SCORE
SCIENCE COMMUNITY REPRESENTING EDUCATION

SCORE response to the Ofsted consultation: Generic grade descriptors and draft supplementary subject specific guidance for inspectors for science

SCORE is a partnership of six organisations, which aims to improve science education in UK schools and colleges by supporting the development and implementation of effective education policy and projects. The partnership is currently chaired by Professor Graham Hutchings FRS and comprises the Association for Science Education, Institute of Physics, Royal Society, Royal Society of Chemistry, Science Council and Society of Biology.

The SCORE partnership welcomes the opportunity to respond to the above consultation and supports the use of subject-specific descriptors to provide additional guidance for Ofsted inspectors on making judgements during subject survey visits to schools. It is important that these descriptors accurately reflect excellent science education and set a standard for schools to aspire to achieve.

Overview

There are three main areas SCORE has commented on; practical work in science, progression routes post-16 and specialist teachers. It is important to highlight that this guidance document is for science specific survey visits and does not distinguish between the different needs of the sciences. For example, biology may require the guidance to have a greater emphasis on fieldwork whereas physics may require inspectors to look for evidence that teachers have considered how they will teach the subject so it will appeal to girls. The subject-specific criteria should require that inspectors are aware of such differences.

It is strongly recommended by the SCORE partnership that the document recognises that there are three separate science disciplines taught in school and would encourage the document refers to 'the sciences' rather than to 'science'.

Achievement in the sciences

The partnership welcomes the strong emphasis on the learning and progress of the students in the guidance documents for achievement in the sciences. SCORE recommends the document clearly outlines that achievement cannot be captured by attainment alone; pupils must also show passion for the subject and an enthusiasm to develop their scientific knowledge and understanding. Science is a core subject in the national curriculum and it is important that all pupils, regardless of future destinations, gain a sound understanding of the subject in order to become responsible citizens of the future. It is important to recognise that good teaching from motivated, well trained teachers is key to making these things happen.

SCORE recommends that the guidance also refers to science progression. 'Outstanding achievement in the sciences' should be reflected in the proportion of students continuing to study science beyond compulsory education. Depending on the type of school, this will include a proportion of pupils studying triple science at key stage 3, studying one or more of the science subjects offered at A-level and studying a science at higher and further education. This would indicate that pupils are aware of the wide range of opportunities available through studying the sciences as well as demonstrating that pupils have engaged with the subject significantly to pursue it further.

SCORE would like to see a greater emphasis on pupils' attitude and ability to carry out practical work. Practical work is essential to science and the guidance should specify that pupils are able to demonstrate a high attainment in the intended learning outcomes of each practical activity as well as understanding the overall purpose and aims of practical work. SCORE also recommends the guidance incorporates a broader view of practical skills – not based solely on the old view of SC1 (hypothesis, prediction and investigation).

Quality of teaching in the sciences

The SCORE partnership welcomes the reference to subject specialism but would like to see a stronger emphasis on its importance. A specialist teacher must have sufficient subject knowledge (i.e. beyond the level they are teaching) and demonstrate a good level of pedagogical knowledge to confidently communicate scientific ideas and to challenge pupils on their scientific understanding at a particular level. At the lowest level (4) it may be obvious that teachers avoid difficult questions from the pupils – particularly if they are teaching outside their subject specialism.

SCORE is currently reviewing the definition of a specialist teacher in the sciences and is considering whether or how the qualification history of a teacher is reflected in the quality of teaching. While pedagogical knowledge and pedagogical content knowledge is hugely influential in the quality of the teaching, a teacher who is a science graduate or who has worked as a scientist is likely to demonstrate: 1) a sufficient level of passion for the subject to pursue science beyond post-compulsory education, 2) a high level of subject knowledge and 3) first-hand experience of progression routes post-16. These qualities are likely to impact on pupils' overall enthusiasm for and understanding of the subject.

Again SCORE suggests the guidance refers to science progression. Effective teaching must inspire a proportion of pupils to continue science education post-16.

A teacher must be able to convey a passion for the subject in order to effectively inspire pupils and should maintain an up-to-date knowledge on current developments in and applications of their subject. The SCORE partnership suggests that inspectors look for evidence of school support for and of teacher involvement in CPD, particularly engagement with professional bodies and the ASE, attendance at conferences, participation in discussions and subscriptions to journals or magazines about subject pedagogy.

SCORE recommends that the guidance on the quality of teaching in the sciences specifically references practical work. SCORE published a report in 2008 that found that poor quality practical work in schools and colleges can have a limiting effect on a young person's engagement and learning of the sciences. Teachers should feel confident in the learning objectives of each practical activity and be confident in undertaking the activity with the pupils.

The SCORE partnership suggests that inspectors look for evidence that teachers are using high quality practical work in a number of ways including (but not limited to): demonstrations, class practicals, field work and using the school grounds. There should also be evidence that apparatus is of an appropriate quality and used frequently in lessons for purposeful practical work. Teachers should also be able to demonstrate a sound understanding of the three main purposes of practical work; 1) to develop scientific knowledge and understanding, 2) to develop practical skills and 3) to develop understanding of scientific enquiry.

The curriculum in the sciences

The SCORE partnership welcomes the fact that the curriculum is expected to match the needs of all pupils, regardless of ability. This expectation should be reflected in the teaching and achievement as well. Standards and expectations must be high enough to stretch pupils.

SCORE recommends that there is a coherent science curriculum throughout a pupil's education at the school; a curriculum that builds on a pupil's prior knowledge and scientific understanding. SCORE strongly supports the need to have a relevant curriculum and the partnership would like to see statements that allow inspectors to look for evidence of useful and interesting content and contexts for each of the sciences. This should help students become adults with a working knowledge of science relevant to society. The curriculum content should be structured in an appropriate sequence so that pupils realise there is a rationale behind ideas in the sciences.

Practical work should be intrinsic to the curriculum and be used not only to develop a pupil's understanding of scientific enquiry and practical skills but also to further a pupil's scientific knowledge and understanding.

The curriculum should be motivating for students and SCORE supports the guidance that a school should demonstrate excellent links with the wider science community and incorporate enhancement and enrichment (E&E) activities into the science curriculum. However SCORE would like to see a greater balance in the guidance document between examples that demonstrate an 'outstanding curriculum in the sciences'. The draft guidance has too much emphasis on good examples of enrichment and enhancement activities and no examples of useful curriculum content or what is good practice for including practical work.

SCORE recommends that E&E activity is coupled with excellent practice in the classroom. The Ofsted report *Guidance for students studying science* highlights an example of a school which, despite engaging with numerous science E&E activities, had a low uptake of science post-16. The report suggested this was because the activities were not supported by an engaging and interesting experience in the classroom.

The SCORE partnership also suggests the document refers to a curriculum that embeds excellent information, advice and guidance on science progression beyond compulsory education. The curriculum should cover a core of ideas in the sciences that will allow for (and encourage) progression to the next level.

SCORE would like to include a requirement that all E&E activity embraced by a school is integrated in and coherent with what is happening in the classroom.

SCORE strongly recommends that the guidance on the curriculum has a greater emphasis on opportunities for learning outside the classroom. One of the recommendations from a report published by the Select Committee for Children, Schools and Families in 2010 was for outside learning to become an entitlement within the national curriculum, though there may even be a case for making this stronger. Outside learning is reflected in the new science GCSE specifications and should therefore be captured in the Ofsted inspection guidance documents. Outside learning offers significant benefits, particularly in illustrating the context of a subject. Furthermore the science subjects offer a vast range of opportunities for outside learning and the curriculum should incorporate field work, observational work and visits to sites where science is at the heart of activities. The guidance document for curriculum in geography highlights that 'Pupils experience fieldwork on a regular basis, and activities offer clear progression rather than repetition'. SCORE recommends that a similar emphasis is captured in the science guidance document.

Effectiveness of leadership and management in the sciences

SCORE supports the guidance that effective leadership and management in the sciences will result in high quality teaching and good attainment levels. The SCORE partnership recommends that the term 'leadership' refers to the Head Teacher and Governors of a school as well as to the Head of Science. Science is a core subject and it is vital the senior management team, who may not have a background in science, appreciate the science requirements of a school. Under the new government schools are becoming more autonomous, increasing the importance for senior school management to acknowledge the costs involved in science education.

Practical work is a key component of science education and pupils must have the opportunity to experience practical activity in well maintained and adequately equipped laboratory facilities. SCORE recommends that inspectors look for a strong commitment among the leadership and management team to ensure that there is adequate provision in place for practical work in terms of laboratory space, equipment, staff time and resourcing. This includes good technician support and adequate budgeting for consumables.

SCORE suggests that the guidance also refers to apparatus. A good department will have a well-stocked prep room; there will be evidence of investment in keeping apparatus maintained and up-to-date; and there will be a good supply of scientific consumables (chemicals, batteries etc). SCORE has recently embarked on a benchmarking exercise of the current state of practical work in schools and colleges. This research will provide a baseline for all science departments to review and evaluate their practical work and, where necessary, to make a case for improvement. SCORE expects the report to be published in autumn 2010 and will inform Ofsted on the findings.

Further examples of areas where the senior management team should ring fence funding for science education include activities incorporating learning outside the classroom; enrichment and enhancement activities that support the curriculum; and information, advice and guidance on science progression.

The SCORE partnership would like inspectors to look for evidence that the school maintains (or has attempted to maintain) a balance of subject specialisms in the science department. This could be through recruitment or through retraining staff (for example, on the Science Additional Specialist Programme[1]). There should also be good support mechanisms in place for less experienced science teachers to ensure these teachers are best advised on how to teach the subject.

The guidance recognises the importance of continuing professional development for teachers. SCORE would like this to include all teaching staff in the sciences including teaching assistants and technicians.

SCORE suggests there is also a strong emphasis on, if not an entitlement to, subject specific CPD so that science teachers have the opportunity to grow and develop in their specialism and are encouraged to remain engaged with their subject. Resources must be made available for CPD. CPD does not have to be tied tightly to specifications and pedagogy; it can offer enrichment to a subject and help teachers engage with new developments in their subject.

[1] The Science Additional Specialism Programme (SASP) enables teachers without a physics or chemistry degree or a secondary initial teacher training (ITT) specialism in physics or chemistry, to teach these subjects effectively. The course is designed to develop participants' subject and pedagogical knowledge and help them teach physics or chemistry to learners aged 11-19 with more confidence, expertise and enthusiasm. Further information is available at http://www.tda.gov.uk/teachers/continuingprofessionaldevelopment/science_cpd.aspx .

SCORE supports the guidance statement on sharing good practice among members of the science department. SCORE would like inspectors to look for evidence that resources and learning outcomes from external CPD courses are shared amongst staff to ensure and encourage new initiatives are embedded in the teaching and learning.

Overall effectiveness in the sciences

Whatever judgement is made under this category needs to cohere with the previous categories in this subject specific guidance. It should also expand on the Section 5 category of 'overall effectiveness', which currently places a higher premium on promoting equal opportunity, tackling discrimination and ensuring safeguarding procedures than on the capacity to teach science effectively across various stages and phases of education. Students should have access to well-informed advice and guidance on careers from and in science.