

Department for children, schools and families: Independent Review of the Primary Curriculum**Response by the Wellcome Trust**

April 2008

1. The Wellcome Trust is pleased to respond to Sir Jim Rose's Independent Review of the Primary Curriculum. The Wellcome Trust is the largest charity in the UK. It funds innovative biomedical research, in the UK and internationally, spending around £600 million each year to support the brightest scientists with the best ideas. The Wellcome Trust supports public debate about biomedical research and its impact on health and wellbeing.
2. As part of this work, the Wellcome Trust has taken an active interest in science education and the development of primary science. Examples of our work relating to primary education include:
 - a. '*Primary Horizons: Starting out in science*'. In 2005, the Trust commissioned a study to explore primary teachers' views and experiences of science education across the UK. Conducted by researchers at Queen's University Belfast and St Mary's University College Belfast, the study is thought to have been the largest of its kind to date. A copy of the summary report, *Primary Horizons* is enclosed¹. This response draws heavily on the findings, conclusions and recommendations of the report.
 - b. '*The effects of national testing in science at KS2 in England and Wales*': The Trust has recently commissioned research into the effects of compulsory national testing on the teaching of science at Year 6 in England; and the impact of the abolition of statutory testing in science at Key Stage 2 in Wales on Y6 science teaching and teachers.
 - c. National Science Learning Centre: as part of the Trust's support for continuing professional development (CPD), we have partnered with the Department for Children, Schools and Families to establish and develop nine regional and one national Science Learning Centre. The aim of this initiative is to provide high quality, accessible CPD for teachers of science and technicians from both primary and secondary education.
 - d. Grants: The Trust's Engaging Science Grants scheme supports activities and research that engage people of all ages with biomedical science, including some grants primary education.
3. Our response to this consultation focuses on those questions that relate to the role of science within the curriculum which is of most relevance to the Trust.

¹ The Wellcome Trust (2005) *Primary Horizons: Starting out in science*. Wellcome Trust, London.
http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtx026628.pdf

Q1c) What should be the position of science and ICT within the primary curriculum?

4. The Wellcome Trust considers that science must have an important role in the primary curriculum. Primary education is crucial in supporting scientific literacy, equipping young people to understand and make informed decisions about the impacts of science and technology on their lives. Children's early years are key to shaping society's attitudes towards science, and high quality science education can engage and inspire young children.
5. The *Primary Horizons* report noted a number of issues about the quality of science education available in primary schools. To some degree these have been, and are being, addressed by the development of high quality training for all teachers, including primary teachers, through the Science Learning Centre Network (see Q6 below).
6. However, concerns remain about the way in which the primary priorities of numeracy and literacy may be 'squeezing' the time available for science in primary schools. These were noted both in *Primary Horizons* and in the recent Trust-funded project examining the effects of national testing in science at KS2 in England and Wales. This concern about available time – allied with a perception that the current English KS2 assessment approach results in 'teaching to the test' – suggests that the science curriculum in primary education in England may be in danger of becoming too narrow.
7. The Trust has recently commissioned research looking at trends in science attainment, attitudes and approaches in English primary schools (in preparation). Initial findings from this work indicate that levels of achievement at the end of primary are at least stable, with a decline in enthusiasm for science on moving from primary school to secondary school. Somewhat paradoxically this transition effect occurs as children move from teaching and learning guided by non-specialists to teaching by specialists.
8. Current research suggests that science is poorly integrated with other curricular areas. We would emphasise the need for cross-curricular approaches, which have been shown to be highly motivational for both teachers and pupils. We recommend that the links between science and other subjects should be made more explicit and strengthened to help bring science to life and develop transferable skills.
9. We recommend there should be a review of curriculum content and assessment programmes at Key Stage 1 and 2 to provide greater opportunities for teachers to focus on topics likely to develop scientific and other skills and to generate enthusiasm. Later in 2008, the Trust will also publish a commissioned 'think piece' examining the pros and cons of having science as a core subject – as it does appear that this status, and the attendant assessment approach, may well be having the unintended consequence of eliminating the hands-on investigative science which young people feel most enthused about.

Q1e) What is case and scope for reducing prescription and content in the programmes of study?

10. The *Primary Horizons* report concluded that primary science education should not just be concerned with knowledge, but also with the acquisition of scientific concepts and the development of scientific and thinking skills. Primary science should include a greater emphasis on the use of creative and innovative approaches, open-ended investigation and cross-curricular work, to help bring science to life and develop transferable skills. The best way to develop children's scientific literacy is to make science more relevant to their everyday lives.
11. Open-ended investigation in primary science provides perhaps the most important opportunity for children to develop scientific thinking and manipulative skills. However, teachers

interviewed as part of *Primary Horizons* commented that these activities are time consuming and in competition for time with the seemingly more urgent preparation for national tests. This conclusion has also been reinforced by the findings of recent work examining the impact of testing on KS2 in England and Wales (see Q6 below). We argue that the programme of study should provide opportunities for children to develop investigative, questioning and thinking skills.

12. We welcome the suggestion that the review should build on developments in the new secondary curriculum. We hope that primary science will benefit from the latest moves in secondary science to reduce course content in favour of developing broader skills, as, for example with the Twentyfirst Century Science GCSE.

Q2b) What can be done to ensure that these vital subjects [reading, writing and numeracy] are taught thoroughly and systematically, and fully integrated within all areas of the curriculum?

13. There are clear opportunities to integrate reading, writing and numeracy through the science curriculum. A good science education depends on strong numeracy skills, an ability to analyse data, understand new concepts, communicate well and demonstrate clear written skills. Incorporating the teaching of reading, writing and numeracy throughout the curriculum, rather than allocating dedicated separate time, therefore provides a focus for the development of transferable skills.

Q5a) How might schools make best use of the information available about prior learning, and information from parents and other professionals working with children, to secure optimum continuity and progression for all children from the Early Years Foundation Stage onwards, paying particular attention to the key transition points?

14. A number of studies reflect the internationally held view that transition points – especially for science and from primary education to secondary – precipitate a decline in interest, enthusiasm and attainment in young people. Examples include: ‘*A literature review of research conducted on young people’s attitudes to science education and biomedical science*’²; The Relevance of Science Education (ROSE) study³; Organisation for Economic cooperation and Development (OECD) Programme for International Student Assessment (PISA)⁴; and The National Science Learning Centre’s Annual survey of young people’s attitudes to science.⁵
15. Transition points in education are regularly accompanied by such changes, but recent studies have demonstrated (in science) how improvements can be made. Evangelou et al (2008)⁶ noted the importance of curriculum continuity and better understanding of teaching across the primary-secondary divide. With particular regard to science, Topping et al (2007)⁷ have

² ‘*A literature review of research conducted on young people’s attitudes to science education and biomedical science*’ Wellcome Trust (2007) Available to download at: http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_grants/documents/web_document/wtd038715.pdf

³ <http://www.ils.uio.no/english/rose/network/photos/grassmate-oslo.html>;

⁴ <http://www.pisa.oecd.org/dataoecd/15/13/39725224.pdf>

⁵ <http://www.sciencelearningcentres.org.uk>

⁶ Evangelou, M., Taggart, B., Sylva, K., Melhuish, E., Sammons, P. and Siraj-Blatchford, I. (2008). What makes a successful transition from primary to secondary school? Findings from the effective pre-school, primary and secondary education 3-14 (EPPSE) project. DCSF Research Brief (RB019). London: DCSF

⁷ Topping, K. J., Thurston, A., Tolmie, A., Christie, D., Murray, P., and Karagiannidou, E. (2007). Group work: transition into secondary. Edinburgh: The Scottish Government.

demonstrated lasting effects of primary group/collaborative work in helping young people to export the progress made in primary science to their secondary schooling. Both studies point to teachers at each phase understanding each other better and building bridges between the two phases. Such approaches take time – as does planning and supporting collaborative work – but this is something which studies suggest primary science coordinators feel they have very little of (even with workload agreement changes regarding planning, preparation and assessment time).

16. The Wellcome Trust remains concerned about the loss of impetus in the transition from primary to secondary science. Significant in-roads can be made through continuing professional development to improve understanding between, and confidence of, teachers in both phases and the Trust would like to see further research into making such transitions more successful at structural and pedagogical levels. The work of the Astrazeneca Trust is notable in providing practical ways of improving transitions in science education.⁸

Q6 Do you have any other comments or contributions to make?

17. Primary teachers should be provided with more opportunities for high quality, career-long continuing professional development (CPD) in science. Most primary teachers are not science specialists and would benefit from greater support to help them develop their science teaching skills and increase their confidence. 50 per cent of teachers questioned for *Primary Horizons* highlighted a lack of knowledge, expertise, confidence and training in science as the main issue facing primary teachers in their science teaching. The most important factor influencing respondents' confidence was professional development; those who had carried out CPD in science were more confident in nearly all aspects of science teaching.
18. Provision is now in place to deliver high quality CPD for science teachers through the Science Learning Centres network. This will be further developed in project ENTHUSE⁹ - a joint initiative between Government, Industry and the Wellcome Trust – which aims to make high quality CPD available to all science teachers, overturning the most frequently cited barrier to participation on training: cost.
19. Second, we recognise that testing and assessment are not included within the scope of this review. However, assessment methods have a significant impact on teaching of curriculum and outcomes of learning. It is difficult to isolate the issues entirely, and we would therefore like to highlight some points relating to the impact of national testing on science teaching.
20. As mentioned above, the Trust has commissioned research to consider the effects of compulsory national testing on the teaching of science. The Institute of Education has conducted research to assess the effects of compulsory national testing on the teaching of science, and teachers, at Year 6 (Y6) in England; and the impact of the abolition of statutory testing in science at Key Stage 2 (KS2) in Wales on Y6 science teaching and teachers.
21. Initial findings are now available, and key points include:
 - teachers consider statutory testing to be leading to a narrowing of the science curriculum and limiting approaches to teaching;
 - teachers in England find it difficult to maintain positive attitudes to science among pupils and suggested that abolishing testing would make science more enjoyable;

⁸ See for example: <http://www.azteachscience.co.uk/code/development/stay.asp>

⁹ Project ENTHUSE will put £30 million into science CPD over five years from 2008 – 2013. For further information see: <http://www.wellcome.ac.uk/News/Media-office/Press-releases/2008/WTD039207.htm>

- teachers in England feel that abolishing statutory testing would enable them to respond more to individual pupils' needs and would allow pupils to develop greater independence in learning;
- teachers support retaining optional test materials to inform teacher assessment (as they have been in Wales); and
- summative teacher assessment is seen to provide a more accurate assessment of pupils' level of attainment in science than national test results and teachers are concerned about how data from school achievement tables may be used.

22. While it is still too early for the effects of the abolition of testing in Wales to be fully realised, Welsh teachers suggest that the emphasis in science teaching is beginning to shift away from the transmission of factual knowledge towards the development of pupils' skills to support their learning in science, and there has been an increased emphasis on small group work and practical activities.

23. The initial report therefore makes three recommendations:

- there should be a review of classroom support for science in Y6 classes to enable practical whole class activities and to support summative teacher assessment of pupil attainment in England and Wales;
- consideration is needed of how to improve progression in learning during KS2 in England and Wales; and
- there should be an evaluation of how appropriate it is to use school achievement tables based on KS2 test results for purposes of accountability in England.

24. We would be happy to discuss any of these issues in more detail if it would help.