCSE in promoting desirable aims, but the pressures caused by their public importance, reinforced by accountability measures, detract from the value that they could have if they could be used in schools solely for formative purposes.

Reduce publicity for results – are individual results necessary to measure the system? Indeed, is testing every child four times a wise use of public money?

A lot of the difficulty is caused by the public way in which results are presented, both locally and nationally, thereby reducing the value accorded to the vital but less measurable aspects of education. There are certainly questions that should be asked about whether the large sums of public money involved are being

spent wisely on an assessment system which is so ubiquitous and all embracing that it is distorting efforts genuinely to raise educational standards, reducing enthusiasm among students and demoralising teachers.

Resits for AS modules ... should be scrapped or January exams could be scrapped.

Scrap external exams apart from final exams (one final exam for each subject!).

A number of specific measures to reduce the burden of assessment are suggested. Whilst modular systems have some benefits they do seem to have led to making the assessments a more dominant feature, something that is reinforced by the frequency of resits. The notion of only one final examination per subject (as in some other countries) is an interesting thought for the future.

AfL has led to increased assessment - informal tests in schemes of work.

It is sad to find one respondent reporting that assessment for learning is adding to the burden that is more commonly associated with summative assessment. There is clearly a serious misunderstanding in some quarters that this form of assessment involves tests, marks and other bureaucratic measures rather than monitoring and responding in much more informal and informative ways.

Question 7

Please add any other comments on the impact of assessment on teaching and learning.

This question provides two quotes which nicely summarise our concerns: the first draws attention to the serious ill effect that assessment is causing and the second points to one very positive way in which the emphasis could be radically changed with great potential benefits for everybody.

Assessment is strangling good maths teaching.

We have no doubt that many teachers will assent to this remark by one respondent. The situation created by the dominance and stifling nature of the current assessment and accountability system is having a profoundly worrying effect on our students and the future of mathematical education. This point cannot be made too strongly and is very clear in the comments of all our respondents.

Formative assessment is more immediate and relevant to helping students make progress.

The idea of assessment for learning, or formative assessment as distinct from summative assessment, is a very valuable recent development and something that research and the experience of teachers using it effectively, has shown to be a successful way of really raising standards whilst encouraging the full range of attributes of good mathematical learning. We have no doubt that mathematical education will be in a much happier and healthier state when greater importance is accorded to formative assessment and summative assessment takes place in a much more low key and less public way.

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Appendix: Some Responses to Questions 3 to 7

3. Comment on whether these examinations give a fair judgement of the students' capabilities.

They largely rank students correctly, but inflate statements of attainment (eg level 6 at KS3 usually means working at level 5).

Yes, except for lower D-G students.

GCSE: the grade tells you something, but there is absolutely no chance for the very able to show what they can do. This is a major flaw and likely to get worse with the two tier exam.

KS3 tests understanding better than GCSE or AL.

The exams give a judgement of the students' abilities to pass exams. too often the result of ... coaching in exam technique ... focused on topics which will 'generate' exam marks easily. Unfortunately the exams do not necessarily give an accurate judgement of the students' mathematical capabilities.

No, it's far too easy to 'coach' to the test and saturate students with practice papers.

Sort of – but there are many bits where the questions require a fairly standard approach, and many students approach the question in a different way which isn't always the best thing to do.

Grades and Levels are very crude measures – so not easy for internal use afterwards (we tend to turn KS3 levels into a decimal) – and very harsh for the student right at the top of a level/grade.

Those who can memorise processes are at an advantage over those who can reason over a longer period.

Doesn't tell you what they understand or what they can apply, only what they can memorise.

4. In what ways does preparation for examinations detract from what you judge to be in the best long term interests of your students?

The push to achieve results means that students are provided with less and less opportunity to explore the subject beyond the rather limiting curriculum. This provides, even in the most able students, an attitude that maths can be a dull, lifeless subject, whereas more freedom to explore would produce more motivated and thoughtful mathematicians.

It forces teachers to concentrate solely on the syllabus.

There is pressure to cover the entire syllabus at the expense of taking the time to understand the underlying concepts.

Stops cross-curricular cooperation on projects.

Schools interested in general in performance rather than long term understanding and application.

The need to be ready for exams tends to force the pace of 'covering the curriculum', rather than having the chance to respond as one might like to the learning needs of the students in one's classes.

Students are not encouraged to investigate areas of mathematics outside the syllabus – because if it is not on the exam then why bother. School appears to be an exam factory – which is bearable for the students if they are going to get a high grade – otherwise it is horrible. A less than A/A* student can still do well in maths – but they feel they can't.

It would be in their long term interests to find education interesting and inspiring.

Preparation for exams takes up over 50% of teaching time. Much of this is unproductive and takes the teaching focus away from the thinking skills, evaluation skills and communication skills that are outside the exam system.

Too much to cover not allowing depth.

If taught to the test it favours those with good memories for processes over those who can apply knowledge. In the post school era this may 'back-fire' as they will appear to have little mathematical understanding when asked to apply previous knowledge.

Too much emphasis is on processes and not on applications and the use of Mathematics in the wider context.

Have to teach to a test when the exams get close, emphasis should be on the big picture and understanding the mathematics. This has got a lot worse in the last five years.

Takes time from some enjoyable pursuits – investigation work, discussion, following up topics beyond the specs. We train students to learn and practice the techniques which will be examined – a shame.

5. How do inspections, league tables and other performance measures influence the way in which you prepare students for examinations?

Teaching for exams is central to all activity.

Students are taught to pass exams, not to gain any long term skills which they retain with confidence.

Inspections are just inconvenient, league tables are irrelevant, other performance measures are statistically unreliable.

Any performance measure will skew what we do – sadly – but we also need to be accountable!

Most measures are superficial, pernicious and damaging to the aim of 'education'.

... testing ...driven by what can be easily measured.

Forced to focus on borderline students perhaps to the detriment of other students, including the brightest.

It forces schools to concentrate resources mainly on C/D borderline at the expense of stronger and weaker students.

I feel obliged to concentrate on the C/D borderline.

There is great pressure from the Senior Leadership team on the maths department at my school to boost Ds to Cs at GCSE level, irrespective of real 'education'.

School performance at grade C becomes more important than individual student progress!

Inspections mean that we're encouraged to be the same as everyone else, league tables mean that a grade C/D student is worth the trouble of extra lessons and extra help – but a B/C student isn't – and a D/E student REALLY isn't worth it...

The pressure is on from everyone higher in the chain. To do what you feel right takes courage and conviction that your way will also give the expected results.

I think long term, but have to accept the consequence of questionable respect by managers.

6. What measures could be taken to reduce the 'burden of assessment' on students?

I would suggest removing the year 9 SATs exam.

Abolish GCSE coursework.

Erm – do less of them! Or do something annually that mattered less – or gave a more continuous measure or contributed to a portfolio of learning (even in maths – allowing them to progress in number beyond their current progress in algebra... - we have real problems with a student who in the first six weeks achieves a level/grade in one topic – but then appears to go backwards because they find the next topic harder...)

Do not allow endless resits of AS/A2 modules.

Resits for AS modules ... should be scrapped or January exams could be scrapped.

Look at using ICT to test aspects of the course.

Remove the burden from teachers – league tables.

Reduce publicity for results – are individual results necessary to measure the system? Indeed, is testing every child four times a wise use of public money?

Bigger weight to teacher assessment (ranking), moderated by external assessment. External exams only at 16.

Scrap external exams apart from final exams (one final exam for each subject!).

AfL has led to increased assessment - informal tests in schemes of work.

7. Please add any other comments on the impact of assessment on teaching and learning.

Assessment is an important tool by which to judge teaching and learning, but is overused and is done too early. This leads to teaching to pass exams as a priority and can reduce a child's enjoyment in learning mathematics when they are under pressure constantly to achieve certain levels at a certain age.

It appears that assessment is the only aim of our current teaching and learning. We are constantly trying to give levels to our students, help them to set targets for the next month to help them move onto another level. For some this is quite motivating – but for very few it yields an interesting and challenging curriculum.

It's not the assessment that is wrong, but the high stakes nature of it, tied with performance management measures which mean there is pressure for short term apparent gains.

Formative assessment is more immediate and relevant to helping students make progress. Summative assessment, especially externally marked papers only give the picture on one day, often several weeks previously and are therefore little real use for progressing learning. Only by analysis of papers can weaknesses in individual's teaching and learning be identified – and that is time consuming. This can be done more quickly, and just as easily, internally.

Assessment, as at present envisaged by this present government, is strangling good maths teaching. Teachers are scared to innovate and interest, and teach to the test.

Teachers are teaching up to the exam the students are doing. This means that teachers in 11 to 16 schools, for example, do not prepare their learners for AS level.

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