

Functional Mathematics

The Association of Teachers of Mathematics is very disappointed that the government has rejected so much of the Tomlinson report. Those of us involved in mathematics education awaited the government's response to Tomlinson with particular interest because, after all, in their response to Adrian Smith's report *Making Mathematics Count* they had said that 'we will.. secure the engagement of all learners through increased pathways, better vocational options, and stretching curricula for the most able. This will be integrated with our approach to broader curriculum reform to ensure consistency and portability of skills across the whole 14-19 curriculum.'

There does not seem to be much opportunity for portability of skills in the White Paper especially as the functional mathematics course looks as if it will only be for some students.

However on the assumption that the government has made up its mind about this then we would like to bring various thoughts to your attention before too many decisions are made about functional mathematics.

It is clearly important for all students to be provided with 'appropriate' opportunities to learn to think mathematically and to be able to demonstrate their understanding of mathematical concepts. A central issue, however, is how the notion of what appropriate means and, therefore what any teacher can do in order to help students see the relevance in learning mathematics.

Mathematics is far too valuable a discipline and too elegant a subject for it to be reduced to functionality, either for all or for a particular group of learners. Ofsted subject reports 2003/04 Mathematics in secondary schools said: *The capacity to reason, justify, explain and prove is central to being successful in mathematics. However, these qualities need to be explicitly developed and nurtured over time in just the same way as calculation skills or techniques for solving equations.*

We find paragraphs 1.1 to 1.9 of the Smith report, which outline all the different facets of mathematics, very helpful when considering what mathematics should be taught to young people.

Annex C of the Tomlinson report gives a brief outline of what the content of functional mathematics might be. It refers to 'end-users' and preparation for 'adult life - this should include financial literacy alongside

the application of mathematics in a variety of other real world contexts'. This needs to be interpreted in the light of the report *Mathematics Skills in the Workplace* (referred to in Smith 1.8), which defines the 'mathematical literacy' needed in the workplace. This mathematical literacy is much more than the ability to carry out and understand calculations and we hope that a functional mathematics course would help to prepare young people to meet the demands of the workplace by developing skills such as complex modelling, interpreting different representations of data, extrapolating, monitoring and communicating. We maintain that, if a functional mathematics course concentrates on the ability to carry out calculations, then the higher-order skills associated with mathematical literacy will remain beyond the grasp of many young people. Furthermore, in order to be able to use and apply mathematical knowledge and skills and be 'mathematically literate', young people need to have confidence in their own ability. This confidence does not develop automatically. Teachers have to pay attention to it, by finding ways of capturing the interest of their students and hence motivating them to work on the knowledge and skills that are to be taught. And then teachers need to help students to become aware of how different ideas and topics link together and also of how they learn.

A particular concern about the introduction of a separate qualification for functional mathematics is the danger that this will become the mathematical curriculum for, so called, 'low-attainers', leading to students who inhabit low sets in schools having a limited diet of mathematical experiences. The ATM has very many concerns about the possibility of such an outcome and again this is a concern expressed by Ofsted: *Inflexible setting arrangements in Key Stage 4 lead many pupils to believe that their GCSE goals in mathematics are limited in nature and ambition. Many become disaffected and choose to channel their energy and enthusiasm into other subject areas...*

It is *how* students are taught mathematics rather than *what* they are taught that is the key to helping young people develop into adults who are interested in, confident about and competent at mathematics. Experience of teaching young people in this age group suggests that this confidence helps them to adapt to future mathematical needs.

We would like to make some further observations relating to what Tomlinson calls 'financial literacy' and 'real-life contexts'.

For many years now the phrase "real-life" mathematics has been used as a way of describing those aspects of mathematics which everyone needs to

understand, use and apply in order to function as numerate citizens. We wonder if this call for functional mathematics is in fact a continuation of the tradition that embraced real-life mathematics and whether functional mathematics is seen as a way of providing learners with real-life contexts through which they make sense of why they are learning mathematics. The complexity for teaching school mathematics, however, is that young people tend to live in the moment or at best they consider their immediate future. With this in mind teaching mathematics using 'adult' or 'future' contexts with teenagers is very difficult and can undermine learning. We would challenge the vast majority of the population to explain where in real, real-life they regularly carry out calculations that demand any higher mathematical skill than addition, or at most multiplication. The dangers here are all too clear of functional mathematics being reduced to teaching a narrow aspect of the curriculum. Even so, young adolescents are not interested in working out VAT on a washing machine, the cost of a meal at a restaurant or the price of a holiday to Florida. Clearly, therefore, defining what functional mathematics means and how once a definition has been constructed, how teachers devise strategies for making functional mathematics interesting, absorbing and relevant to students will be a significant challenge. As Ofsted recently commented ... *many lessons employ an approach to teaching that is based on imitation: the teacher demonstrates a technique and then the pupils practise it by completing exercises from a textbook or worksheet, usually without contexts that are meaningful, or without any opportunity to appreciate the use of these techniques to solve problems.*

In support of functional mathematics, we believe there are many contexts which arise naturally in other subject areas and in the citizenship and PSHE curricular. Frequently mathematical contexts which focus on Handling Data can be utilised within other subject areas. For example, it would be highly appropriate for students to explore issues such as Healthy Eating, Smoking, TV watching habits and in doing so would need learn, use and apply a range of statistical skills. Such issues are certainly topical and they certainly impact directly upon students' lives. Creating opportunities for such topics to be explored, discussed and presented would most certainly be more attractive to adolescents than some of the contexts mentioned above. The issue here, however, is whether these opportunities should be utilised within mathematics lessons or within cross-curricular contexts.

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