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'Curriculum' is not always understood in the same way, but within the reports in the collection it seems to be taken as the content that is addressed and the way in which this is structured and organised. According to the DfE (2011), the 'National Curriculum' was 'originally envisaged as a guide to study in key subjects which would give parents and teachers confidence that students were acquiring the knowledge necessary at every level of study to make appropriate progress.' (para. 2, note to editors)

The majority of reports in the collection were written after the announcement by Michael Gove, UK Education Secretary, on January 20th 2011 that a major review of the national curriculum was announced. It seems that the main reason for this overhaul derived from the Government's perception that '[w]e have sunk in international league tables and the national curriculum is substandard…. The previous curriculum failed to prepare us for the future. We must change course.' (DfE, 2011)https://www.gov.uk/government/news/national-curriculum-review-launched

This announcement seems to imply that the Government believed that a different (better?) curriculum would drive standards up. It is unsurprising therefore that most of the reports address the curriculum, with many providing advice and recommendations related to the proposed revision of the curriculum, but interestingly not many of them cite the curriculum as a key reason for the 'problems' in mathematics education.

Where the curriculum is seen as a cause, it seems that it is boring (British Academy, 2012; Burghes, 2012), not relevant, uninspiring (Royal Society, 2011) and not stimulating (Clark-Wilson, Oldknow, & Sutherland, 2011). A problem seems to be that the curriculum does not sufficiently take into account the 'dynamic and practical aspects' of mathematics (Burghes, 2012). Similarly Clark-Wilson et al (2011) imply that the curriculum does not reflect the modern world and the interests of pupils and it seems that NIACE agrees:

'The challenge for providers and teachers is to make maths relevant, interesting and enjoyable as without these ingredients, adults will simply continue to cope with their existing skills'. (Southwood & Dixon, 2012, p. 3)

In the specific areas of finance and statistics, the curriculum is seen as a cause of the problems described in the section on symptoms. The suggestion by the All Party Parliamentary Group (2012) and Gillie (2013) is that addressing finance within mathematics occurs on an 'ad hoc' basis and that this means that students have an uneven experience. The report by Porkess (Porkess, 2012) suggests that statistics

within mathematics does not address the key important aspects of the subject at the right times, so that pupils are not introduced to the practical uses of statistics or hypothesis testing early enough.

Whitehouse and Burdett (2013) take a broader view, suggesting that the way mathematics is viewed is possibly too narrow: *Mathematics is not a single discipline, much less a single coherent cognitive construct. Mathematics covers a broad church of disciplines and that is part of the problem. (p. 3)*

For most, however, the mathematics in the curriculum does not seem to be a particular cause for the problems in mathematics; rather it is the nature of the curriculum. The ACME report, Mathematical Needs of Learners, stated that 'it is not necessarily mathematics itself that is problematic, but rather the nature of the curriculum and the teaching methods and assessment regimes' (p. 8). It went on to say that 'the current curriculum is seen as being fragmented' (p. 6).

Teaching methods and assessment regimes are addressed below, but here the focus turns to the organisation of the curriculum. First, as described by ACME, the curriculum is linear and lists topics and skills which should be taught and tested in order. This approach can mean that, for students, learning in mathematics is 'fragmented and incoherent' (p 17). The way the curriculum is organised, with a focus on 'levels', does not take into account the complexity of mathematics and the connections and relationships between key mathematical ideas (ACME, 2011a):

the focus on 'levels' endemic in textbooks, school schemes of work and testing regimes obscures the need for learners to develop their understanding of key ideas over time, in a coherent pathway. (p. 17)

The curriculum is also seen, in a way, as too ambitious particularly towards the end of compulsory schooling (GCSE), where, it is argued that one curriculum cannot meet the needs of all learners, amongst whom there is a wide range of mathematical development (six years or more) (Vorderman, Porkess, Budd, Dunne, & Rahman-hart, 2011; Whitehouse & Burdett, 2013). On the one hand it fails those who struggle with mathematics (as is evidenced by the large numbers of young people who do not meet minimum targets) and on the other hand it can be seen as insufficiently ambitious because is does not challenge the most successful mathematicians. (ACME, 2012; Norris, 2012; Vorderman et al., 2011; Whitehouse & Burdett, 2013).

Vorderman et al (2011) make the point that the National Curriculum introduced the idea of 'entitlement', and explains that this meant that every child was entitled to be taught the relevant Programmes of Study, so that all children are taught the same thing at roughly the same time, irrespective of whether this is appropriate or not. The report suggests that as a result of this, many young people experience difficulties and begin to believe that they cannot do mathematics.

Some reports look beyond the mathematics curriculum to consider the mathematical experience of school students overall. The suggestion is that students do not encounter appropriate and sufficient mathematics within other subjects areas and that subjects such as mathematics and physics are taught and assessed as distinct subjects. As a result, it is claimed, students have little idea of how mathematics is used in 'real life', they do not learn to apply their mathematics in different contexts and they miss opportunities to practise their mathematical skills (Morgan, 2011; Vorderman et al., 2011). The lack of cross over between subjects also means that students are ill-informed about the level of mathematics required in, for example, science subjects at HE level (Morgan, 2011).

From the perspective of learning in other subject areas, both at school and HE, the lack of cross over is also seen to account for problems of, for example, quantitative skills (British Academy, 2012; Morgan, 2011). The British Academy report, for example, suggests that teaching of quantitative methods occurs in isolation and this means that students do not appreciate the relevance of these methods.

Assessment is widely mentioned in the reports and there seems to be general agreement that it needs to be improved (see recommendations section). However, assessment is not frequently cited as a cause of the mathematics problems. Where it is given as a cause, this is in terms first of the content of some assessments and second the 'assessment regime'.

Reports which discussed assessment almost always did so in the context of the external examinations at GCSE and A-level. A clear message coming through that teaching time and resources are given to the aspects of the mathematics curriculum that will be assessed in examinations in schools and colleges.

The first main complaint about assessments relates to the tension between promoting mathematical thinking within, for example, extended investigative projects or problems solving, and the ways in which mathematics is assessed. The claim is that examination questions tend to be routine and familiar, and the only

mathematical thinking that is assessed is that which is easy to test, and reliability of assessment tends to be highly valued possibly to the detriment of validity. (ACME, 2011a; Norris, 2012; Noyes, Drake, Wake, & Murphy, 2011; Vorderman et al., 2011)

GCSE and A-level examinations are dominated by routine procedures and familiar applications. There is strong agreement among teachers, educationalists and Ofsted inspectors that unless all aspects are assessed they will not be given significant teaching time and resource in schools and colleges. (ACME, 2011a, p. 6)

Further, it seems that many school leavers have only learnt how to answer the sorts of questions found on GCSE papers (ACME, 2011c). Examinations do not stretch the highest attainers. As Vorderman et al state: Many teachers are critical of the lack of demand for the most able students in the Higher Tier papers. (2011, p. 62)

It is claimed within the reports that standards in GCSE and A-level examinations have fallen (ACME, 2011b; Parliamentary Office of Science and Technology, 2013; Vorderman et al., 2011) and it seems that it is now easier to gain high grades (ACME, 2011b; Score, 2012; Vorderman et al., 2011) although, as Vorderman et al suggest, 'there has been little overall change in maths attainment since 1976'. (2011, p. 52). One reason for this may be the 'race to the bottom' by exam boards (Select Committee on Science and Technology, 2012). However, recent reports in the media following the release of the latest GCSE results (August 2013) may suggest that this trend is now being reversed (BBC, 2013).

A major concern seems to be the 'assessment regime'. For example, ACME (2011a) suggests that mathematics itself is not necessarily problematic but rather, amongst other factors, the assessment regime, stating that

'[d]eclining attitudes towards mathematics from upper Key Stage 2 onwards are also linked to assessment strategies.' (p. 8).

Many reports suggest that assessment takes place within a 'culture of performativity' (Norris, 2012, p. 11) driven by the annual publication of league tables and that operating within this culture maybe at the expense of the best mathematical experiences for pupils (ACME, 2011a; Norris, 2012; Noyes et al., 2011; Ofsted, 2012; Vorderman et al., 2011).

According to some, this system encourages 'teaching to the test'. (ACME, 2011b; Harris, 2012; Royal Society, 2011; Vorderman et al., 2011).

A further cause of problems can be the common practice within schools to view a C Grade at GCSE as an end-point or ultimate goal for both individuals and schools. For example, it is common for schools to organise their teaching at GCSE to focus attention, effort and funding on the group of students who are seen as borderline C/D and who, with some extra help, might achieve a C grade. (MN-L), *'There is evidence across the range of primary and secondary data analysed for this study that schools focus strongly on C/D borderline students, monitoring them closely and providing additional intervention.(AlphaPlus Constulancy, 2012, p. 5)*

This practice is frequently considered to compromise the overall quality of teaching and learning in mathematics (ACME, 2011a; AlphaPlus Constulancy, 2012; Harris, 2012; Norris, 2012; Ofsted, 2012; Vorderman et al., 2011), and in particular the experience of the higher achieving students who have less positive experiences of mathematics than they might otherwise have had; they are then attracted more by other subjects than mathematics post-16. There is an increasing trend to enter students early for GCSE (ACME, 2012; AlphaPlus Constulancy, 2012; Harris, 2012; Hodgen, Marks, & Pepper, 2013; Norris, 2012; Noyes et al., 2011; Vorderman et al., 2011), and frequently once they have achieved the coveted C grade (or above) they do no further mathematics at the pre-16 level (ACME, 2012; Norris, 2012; Noyes et al., 2011).

Further, it seems that teaching focuses topics within the curriculum which are necessary for a grade C, avoiding or giving minimal attention to those that are less necessary such as problem solving, deductive and inductive reasoning, developing mathematical argument and proof (ACME, 2011a). These mathematical areas, however, are seen as important for the overall development of the mathematical thinking of young people, and the fact that they are not engaging in them may account for their lack of skills at later stages.

A second knock-on effect is that some pupils who may have benefitted from more challenging mathematics are held back. Some, for example, who would perhaps benefit from experiencing demanding mathematics, follow a less demanding syllabus leading to a less demanding examination (Foundation tier) for which the top grade is a C. A C grade in this context is often seen as easier to achieve than a C at the more demanding level (Higher tier) (ACME, 2011b; Vorderman et al., 2011). Others, who might achieve the highest grades are not encouraged to strive for anything higher than a B grade (Ofsted, 2012). Finally, a focus on Key Stage 4 sometimes means that Key Stage 3 pupils are neglected and that their difficulties are not diagnosed or addressed (Ofsted, 2012).