GCSE coursework in mathematics

Mike Ollerton and Anne Watson describe the success of the ATM-SEG 100% GCSE coursework syllabus (1986-1994).

The demise of GCSE coursework is heralded as a relief to teachers, examiners, parents and students. 'Coursework' had become remote, artificial and nothing to do with the 'course', and even, given opportunities for internet cheating, nothing to do with 'work'. But before the whole issue gets forgotten, we invite readers to look at the vision and intentions with which coursework, as a substantial component of assessment at GCSE, began. Indeed, the original vision still continues in some parts of the world as 'portfolio assessment'. What we are reporting here is light-years away from the bolt-on, high-stakes, meaningless heuristic activity which has been rightly judged to be a waste of everyone's time.

The ATM-SEG 100% coursework syllabus

The highly successful Association of Teachers of Mathematics-Southern Examining Group (ATM-SEG) 100% GCSE coursework syllabus was pioneered and piloted between 1986 and (albeit in an altered form) 1994. It defined coursework as the work students did during the course of their GCSE years, and was based upon gathering portfolios of evidence which included extended pieces of work and, indeed, anything else done during those two years. The emphasis was on crediting students for what they did and gradually accumulating better and better work.

The ATM-SEG GCSE was piloted by seven schools. This scheme was originally based upon a 100% teacher-assessed coursework format and was underpinned by termly moderation meetings attended by teachers from schools together with officers from the ATM and SEG. At the moderation meetings, which were attended by most of the teachers involved, samples of students' work were shared and discussed, creating an atmosphere in which the relationships between teaching, learning and assessment were constantly under review.

Course content

Most schools devised modules of work, or tasks, which tended to run for a minimum of three weeks, and this meant students had opportunities to study ideas in depth. The work schools organised was, of course, based upon required GCSE curriculum content (defined by the Schools Examinations and Assessment Council, SEAC) and assessed against agreed criteria. These criteria focused on the processes by which mathematics is learned, and schools had to demonstrate content coverage through the work students produced. The criteria were developed cyclically through learning what students were capable of learning given extended tasks and support for extended working. The criteria provide a detailed description of mathematical behaviour and a mathematical mindset unlike anything else we have seen produced for subsequent assessment systems.

Because schools adopted a largely investigative approach to learning and teaching mathematics, ways of acting mathematically, using and applying mathematical ideas (such as appeared in MA1) were naturally integrated into the work students produced, through which students had to demonstrate they met the criteria. All pieces of work had the potential to be used as part of the final assessment in terms of the GCSE grade students achieved and were awarded. Each portfolio submitted for final moderation had to demonstrate coverage of the curriculum content, and this meant that a portfolio contained at least 10 or so different modules of work.

Professional and curriculum development

As one might imagine, a massive amount of professional and curriculum development work took place during moderation meetings, and this became a notable outcome of the weekend moderation meetings attended by teachers involved in the ATM-SEG GCSE scheme. So, for example, sharing approaches about how teachers used investigative starter tasks to engage their students with concepts such as Pythagoras' Theorem, trigonometry, transformations, standard form, etc became a regular feature. It was common to include some kind of mathematical activity for the teachers in the weekends; this inevitably provided rich curriculum-development opportunities.

Assessment and cheating

Issues of cheating did not arise, and this was because teachers knew about the work their students produced on a lesson-by-lesson basis. Over three weeks there had been plenty of discussion, which made it impossible for students to falsify their work. In fact, there would be no advantage to be gained from cheating, because conversations with the teacher were always part of the work. Furthermore, because schools did not entertain the use of 'bolt-on' or prescribed 'one-off' tasks, typical of coursework in the recent past, the scheme had built-in assessment integrity; this naturally supported teacher autonomy and professionalism, because they could select and create tasks and modules for assessment which supported student learning. This was assessment *for* learning and assessment *of* learning in

action, long before AfL became a buzzword and assessment often reduced to particular actions rather than an integrated part of teaching and learning.

Past and future

The ATM-SEG GCSE proved to be a significant movement in learning, teaching and assessing mathematics for students. Unfortunately, the then secretary of state for education failed to recognise this as an innovative, robust and profound development in mathematics education. Neither was it recognised as a way to develop students' problem-solving skills, flexible approaches to learning and the knowledgeable, adaptable, confident use of mathematics for which employers and universities now call.

Recently we have heard the suggestion that some ways should be found to assess mathematical creativity, use, adaptability and problem-solving capabilities in ways similar to the way art is assessed. Mathematics has some distinct differences to art – there are things which have to be done; there are facts and answers which have to match the accepted canon of the subject – yet in those years we showed that 'being mathematical' can be assessed at school level as a complex web of activity, and that students in these systems learn mathematics in effective and useful ways.

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Coursework assessment was carried out under the following headings:

- communication
- implementation
- mathematical knowledge
- interpretation
- evaluation
- mathematical attitude
- autonomy

For detailed descriptions of criteria under each of these, please go to www.atm.org.uk/mt/.

Effective use of ICT?

Jenni Ingram

What exactly do we mean by 'effective use' and how is it different from 'use of' ICT? I am currently driving around schools observing my PGCE students teach, and the majority of them are using ICT, yet I am finding it very difficult to tick the box on the observation sheet labelled 'effective use of ICT'. The majority are using pre-prepared slides, with a starter on the first slide, the learning objectives on the second, an example on the third and so on. This seems like a form of classroom management to me. If something is on the board as the pupils enter the room, they immediately have something to do, and because it is pre-prepared the teacher can use the time to move around the classroom, taking time to talk to individual students, etc. We all know that we 'have' to share the learning objectives at the start of the lesson, and what better way to make sure (and to be able to prove to others) that you've done it than to have it on your pre-prepared slide. It is all about ticking the boxes to say you told me to do this and here it is. The main part of the lesson is similar: the slide shows an example which means that the teacher does not have to turn their back on their class in order to write on the board. I am not saying that any of these practices are bad things, just that they are purely a classroom management tool. Yes, I agree that the arrival of the interactive whiteboards and the data projectors have changed the way we present our lessons; the question is whether they have changed (or should change) the way in which we teach. Using software to present ideas professionally, accurately and in a colourful way may have a motivational impact, but does it alter what the pupils are learning?

I have observed one lesson where the student used a spreadsheet to simulate two dice being rolled, though this was the plenary, so was squeezed into the last five minutes. What I have not seen is the pupils interacting with the technology. Even at the simplest level where pupils come to the front of the classroom and 'interact' with the interactive whiteboard appears to be a rarity. There is so much potential, not only in the tools accompanying the interactive whiteboard, but also with the subject specific software; for example, the dynamic geometry packages or *Autograph*. So the question remains of how do we encourage teachers (and I include myself in this) to use the technology and the software to its full potential? There is already some good practice out there. I have had several conversations with some truly inspiring teachers who have really thought about the way they were using their interactive whiteboards or the class set of laptops. One of the key features that stands out in these conversations is the focus on *how* the pupils are learning, instead of *what* they are learning. *Powerpoints* are excellent at transmitting knowledge in a clear and æsthetic way, but the focus is on the content: what do I need to include, what are my teaching objectives, which examples shall I use, which pictures can I add, which starter can I download from the internet? By the time you put all this together there is no time to consider how will I actively engage and interact with the pupils. Even when I have seen dynamic geometry being used it is usually with the teacher dragging a point while the pupils watch. I know that there are many of you out there doing great things with technology and I urge you to tell us about it. Write an article, send us a resource, post a message on the forum www.atm.org.uk/forum/YaBB.pl. It doesn't matter if the idea isn't original, the way in which you use it and the way in which your pupils react to it will be. The real power in an idea is the ability for others to use it and adapt it to their own pupils.

Jenni Ingram is chair of the ATM ICT group.

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