

Quinquennial Review of the National Network of Science Learning Centres

A Report of the Review Panel for the Department for
Education and the Wellcome Trust
June 2012

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Scope of the Review

- 1) This Review covers past performance over 2008–12 and recommendations for the future for:
 - (i) the National Science Learning Centre (NSLC), which currently receives core funding from the Wellcome Trust
 - (ii) Project ENTHUSE, through which Wellcome Trust funds are directed to the NSLC (to provide its core funding), and which also includes the ENTHUSE Charitable Trust (funded by the Government and industry partners), which provides schools with bursaries to enable attendance at the NSLC
 - (iii) the Regional Science Learning Centres (RSLCs), for which the Department for Education provides core funding as well as bursaries (Impact Awards) for teachers and technicians to attend courses.

Both the NSLC and RSLCs are currently run by Myscience.

Background

- 2) In 2003, the Government and the Wellcome Trust agreed a joint initiative intended to transform science teaching through improving the quality and availability of science-specific continuing professional development (CPD) for teachers and technicians. Nine government-funded RSLCs opened in 2003, primarily offering day courses to teachers. This was followed by the opening of the NSLC, which specialises in residential CPD courses, funded by the Wellcome Trust and operated by Myscience. Together the NSLC and RSLCs provide a network of coverage across England,¹ based on the regional structure of the former Regional Development Agencies (RDAs).
- 3) In 2008, the NSLC underwent a favourable quinquennial review. However, there was worryingly low demand; schools were not sufficiently prioritising science CPD despite its potential to train up teachers in subjects in which there were shortages, and despite the ongoing need to update scientific knowledge and pedagogical skills (see paragraphs 10–12). The Wellcome Trust garnered new support from industry and the Government for a second phase of the initiative, with the goal of increasing throughput and creating a cultural shift in the attitude of schools towards CPD. Project ENTHUSE was formed, through which the Wellcome Trust pledged £10 million over 2008–13 for the operating costs of the NSLC while the ENTHUSE Charitable Trust was founded with £10 million from the Government and a total of £7 million from industry partners (AstraZeneca, AstraZeneca Science Teaching Trust, BAE Systems, BP, General Electric, GlaxoSmithKline, Vodafone, Vodafone Group Foundation and Rolls-Royce). The ENTHUSE Trust funds bursaries for participants on NSLC courses (covering course fees, accommodation, travel and teaching cover). The Government announced ongoing core funding for the RSLCs, adding Impact Awards to assist schools with

¹ The NSLC also works with the devolved administrations.

the costs of attending RSLC courses.

- 4) In 2011, the Wellcome Trust and the Department for Education agreed to conduct a joint quinquennial review of the RSLCs, the NSLC and Project ENTHUSE. In his Autumn Statement in 2011, the Chancellor announced the Government's intention to invest £10 million in Project ENTHUSE over 2013–18 with matched investment from the Wellcome Trust, contingent upon the outcome of this Review. This Review will therefore inform the final funding decisions for the NSLC and Project ENTHUSE (with the current funding period ending on 31 July 2013) and it will also provide guidance for the Department for Education on the re-tendering of the RSLCs (with the current funding period ending on 31 March 2013).²
- 5) This is the report of the Review Panel based on consideration of:
 - a report from Myscience on the performance of the National Network of Science Learning Centres and Project ENTHUSE, including proposals for the next five years
 - an independent evaluation of the Network by SQW
 - the comments of five external reviewers on the above and Myscience's response to them
 - a site visit by the Review Panel to the NSLC on 15–16 May 2012 incorporating discussions with key personnel from across the Network (including members of the Board of Directors of Myscience and of the ENTHUSE Charitable Trust, and Directors of two RSLCs).

The Review Panel membership is given in the Appendix.

Observations and recommendations

- 6) Myscience has assembled an impressive array of quantitative and qualitative evidence which the Review Panel believes demonstrates that the quality of CPD delivered is outstanding. The Panel also notes that Myscience responded well to the recommendations made in the first quinquennial review of the NSLC, most notably in improving its operational processes and governance. Furthermore, the ENTHUSE Trust has become much more than a funding mechanism, and has challenged and guided the work of the NSLC for the better.
- 7) The Panel recognises that it is challenging to gather evidence of the impact of individual interventions on schools, teachers and their students, but notes the many examples of positive impacts quoted in the submission, including those described below:
 - Of CPD participants surveyed, 94 per cent reported that the courses had improved their knowledge and understanding, 90 per cent reported that they had changed their practice, and 98 per cent said they would recommend the course that they had been on to others (SQW, 2012).
 - 57 per cent of teachers who had participated in five days or more of NSLC or RSLC CPD said that this CPD had increased their likelihood of staying in teaching (Wollstenholme et al., 2012).
 - “The quality of professional development received from external providers was variable but that provided by the national network of Science Learning Centres was consistently reported to be good.” (Ofsted, 2011)
 - Non-specialist teachers, attending CPD to improve their teaching of specific aspects of physics or chemistry, showed significant gains in associated knowledge and skills, and

² The RSLCs originally had nine individual Government contracts. In 2007, the Government brought the management of the centres into a single contract, which was tendered for and won by Myscience.

their pupils demonstrated more understanding than pupils in 'control classes' (Scott et al., 2010).

- "participation by teachers in Science Learning Centre programmes is associated with improved teaching and learning, and higher take-up and achievement in science at their school" (National Audit Office, 2010). For instance, attendance on a course of average duration (3.5 days) at the NSLC was associated with an increase of 0.5 percentage points in the proportion of the schools' pupils gaining A*–C grades in science GCSEs.
- 8) While the evidence presented is strong, the Panel would welcome more evidence on direct causal links in key areas, such as improved examination performance and teacher retention, which could be used to assess the cost-effectiveness of the programme or to compare different types of intervention.
 - 9) To date, the Network has worked with nine out of ten English secondary schools and one in ten primary schools (the latter had not been given strategic priority by the funders to date).
 - 10) Despite the quality of the work of the Network and the emerging evidence on impact, schools are still apparently unlikely to pay the full cost for their teachers and technicians to participate in courses.
 - 66 per cent of participants surveyed who had received ENTHUSE bursaries or Impact Awards reported that they would have been unable to attend courses without such funding (SQW, 2012).
 - 11) Subject-specific CPD should be an intrinsic part of all teachers' career paths. Additionally, there will always be a special case for science-specific CPD. The pace of scientific discovery alongside technological developments means that science teachers need to update their skills and knowledge regularly. Furthermore, schools frequently require teachers to cover subjects and topics beyond their expertise (e.g. a biology graduate required to teach all three sciences to GCSE level); similarly, nearly all primary school teachers are expected to teach science. It is unrealistic to expect teachers to cover this breadth of knowledge in their initial teacher training and there should be an expectation for ongoing science CPD especially in the early years of teaching. Aside from all these ongoing needs for science CPD, secondary schools are currently experiencing shortages of specialist science teachers, especially in physics and chemistry, and at least two-thirds of primary schools do not have even one science graduate on the teaching staff. These shortages can be alleviated through science CPD for the current workforce, as well as improving recruitment of the relevant specialists (the Department for Education is tackling this by encouraging more physics and chemistry graduates to train as teachers, with bursaries of up to £20 000 for the best graduates, as well as introducing new teacher training for primary science specialists).
 - 12) The three funding sectors involved in the ENTHUSE partnership – Government, research charity and industry – have much to gain from investing directly in science-specific CPD. These gains include:
 - enhancing the scientific literacy of the general public
 - increasing the number and proficiency of skilled scientists and engineers in the UK workforce (with the economic gains that this should bring)
 - creating a more efficient science teaching workforce (not least with higher retention rates giving a greater return on investment in teacher training), and a more effective one, thus encouraging more young people to study science subjects and to achieve better results in them.
 - 13) Different partners may have different motives for continued funding, but given the strength of the case for science CPD as an integral part of science teaching, the need for public funding is

compelling. Such funding can be delivered in a ring-fenced manner (most effectively to the science CPD providers), as is currently the case, or it could be delivered in normal school budgets. The latter should only ever be the case if there is firm evidence that schools will prioritise sufficient funding for science-specific CPD.

Recommendation 1

The Review Panel strongly recommends continued funding for 2013–18 of the NSLC, of a Network providing science CPD across the regions, and of a system of bursaries that financially supports participants attending CPD courses across the Network.

Vision and evidence

- 14) The current vision of the Network should be updated and strengthened to reflect the greater ambition of a mature and self-confident Network.
- 15) While the evidence presented on quality and impact of the NSLC and RSLC courses is strong, much of it is anecdotal and about inputs (teachers reporting that the courses improved their teaching). It is not straightforward to link CPD with long-term change: for instance, while it may be that true that schools with higher use of SLC courses improved their science GCSE results (National Audit Office, 2010), it is difficult to attribute causality to this correlation. Nevertheless, Myscience should develop a model that articulates causal connections between CPD and the environment in which it occurs and desired key outcomes. This model should consider: the environment in which professional development occurs; the components of the training delivered and how they affect participants; the influences on student performance; and the influences on teacher motivation and retention in the profession. The inter-relations of these elements and the opportunities they present for change should be examined, tested and refined based on the evidence collected. This process should improve the model that Myscience develops and its understanding of what it can do to better achieve the key outcomes that will contribute to realising the Network's vision.

Recommendation 2

Myscience should update and strengthen its vision for the Network to make a stronger and clearer commitment to transforming science education across the UK.

Recommendation 3

Myscience needs to develop a coherent model which articulates the links between its delivery of consistently high-quality professional development and key outcomes, such as better participation and performance in science and improved teacher retention. Myscience should then develop an action plan that will test this model and enable Myscience to achieve its vision for the Network.

- 16) The Review Panel supports the view of the Myscience team that the work of the Network should be measured by the quality and impact of its activity, not primarily by the quantity of CPD delivered. To achieve this, Myscience should develop new measures of performance and impact, including evaluating cultural changes in attitudes towards CPD, as well as exploring and testing its theory of change, while retaining appropriate CPD delivery metrics.

Recommendation 4

Myscience should propose a set of measures to assess the performance of the Network over the next spending period. These should reflect cultural change and the levels and impact of training delivered, and should be appropriate for formative as well as summative assessment.

- 17) Many policy and cultural factors influence the likelihood of educators' investing time and money in science-specific CPD, for example:

- which investments are perceived as drivers of improvement in **student performance**, what is covered in the curriculum and how different competencies are assessed in examinations (e.g., the weight given to practical, inquiry or mathematical skills)
- **teachers' expectations for and commitment to CPD** (e.g., whether CPD qualifications are seen as critical for career development and promotion, how teachers approach curriculum change, what is stated in guidelines for teaching cover, whether teachers will participate in CPD in school holidays, and whether initial teacher training is expected to deliver all the necessary science-specific content and pedagogical skills)
- **how schools are held accountable** – by students and their parents, by governors and by the Government (including through Ofsted).

18) The NSLC should develop a stronger voice to try to influence the factors, such as those listed above, that affect professional development, working with relevant partners such as SCORE and ACME. The NSLC should become a respected adviser to Government, Ofsted and the sector, sharing its expert knowledge of professional development and what factors influence its uptake, as well as its understanding of teachers' perspectives, to support policy development and review, and sector practice.

Recommendation 5

The NSLC should take a stronger national lead in using its expertise to shape the wider environment that affects CPD, aligned with its updated vision. It should focus on increasing the demand for science CPD by providing the evidence base to improve attitudes towards, and therefore likely uptake of, professional development for science teachers and technicians. To ensure this is effective, Myscience should engage in a strategic dialogue with the Department for Education about the best ways to inform the development of policies that improve the teaching of science in an evidence-based and apolitical way. Myscience should also ensure that its compelling messages reach schools' senior leadership teams.

19) Myscience is well aware of the fast-developing structural changes in the educational landscape, including rising numbers of academies and free schools, a decentralisation of control from Government and Local Authorities, a revised National Curriculum, and evolving examinations. Teaching schools may be a particularly important element, and the Panel notes that Myscience is working with those with a science specialism (in collaboration with the National College for School Leadership), although the eventual geographic coverage and importance of these schools is not yet clear.

Recommendation 6

The rapidly changing education and policy environment presents many new opportunities that Myscience should seek to capitalise upon while also giving due consideration to any risks to achieving its vision for the Network, and ensuring that appropriate mitigating actions are in place.

20) Myscience and the Network should be applauded for their current work with partners; in considering their role in the wider environment, they should continue to develop strategic partnerships and collaborations and ensure that they do not miss new opportunities.

Recommendation 7

As part of its national leadership role, Myscience should work with partners, including those beyond its Network, to develop an overview of available CPD and science enhancement and support for teachers, to help ensure quality, availability of provision across key subject areas, and access by all schools and colleges. This might extend to offering accreditation for courses offered by other organisations.

Sustainability, breadth and depth

- 21) Because of the funding announcement in the Autumn Statement, Myscience may not have felt under pressure to offer financial models which reduced the Network's dependence on external funding; Myscience modelled the same level of income and plus or minus 10 per cent. Indeed, while the models include schools contributing more and ENTHUSE bursaries being reduced, in all but one model, investment from Project ENTHUSE increases over the five-year period due to rising activity levels. Despite stated commitments to long-term funding, the planning and implementation of new delivery models which depend less on external funding sources will take time to achieve. There are strong arguments for this work to start now.

Recommendation 8

The Wellcome Trust should continue to fund the NSLC for a further five-year period from 2013. In turn, Myscience should over the next year develop a stronger business vision – this should include testable strategies to reduce the level of external funding needed and should be aligned with Myscience's overall vision. The Trust should consider whether it will continue to fund at a similar level over the next five years, or whether funding levels might start to reduce in years four and five as the NSLC moves towards a more sustainable model. Myscience should include in its business plan possible responses should the overall level of funding significantly reduce.

Recommendation 9

The Wellcome Trust should require Myscience to participate in a light-touch review three years into the next funding cycle, in 2016, before releasing the final tranche of funding. In preparation for this review, the Trust should indicate possible scenarios to Myscience for the continuation of funding beyond five years.

Recommendation 10

A clearer rationale and prioritisation should be presented for the proposed increase in spending from Wellcome Trust funds for 2012–13. These proposals should start to respond to this Review's recommendations. Myscience needs to make a stronger case for retaining any underspend that will remain from Trust funding for 2008–13.

Recommendation 11

The Wellcome Trust, the Department for Education and industry should continue to work in partnership to ensure that the National Network of Science Learning Centres provides teachers across the country with accessible and transformational science CPD.

- 22) Myscience should explore more income-generating opportunities within professional development (e.g., accreditation and franchises) and also ways of reducing the costs of delivery (e.g., e-learning) and of participation (e.g., using more holiday or 'twilight' courses to reduce the need for cover costs, with the added benefit of not taking teachers away from their classes). Myscience can also drive the move towards greater financial independence by shaping the wider environment so that schools increasingly choose to invest in science-specific professional development (see recommendation 5).
- 23) External or additional expertise could be useful, for instance, in developing the vision, exploring opportunities to shape the wider environment, understanding the most appropriate e-learning and online offer, and establishing a programme of educational research that could help develop and validate the models.

Recommendation 12

Myscience should seek to be more creative and more entrepreneurial in its business approaches – to challenge itself and any perceived constraints. In support, funders

should set targets that allow some leeway for Myscience to take risks as it tests different strategies.

Recommendation 13

The Network should continue to focus on the professional development of science teachers and technicians, build up its support of primary science, and continue to prioritise engagement with hard-to-reach schools. It should develop opportunities to support mathematics and broader STEM (science, technology, engineering and mathematics) skills for science teaching, as well as initial and early teacher training, through providing science leadership for teaching schools and running subject knowledge enhancement courses at some sites.

- 24) It was felt that Myscience is not ahead of the game in its e-learning delivery. This is an area that needs thoughtful consideration, prioritisation and investment, and should be strengthened by working with partners with the relevant expertise.

Recommendation 14

Myscience should develop its e-learning expertise and aim to be the gold standard in this, as it is in face-to-face professional development.

Structure of the Network

- 25) The rationale for having nine physical RSLCs across England related to the former RDA geography and should be reviewed. A range of issues need to be taken into account when considering the optimal structure for national coverage and the place of individual RSLCs within this. The good work of RSLCs is apparent: they have provided teachers with an opportunity to explore new laboratory equipment, to network with each other, and to engage in out-of-school CPD (preferred by some); they have built up valuable local knowledge, and they also provide a physical environment for the CPD trainers themselves to be trained and to develop new practical work. It is also important to appreciate the sizeable benefits that the RSLCs have gained from working with their host universities, from cost efficiencies to access to educational and scientific research expertise.
- 26) In a future retendering for delivery of science CPD across the Network, the Department for Education should ensure that high-quality CPD is accessible to all schools across England, that there is flexible delivery best suited to participants and localities, and that trainers, teachers and technicians have access to rich experimental equipment. If the future Network does not fully utilise all of the current RSLCs, it would be important to consider how their infrastructure and local expertise could continue to contribute to the Network.

Recommendation 15

It is vital to maintain an integrated science-specific professional development network across the UK. Regional Science Learning Centres should be a part of this, but with the changes in the educational environment including new developments such as teaching schools, it is appropriate to take a fresh look at how to achieve this. The retention and future funding of physical RSLCs should be considered on a case-by-case basis in this context. The Review Panel endorses the proposed model for diversified local delivery, including the use of clusters and work with teaching schools.

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Appendix: Members of the Review Panel

Julia King (Chair), Vice Chancellor, Aston University

Rodger W Bybee, international expert (former Executive Director, National Research Council's Center for Science, Mathematics, and Engineering Education, Washington, DC)

Deborah Colvin, Director of STEM Learning, Mulberry School for Girls, Tower Hamlets

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