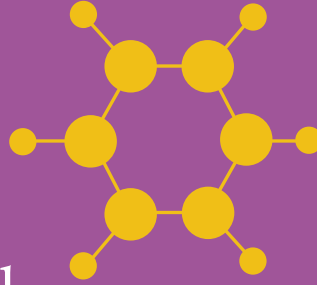


In July 2010, 21 years after the National Curriculum was first introduced, the Wellcome Trust convened a seminar to reflect on the impact of the National Curriculum for science.



The curriculum is at a critical point in its development. With the prospect of a full review, it is vital to stop and consider the lessons that can be learned from its history in order to inform its future.

The 1988 Education Reform Act was a landmark in shaping the education systems of England, Wales and Northern Ireland. Among other things, it paved the way for the first statutory National Curriculum with associated national testing at seven, 11 and 14. The curriculum was first taught in schools from September 1989 – 21 years ago.

During these 21 years the National Curriculum has undergone several revisions, been the subject of much debate and used as a tool to achieve educational reform. Once again the curriculum is under political scrutiny, with a clear agenda for reform being set out by ministers.

Presented here are views that emerged from the seminar where delegates considered the National Curriculum's initial development and subsequent evolution; highlighting both the benefits and drawbacks of the National Curriculum for science and five key messages that should be considered by policy makers and curriculum reformers during the proposed review.

The group felt that understanding and taking account of these messages would help to ensure that any future developments were well thought through and therefore more likely to be successful. It is important to note that while the focus was on the National Curriculum for science, many of the key messages apply more widely.

Contributors to the seminar included members of the original National Curriculum science working group, individuals from learned societies and professional bodies¹ and, importantly, science teachers. However, this paper does not necessarily represent the views of the Wellcome Trust, nor of any other organisation or individual seminar delegate present.

¹ The Royal Society, the Royal Society for Chemistry, the Institute of Physics, the Society of Biology, the Association for Science Education, the Science Learning Centres, the Nuffield Foundation and the Gatsby Charitable Foundation.

Impact of the National Curriculum for science

“legislation should leave full scope for professional judgement...there must be space to accommodate the enterprise of teachers, offering them sufficient flexibility in the choice of content to adapt what they teach to the needs of the individual pupils, to try out and develop new approaches and to develop in pupils those personal qualities which cannot be written into a programme of study or attainment target.”

Department of Education and Science, 1987²

Benefits

There was broad agreement that the National Curriculum has brought about significant improvements that include:

- the first ever national entitlement to science education for all students from five to 16
- a raising of standards in many schools
- ensuring that students studied all the major scientific disciplines, in particular increasing the number of girls studying physics to the age of 16
- establishing science as an important core element of the primary curriculum
- improving the continuity and transferability when young people moved from one school to another, whether between phases or geographically.

Drawbacks

The group agreed that the National Curriculum does not act in a vacuum. Its implementation is influenced by a complex web of outside factors – many of which, including the assessment and inspection regimes, were specifically designed to support its delivery. These factors have contributed to teachers working in a climate of uncertainty, unsure of educational priorities. Ofsted and the development of league tables have left teachers with the impression that political measures for success are not aligned with their own educational aims for their students. Schools want to provide rich and flexible experiences that engage and develop young people. However, this has not been recognised as a national measure of success, with improvements in exam results being seen as the overwhelming priority.

Teaching professionals reported a lack of direct engagement with the actual National Curriculum, often using a range of interpretations from the Qualifications and Curriculum Authority and awarding bodies. This has caused additional confusion for teachers, creating the perception that the National Curriculum is more constraining and restrictive than is actually the case.

Thus, over the years, the mistranslation of what was originally intended has resulted in:

- many teachers feeling disempowered to teach in a manner appropriate to their students and circumstances
- a strong sense of over-prescription in terms of the content of the curriculum
- increased pressures to ‘teach to the test’ at all levels
- frequent, apparently piecemeal, changes to the curriculum in order to fix shortcomings and meet top-down policy changes
- tests and examinations dominating not just what is taught but also how it is taught.

The group felt that the overall impact has undermined teacher confidence to innovate, leaving them as deliverers of the National Curriculum rather than as developers of a rich and varied science education. This has resulted in a narrowing of the educational experience of young people.

² Department of Education and Science.
The National Curriculum 5–16: A consultation document. London: HMSO; 1987.

The National Curriculum for science: key messages for the future

“I want to remove everything unnecessary from a curriculum that has been bent out of shape by the weight of material dumped there for political purposes. I want to prune the curriculum of over-prescriptive notions of how to teach and how to timetable. Instead I want to arrive at a simple core, informed by the best international practice, which can act as a benchmark against which schools can measure themselves and parents ask meaningful and informed questions about progress.”

Michael Gove MP, Secretary of State for Education, to the National College for School Leadership Annual Conference, Birmingham, 17 June 2010

The group believed that all young people should have a core entitlement to a broad and balanced science education, covering the big ideas of science, with opportunities to pursue some aspects of the subject in depth according to their interests and aptitudes. The entitlement should also extend to opportunities to experience science in a range of contexts and locations, in order to show the ways in which science and its associated STEM disciplines relate to everyday life as well as industrial and cultural developments.

To meet the aspiration of such an entitlement, the group identified five key messages that should be considered by policy makers, curriculum developers, teachers and schools during the revision process.

1. The aims and purpose of the National Curriculum for science must be clearly articulated and adhered to.

The current National Curriculum has subjects as its underlying structure. However, the purpose and aims for these individual subjects have not always been clearly articulated. For science, these aims should be developed by considering the unique contribution that science makes to the entirety of a young person's education. These aims should be developed and made explicit in order to ensure they underpin a science education that meets the needs of all young people, the economy and the society in which we live.

Agreeing the aims and purpose of a science education would provide a shared long-term vision that policy makers, teachers and other stakeholders could work towards, ensuring that any reforms were considered in light of these and contributed to their overall achievement.

2. The body of core knowledge should be clearly defined but not over-prescribed.

The body of scientific knowledge encapsulated in a National Curriculum should include a balance of information (what we know), skills (how we do things) and concepts (what we understand). The science curriculum should enable young people to gain knowledge and capabilities in all these aspects of the subject as well as ensuring that they experience science through practical activities and in settings beyond the classroom.

Striking a balance is also important when considering the level at which content should be prescribed: ensuring an entitlement for all to a well-rounded and enriching science education, while allowing the time and space for local innovation in teaching approaches and encouraging the pursuit of some aspects of science in more depth. Such an approach would enable those who wish to pursue a career in science and related fields to do so.

3. Assessment should be designed as an integral part of National Curriculum development.

Assessment has had a major influence on the way in which the National Curriculum has been implemented. Parts of the National Curriculum for science that are easily assessed – and therefore frequently assessed – are given a disproportionate amount of teaching time, narrowing the educational experiences of young people.

More thought and care must therefore be put into developing and carrying out appropriate means of assessing young people's progress and achievement. This should be done alongside curriculum development, ensuring that assessment covering the whole of the curriculum is in place.

Ultimately, assessment should be designed to support learning, improve achievement and assess the things that are considered important for young people to know, understand and be able to do. The assessment structure should therefore ensure that teachers can use assessment formatively to improve teaching and learning for their students and their own professional practice.

4. New developments should be carefully piloted and rigorously evaluated before being refined and rolled out nationally.

The existing science curriculum has strengths and so care should be taken to ensure that these are not lost. The new curriculum must build on these strengths, but it is also vital that its development and subsequent implementation are well informed by what has been learned over the last 21 years, drawing on research and the expertise of learned societies, professional bodies, science teachers and head teachers.

Frequent and piecemeal changes to the National Curriculum have led many people involved in education to become disillusioned and disengaged from top-down policy making. Before system-wide changes are made they need to be robustly piloted, evaluated and refined. This would allow for long-term stability and ensure the effective implementation of any reforms.

5. The implementation of a new curriculum must be carefully planned to ensure that all parties involved (including teachers, inspectors, parents and pupils) understand how it should be applied.

Many of the drawbacks of the present National Curriculum for science stem not from the curriculum itself but from the way it has been interpreted and translated into practice. Greater efforts must, therefore, be made to ensure that teachers and their schools understand how best to apply the National Curriculum and are empowered to be creative and innovative in their approaches to teaching and learning.

However, for teachers to use the curriculum as a launch pad, continuing professional development and support are essential. Throughout the National Curriculum's history, science teachers have perceived a shift towards prescribing how to teach rather than what to teach. This has caused a drop in teachers' professional confidence, with many teachers following schemes of work without much interpretation to suit local needs. Professional support will allow teachers to implement the curriculum successfully, but more importantly it is also needed for them to engage in curriculum development, helping to ensure an exciting science education that is tailored to the interests and needs of their students.

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