



Reform of the National Curriculum in England

Consultation response from the Nuffield Foundation

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Category of respondent	Other The Nuffield Foundation is an endowed charitable trust that aims to improve social well-being in the widest sense. It funds research and innovation in education and social policy and also works to build capacity in education, science and social science research. www.nuffieldfoundation.org
Relevant subjects	We are answering this consultation mainly in response to mathematics and science, with some reference to design & technology and computing.
Is this response confidential?	No

Q1: Do you have any comments on the proposed aims for the National Curriculum as a whole as set out in the framework document?

- The National Curriculum aims to provide ‘pupils with an introduction to the core knowledge that they need to be educated citizens’ [section 3.1]. ‘Skills and processes’ are part of this core knowledge and the Secretary of State is required by legislation to set these out at each key stage [section 3.4]. Yet these are not developed at the same level as subject content. Skills need to be defined and assessed. One way of doing this is to move some of the rubric on skills in the early part of the consultation document [section 5, and in particular sections 5.2 and 5.5 for mathematics] into the subject criteria, and to develop and exemplify this.

Q2: Do you agree that instead of detailed subject-level aims we should free teachers to shape their own curriculum aims based on the content in the programmes of study?

We disagree, for the following reasons:

- There must have been aims for each subject area for the authors to write the programme of study, so these should be made explicit. This is not to say that teachers should not be free to expand the curriculum to embrace broader curriculum aims.
- There is currently a false dichotomy between concepts and the practices and processes of a discipline. Teachers need guidance on this. The Key Stage 3 mathematics programme of study does a better job of highlighting the processes of mathematics compared to the Key Stage 2 programme. But both could benefit from giving the skills, practices and processes of mathematics a more central role (as opposed to serving an 'introductory' role). The US Common Core Standards provide an evidence-based model for this (www.corestandards.org/Math/Practice), and this approach is also reflected in the Singapore and New Zealand National Curricula.

With regard to subject-level aims, it is important to provide guidance on the weighting of the mathematics which appears in the science curriculum. Otherwise the mathematics which is specified will not be sufficiently taught and assessed.

Q3: Do you have any comments on the content set out in the draft programmes of study?

- The need for students to consider the impact of science on society has largely been removed. As a consequence, a key function of science – its use to inform debate about the world and way in which we live in it – has also been eliminated. The teaching of ethics in science, and its assessment, also needs to be addressed. See *Assessing Ethics in Secondary Science*, which has a number of relevant findings and recommendations ([www.nuffieldfoundation.org/sites/default/files/files/Assessing_Ethics_in_Secondary_Science\(1\).pdf](http://www.nuffieldfoundation.org/sites/default/files/files/Assessing_Ethics_in_Secondary_Science(1).pdf)).
- The importance of understanding and application should also be emphasised. The draft programmes of study for science make reference to what pupils 'should be taught', rather than what they 'should understand and apply in a range of contexts'. If teachers are to develop their own curriculum aims, there must be a requirement for deep learning, not just teaching of facts.

- Mathematical processes need to be expanded in a similar way to the science processes. 'Working mathematically' can be developed along the lines of 'working scientifically'.
- The principles set out in section 5.5 (Numeracy and mathematics) are exemplary, and could be made integral to the primary and secondary mathematics programmes of study.
- We also support the points made in section 5.2 (Language, literacy and numeracy), on the importance of mathematical skills across the curriculum. However these statements are not embodied in the framework, which has a distinct lack of links between the different subject-specific sections. We recommend undertaking an audit of the links between mathematics and other subjects, including where one is needed to support the other, as this affects teaching sequence. In addition to cross-referencing mathematical topics, terminology and teaching order with other subjects, mathematical requirements should also be integrated with subject-specific assessments. Research evidence from the Nuffield Foundation and SCORE has shown the need for clarification on a) the extent to which the mathematical components of other subjects should be assessed and b) the timetable for rotation of assessment of learning outcomes (e.g. all mathematics content will be assessed over a 5 year period). This research pertains specifically to A level assessments, but is relevant to assessment at other levels (www.nuffieldfoundation.org/mathematics-level-assessments).
- Further comments relating to the mathematics programmes of study are made in our response to Question 4.
- Given the lack of teaching capacity for computing, in particular at primary level, the goals of the computing curriculum, whilst laudable, are unrealistic.
- We share the concerns of the Design and Technology Association and the engineering community regarding the draft design and technology curriculum. The draft reflects an inadequate understanding of current design and technology. For example, on page 157 it suggests pupils 'undertake common diagnostic and maintenance tasks' on motor vehicles as part of work on mechanics. The level of detail is highly variable. For example specific mention is made of cooking a 'repertoire of savoury meals', whereas areas such as robotics, graphics, and games design, which offer excellent opportunities for linking with the computing and mathematics curricula, are not touched on at all.

Q4 Does the content set out in the draft programmes of study represent a sufficiently ambitious level of challenge for pupils at each key stage?

We are not sure, for the following reasons:

- Challenge is more a function of how these topics are assessed and hence what students are required to do with the knowledge. The science programme of study refers to what pupils 'should be taught'. This implies that facts are to be learnt without application. There should be more detail on how students should apply what they have learnt in a range of contexts.
- The challenge within the mathematics programmes of study is variable and at times it is challenging for the wrong reasons. For example some statements are ill-defined and some topics and procedures are being introduced or withheld at inopportune points. We recommend that those responsible for drafting the programmes of study work closely with specialist academics, and consider the relevant research on curriculum concepts and their sequencing. In relation to the former, we would highlight Mike Askew, Terezinha Nunes and Ian Thompson (for primary), and Keith Jones, Dave Pratt and Anne Watson (for secondary). For the latter, the following are recommended:
 - www.nuffieldfoundation.org/key-understandings-mathematics-learning
 - <http://www.nuffieldfoundation.org/childrens-understanding-probability-intervention-study>
 - www.nuffieldfoundation.org/key-ideas-teaching-mathematics
 - www.nuffieldfoundation.org/values-and-variables-mathematics-education-high-performing-countries
 - [http://www.ianthompson.pi.dsl.pipex.com/index_files/mental_calculation_strategies_for_the_addition_and_subtraction_of_2-digit_numbers_\(nuffield_1\).pdf](http://www.ianthompson.pi.dsl.pipex.com/index_files/mental_calculation_strategies_for_the_addition_and_subtraction_of_2-digit_numbers_(nuffield_1).pdf)
- The variation in level of specificity and approach, and patchiness in quality, across different topics makes the mathematics programme of study difficult to interpret. For example:
 - The programme of study for upper Key Stage 2 does not mention the essential dimension of *quantitative reasoning* – the understanding and determination of which operation/computation is required for a particular problem, not simply the execution of a computation.
 - There is minimal detail in the sections on data in Key Stage 2 and statistics in Key Stage 3, which will be unhelpful for teachers without further exemplification. For example, at Key Stage 2 (pg 93), the guidance says 'Pupils should know when it is appropriate to find the mean of a data set', but there is no mention of what other averages should be considered and at what level of detail. Similarly, at secondary level, the phrase 'appropriate measures of central tendency and spread' is used, but without any indication of what is to be deemed 'appropriate'.

- We are unconvinced by the omission of probability at primary, where it can help anchor learning on fractions, multiplication and division; the omission of combinatorial reasoning (which is age appropriate and provides a basis for probability calculations); and the lack of connections between probability and statistics at secondary. For further evidence on probability, see Nunes and Bryant (www.nuffieldfoundation.org/childrens-understanding-probability-intervention-study), and the resources published by David Spiegelhalter and NRICH (<http://nrich.maths.org/probability>). We also share the concerns expressed by the Royal Statistical Society in relation to probability and statistics.
- We commend the inclusion of the data handling cycle within the science and geography programmes of study. We support the better teaching of statistics in subject-specific contexts and are not recommending that probability and descriptive statistics be merged and taught purely in the mathematics classroom. But clearer connections need to be made between the teaching of probability and statistics, in particular via a modelling approach. This is addressed in our recent *Key Ideas in Teaching Mathematics* project:
 - www.nuffieldfoundation.org/key-ideas-teaching-mathematics/reasoning-about-data
 - www.nuffieldfoundation.org/key-ideas-teaching-mathematics/reasoning-about-uncertainty
 - www.nuffieldfoundation.org/key-ideas-teaching-mathematics/modelling-uncertainty

Q5: Do you have any comments on the proposed wording of the attainment targets?

Q6: Do you agree that the draft programmes of study provide for effective progression between the key stages?

We disagree, for the following reasons:

- There has not been enough work on the transitions between Key Stages – in particular between Key Stage 2 and 3, and Key Stage 4 and 5.
- As suggested thus far, Key Stage 5 development will take place in parallel with Key Stage 4. Key Stage 5 development needs to wait until Key Stage 4 is confirmed.
- A two-year lag for Key Stage 5 would also solve the issue of having two year groups of pupils taking A levels having followed the old Key Stage 4 curriculum, which makes a nonsense of the idea of progression.

Q7: Do you agree that we should change the subject information and communication technology to computing, to reflect the content of the new programmes of study for this subject?

This is the wrong question to ask, for the following reason:

- Computing and ICT are different areas of study. There are needed for different contexts and one should not replace the other. This is not to say that the ICT curriculum does not need revision, or that computing is not desirable as an area of study.

Q8: Does the new National Curriculum embody an expectation of higher standards for all children?

No, we do not believe it does, for the following reasons:

- There is not much change in the science programmes of study; just re-bottling and some refinements. The thinking about 'How science works' and practical work content has also moved on. There is some tinkering with the age at which certain mathematical content and procedures are encountered, and some examples of this in science (e.g. in evolution) but this does not 'embody an expectation of higher standards'. There is a preoccupation with phrases such as 'efficient written methods of columnar addition and subtraction, short and long multiplication, and short and long division'; 'larger

calculations'; 'larger numbers'; and 'increasingly complex properties'. But again, these do not embody higher standards in mathematics.

- Higher standards are more of a function of assessment than of the curriculum.
- The phrase 'for all children' is meaningless without a carefully designed range of courses and assessments for the full range of abilities. It is not possible to claim the curriculum is 'for all' when a possible consequence of a more demanding curriculum is that more students 'fail'.

Q9: What impact - either positive or negative - will our proposals have on the 'protected characteristic' groups?

- References to greater 'rigour' have implications for progression, but what alternative courses/ routes are being provided for those who 'fail'? This has not been adequately discussed.

Q10: To what extent will the new National Curriculum make clear to parents what their children should be learning at each stage of their education?

- The National Curriculum needs to make clear what students are expected to do rather than just what they should 'know'.
- Exemplification will be needed for parents, for example in the form of student activities.
- The phrase in Section 7.4 of the consultation document about parents given information on what their children 'should know' should be changed to 'know and do' – in line with Section 10.2.

Q11: What key factors will affect schools' ability to implement the new National Curriculum successfully from September 2014?

- Access to expert CPD – i.e. subject specific, with reference to research and external expertise where appropriate.
- Exemplification of what is expected is also relevant here, as student activities and assessment items.
- Teachers' time must be freed up for planning and CPD.

Q12: Who is best placed to support schools and/or develop resources that schools will need to teach the new National Curriculum?

- A combination of external experts, such as the Science Learning Centres, NCETM, the National STEM Centre and professional curriculum developers and CPD providers, in collaboration with schools. These organisations have access to significant evidence based projects including those funded by the DfE, research councils, the EU, and Foundations such as Gatsby, Wellcome, and ourselves. Teachers do not have the expertise to develop resources alone.
- However this approach may present difficulties for those subjects which do not have supportive subject associations or networks.

Q13: Do you agree that we should amend the legislation to disapply the National Curriculum programmes of study, attainment targets and statutory assessment arrangements, as set out in section 12 of the consultation document?

We disagree, for the following reason:

- In the absence of a clear statement as to the nature of interim assessments and attainment targets, it would not be advisable to disapply the current programmes of study, attainment targets and statutory assessment arrangements. Disapplying the statutory assessment arrangements will not provide sufficient clarity to teachers as to what exactly their pupils, who would have studied the earlier curriculum, will be tested on.

Q14: Do you have any other comments you would like to make about the proposals in this consultation?

- While we have responded to the consultation, we found both the process and the content of the national curriculum review difficult to engage with. The variability in style and level of detail, particularly for the mathematics programmes of study, were problematic. We would have liked to have seen a more coherent curriculum, with more connections between subjects. Given the significant costs (for pupils, teachers and more generally) of wholesale change to the national curriculum, we would like to see a consensus curriculum that all leading political parties and educational stakeholders are signed up to. This requires a fully transparent and inclusive process. We hope the Department for Education will address these issues in preparing the final curriculum, and utilise the willingness of the wider educational community to engage with the process.

Q15: Please let us have your views on responding to this consultation (e.g. the number and type of questions, whether it was easy to find, understand, complete etc.)

Please acknowledge this reply	✓
Email address for acknowledgement	fbright@nuffieldfoundation.org
Would it be alright if we were to contact you again from time to time either for research or to send through consultation documents?	✓