

# Science survey visits

Supplementary subject-specific guidance for inspectors on making judgements during visits to schools

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Inspectors visit 150 schools each year to inform Ofsted's subject surveys in English, mathematics and science. Survey visits for other subjects are less frequent but continue to take place from time to time.

Where applicable, subject feedback letters, which are sent following survey visits, usually contain separate judgements on:

- the overall effectiveness of the subject
- the achievement of pupils in the subject
- the quality of teaching in the subject
- the quality of the subject curriculum
- the quality of leadership in, and management of the subject.

In coming to these judgements, inspectors draw on the criteria and grade descriptors from the September 2013 School inspection handbook as they can be applied to individual subjects. Supplementary, subject-specific descriptors are provided to give additional guidance for schools and inspectors. This includes guidance on the quality of the curriculum in the subject.

This supplementary guidance is not for use on Section 5 whole-school inspections.

**Age group:** All

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Piccadilly Gate  
Store Street  
Manchester  
M1 2WD

T: 0300 123 1231  
Textphone: 0161 618 8524  
E: [enquiries@ofsted.gov.uk](mailto:enquiries@ofsted.gov.uk)  
W: [www.ofsted.gov.uk](http://www.ofsted.gov.uk)

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## Grade descriptors – the overall effectiveness of science education provided in the school

*Note: These descriptors should not be used as a checklist. They must be applied adopting a 'best fit' approach, which relies on the professional judgement of the inspection team. The exception is that teaching in science must be outstanding for overall effectiveness to be outstanding.*

### Outstanding (1)

- Teaching is outstanding and, together with a rich and relevant curriculum, contributes to outstanding learning and achievement, significant growth in students' knowledge, and excellent attitudes to learning. Exceptionally, achievement may be good and rapidly improving.
- Pupils, and particular groups of pupils, have excellent educational experiences of science and these ensure that they are very well equipped for the next stage of their education, training or employment.
- There is excellent practice which ensures that all pupils maintain high levels of literacy in science appropriate to their age.
- The school's practice consistently reflects the highest expectations of staff and the highest aspirations for pupils, including disabled pupils and those with special educational needs.
- Good practice is spread effectively in a drive for continuous improvement.
- The school's thoughtful and wide-ranging promotion in science of pupils' spiritual, moral, social and cultural development and their physical wellbeing enables them to thrive in a supportive, highly cohesive learning community.

### Good (2)

- Pupils benefit from teaching that is at least good and some that is outstanding. This leads to growth in students' knowledge, promotes very positive attitudes to learning and ensures that pupils' achievement is at least good.
- Pupils and particular groups of pupils have highly positive educational experiences at school that ensure that they are well prepared for the next stage in their education, training or employment.
- Pupils' progress is not held back by an inability to read accurately and fluently. Those pupils who have fallen behind are being helped to make rapid progress in their reading.
- The school takes effective action to enable most pupils, including disabled pupils and those with special educational needs, to reach their potential.
- Other principal aspects of the school's work are likely to be at least good.
- Deliberate and effective action is taken to create a cohesive learning community through the promotion of pupils' spiritual, moral, social and cultural development, and their physical wellbeing. There is a positive climate for learning.

### Requires improvement (3)

Science requires improvement because one or more of the four key judgements requires improvement (grade 3) and/or there are weaknesses in the overall provision for pupils' spiritual, moral, social and cultural development

### Inadequate (4)

The school is likely to be inadequate if inspectors judge **any** of the following to be inadequate:

- the achievement of pupils
- pupils' progress in literacy

- the quality of teaching
  - the behaviour and safety of pupils
  - the quality of the leadership in, and management of, the school
- and/or
- there are serious weaknesses in the overall promotion of pupils' spiritual, moral, social and cultural development or their physical wellbeing
  - evidence from classroom observations and discussions with pupils and staff indicate that unsafe behaviour, misuse of practical equipment or poor compliance with the school's behaviour code occurs in one or more science lessons.

## Grade descriptors – achievement of pupils in science

*Note: These descriptors should not be used as a checklist. They must be applied adopting a 'best fit' approach which relies on the professional judgement of the inspector.*

*This subject specific guidance is supplementary to the generic grade descriptors which are found in the School Inspection handbook.*

### Supplementary subject-specific guidance

#### Outstanding (1)

- Pupils are able to think for themselves, take the initiative and raise their own questions about science knowledge, understanding and scientific enquiry.
- They are confident and competent in the full range of stage-related practical skills, taking the initiative in planning, carrying out, recording and evaluating **their own** scientific investigations.
- Pupils frequently use their scientific knowledge and understanding very effectively in written and verbal explanations, solving challenging problems and reporting scientific findings formally.
- They work constructively with other pupils, demonstrating common understanding in discrete well-focused roles, with all playing a part in successful investigations.
- Pupils show high levels of originality, imagination and innovation in their understanding and application of their knowledge and skills.
- Their practical work incorporates a variety of contexts, including fieldwork.
- Pupils research contemporary issues and understand the impact of science on society.
- They develop a sense of passion and commitment to science, showing strong application and enthusiasm to learn more through scientific endeavour.
- Over time, the proportion of male and female pupils that progress to post-16 science studies is similar to the proportions nationally.

#### Good (2)

- Pupils often take the initiative in individual work and when working with others.
- They show confidence and competence in the full range of stage-appropriate practical work, including planning and carrying out science investigations in groups or individually.
- Pupils use their scientific knowledge and understanding well in most situations to give accurate explanations or solve challenging problems requiring appropriate control of several variables, and report their findings clearly using accurate scientific language.
- They research science issues using different sources of information. They demonstrate some originality in their approach, coming up with new ideas on how to tackle a problem or display data. They show imagination in forming hypotheses and in the way they go about their science work.
- Pupils enjoy science and apply themselves well. They are able to explain the subject's value and show an appreciation of the impact of science on society, themselves and its contribution to life in a technological age.
- Over time, the proportion of male and female pupils that progress to post-16 science studies is similar to the proportions nationally.

#### Requires improvement (3)

- Pupils are often unable to make decisions for themselves and do not offer their own ideas without being prompted.
- They show average attainment in a range of practical work.
- Pupils use scientific knowledge and understanding to give reasonable explanations or solve straightforward problems involving two or three variables. They can report their findings but do

### **Supplementary subject-specific guidance**

not always use accurate scientific terminology.

- They are generally interested in the subject but show limited enthusiasm for acquiring greater knowledge and understanding of science.
- They do not always understand the link between the science work they are doing and its application in society.
- Over time, the proportion of male and female pupils that progress to post-16 science studies is lower than the proportions nationally.

### **Inadequate (4)**

Achievement is likely to be inadequate if any of the following apply.

- Pupils rarely take the initiative in their work.
- They have weak practical skills, or have a limited range of such skills. They do not plan and carry out scientific investigations for themselves.
- Pupils do not work well with others, and do not know how different roles can contribute to successful outcomes in research or in scientific enquiry.
- They do not use their scientific knowledge and understanding to give explanations or solve problems.
- Pupils lack interest and enthusiasm for the subject and cannot describe the relevance of science to a technological age.

## Grade descriptors<sup>1</sup> – quality of teaching in science

*Note: These descriptors should not be used as a checklist. They must be applied adopting a 'best fit' approach which relies on the professional judgement of the inspector.*

*This subject specific guidance is supplementary to the generic grade descriptors which are found in the School Inspection handbook.*

### Supplementary subject-specific guidance

#### Outstanding (1)

- Teachers expect each pupil to operate as a scientist, engaging fully in practical work using science skills, knowledge and understanding to inform their work.
- Pupils are aided in moving beyond the limits of the National Curriculum or examination specification in order to maintain curiosity.
- Answers to pupils' questions are accurate and effective at stimulating further thought. Their confidence extends to all areas of science taught, and in secondary schools, not just in their specialist subject. This stimulates pupils' inquisitiveness.
- Teachers have a very clear understanding of how science is learnt best, using the scientific phenomenon itself as the core focus of lessons. This includes scientific investigation and practical work, including fieldwork; research using a range of resources; evaluation; discussion; and opportunities for pupils to deliver high-quality presentations.
- Pupils' active participation in their learning secures outstanding progress across all aspects of the subject because teachers use a very wide range of innovative and imaginative resources including local contexts, along with well-chosen teaching strategies.

#### Good (2)

- The value of science is explained through the use of a range of relevant contexts, which also exemplify its impact on society. These examples engage pupils' interest, maintain curiosity and hone their understanding of research and the application of scientific skills.
- Pupils engage well in practical work, including fieldwork. Teachers have a confident level of specialist expertise which they use well in planning and teaching their subject, using accurate assessment of individual pupils' prior knowledge and understanding.
- Further discussion is prompted by informed responses to pupils' questions. Pupils have frequent opportunities for research using books and the internet. They are taught how to summarise and present their research as part of developing their literacy and communication skills.
- Teachers have a clear understanding of progression in science skills, knowledge and understanding and how the 'big ideas' of science can be understood through increasingly demanding details and concepts. As a result, they use an appropriate range of resources and teaching strategies to promote good learning across all aspects of the subject.
- Teachers give pupils many opportunities to show and apply their own knowledge, skills and understanding of science, and give extended explanations.

#### Requires improvement (3)

- Pupils are active participants in learning, including through their application in practical work.
- Pupils extend their scientific knowledge, understanding and skills as a result of teachers' targeted questions.

<sup>1</sup> These grade descriptors describe the quality of teaching in the subject as a whole, taking account of evidence over time. While they include some characteristics of individual lessons, they are not designed to be used to judge individual lessons.

### Supplementary subject-specific guidance

- Teachers have sufficient subject expertise and use this to inform planning and teaching. There is learning across all disciplines of the subject as a result of the use of a range of resources and teaching strategies.
- Marking usually provides guidance for pupils on how to improve their work, but this is not regularly followed up.
- Lesson plans rely on differentiation by outcome, rather than by tasks assigned to particular pupils based on their prior knowledge.
- Pupils' questions result in teachers giving limited responses that do not extend learning beyond the minimum required. Methods of assessing scientific knowledge, skills and understanding are limited to closed questions in written tests.

### Inadequate (4)

Teaching is likely to be inadequate where **any** of the following apply.

- Teaching fails to engage pupils' interest in science. The content of science lessons is not often in contexts that relate to pupils' lives and the relevance of science is not made apparent.
- All pupils in a class record identical content by copying or dictation. Consequently, marking is limited to presentational comment.
- Assessment information does not inform lesson planning. Schemes of work are not differentiated for different teaching sets.
- Teachers are not applying the school's cross-curricular literacy, numeracy and ICT policies.
- Teachers have low expectations of pupils' engagement in practical work and therefore limit their opportunities to do it.
- Pupils are too passive, as a consequence of teaching strategies that offer pupils little opportunity to contribute their own understanding and ideas in lessons.
- Teachers' subject expertise is limited and does not cover the required breadth of the science curriculum at a sufficient depth. As a result, they do not provide the resources or teaching strategies to promote effective subject learning and they give inadequate responses to pupils' questions.



## Grade descriptors – quality of the curriculum in science

*Note: These descriptors should not be used as a checklist. They must be applied adopting a 'best fit' approach which relies on the professional judgement of the inspector.*

### Outstanding (1)

- The imaginative and stimulating science curriculum is skilfully designed to match the full range of pupils' needs and to ensure highly effective continuity and progression in their learning. The curriculum equips pupils in all year groups with an excellent balance of subject knowledge and understanding, and the skills of scientific enquiry, across the three main areas of biology, chemistry and physics.
- An excellent range of learning opportunities involves pupils frequently in scientific enquiry, practical work, fieldwork, research, use of ICT, individual and group work, discussions, modelling and evaluation.
- The contexts in which science is taught are relevant to pupils' lives, capture their interest and reflect current science from the worlds of industry, research and other science-based endeavours such as health care.
- The non-statutory entitlement for all pupils with Key Stage 3 science attainment at Level 6 and above that would benefit from the study of triple science GCSEs is met.
- There are productive links with other subjects in the school, including with mathematics, design technology and English.
- Excellent links with other agencies and the wider community provide a wide range of enrichment activities to promote pupils' learning and engagement, such as science-based clubs and visits to sites where science is at the heart of the activities. Regular visits by science professionals who share their relevant experiences should relate to pupils' experiences of science in lessons.
- Rigorous planning for pupils' spiritual, moral, social and cultural development ensures that all pupils experience the full wonder of the universe and develop a responsible attitude to environmental protection.

### Good (2)

- The curriculum is broad, balanced and well informed by current research and development in science education. It meets the learning needs of all groups of pupils and ensures effective continuity and progression, including in scientific enquiry and pupils' understanding of how science works.
- Planned experiences for learning promote progress within and between year groups, and maintain a good balance between all four areas of the science National Curriculum. In primary schools, the key ideas are regularly reinforced over time through practical work. In secondary schools, sufficient time and high-quality practical resources to teach science through practical investigation and illustration are provided, with the result that students are motivated to study the subject further at 16 and 18.
- Good links are forged with other subjects and the wider community to provide a range of enrichment activities that promote pupils' learning and engagement with science.
- Good advice and guidance on progression in science beyond compulsory education is embedded in the curriculum, and pathways do not limit progression, particularly if vocational subjects are taken at Key Stage 4.
- Opportunities to promote spiritual, moral, social and cultural development are systematically planned and delivered to ensure every pupil benefits.
- The statutory entitlement for **all** students to study science courses leading to at least two GCSEs is met. Specifically, this includes either science GCSE and additional science GCSE, or

triple science GCSE.

### **Requires improvement (3)**

- The curriculum provides a programme of activities that promotes a continuous development of learning in all four areas of the National Curriculum for science.
- The range of learning experiences provided promotes adequate progress in scientific knowledge, understanding and practical skills.
- Some science-related links are forged with other agencies and the wider community, although the range of activity provided to enrich pupils' interest and learning may be limited.
- The curriculum ensures that the subject contributes to pupils' spiritual, moral, social and cultural development.

### **Inadequate (4)**

- In maintained schools, or academies that have elected to adopt the National Curriculum, the science curriculum does not meet the statutory programmes of study.
- It does not secure continuity in pupils' learning. Long gaps of several weeks between science lessons do not allow pupils to embed understanding, or reinforce practical skills.
- Pupils rarely carry out their own practical investigations, because of poor teaching, lack of practical resources, or lack of teaching time. Where practical work does occur, it is limited to following instructions.
- Learning across the four areas of the National Curriculum for science is unbalanced and learning experiences do not secure progression in scientific knowledge, understanding and/or practical skills.
- There are no suitable progression routes into post-16 science.
- There are no links between science and other subjects.
- Science lessons do not contribute to developing literacy and numeracy.
- There is little by way of enrichment activity in the subject. There are only weak connections between the science experiences planned and the lives of pupils. This results in low levels of engagement and enjoyment and the science taught has little relevance to pupils.
- Opportunities to promote spiritual, moral, social and cultural development are missed.

## Grade descriptors – quality of leadership in, and management of, science

*Note: These descriptors should not be used as a checklist. They must be applied adopting a 'best fit' approach which relies on the professional judgement of the inspector.*

*This subject specific guidance is supplementary to the generic grade descriptors which are found in the School Inspection handbook.*

### Supplementary subject-specific guidance

#### Outstanding (1)

- Leadership is informed by a high level of science expertise and vision and is improving the performance and practice of members of the department (secondary) or school as a whole (primary).
- Pupil progress in science is tracked frequently, with feedback from this used to drive intervention and extension activities.
- Science teaching embraces whole-school policies on literacy and numeracy and the subject systematically contributes strongly to improving these aspects.
- There is a strong track record of innovation and this is recognised and shared in the department to promote raising standards. Subject review, self-evaluation and improvement planning are well-informed by current good practice in science education. This should involve participation in debate and developments with other science providers in a wider area.
- Subject leadership inspires confidence and whole-hearted commitment from pupils and colleagues. There are effective strategies to delegate subject responsibilities where appropriate, share good practice and secure high-quality professional development in the subject.
- Continuing professional development is well targeted and thoroughly evaluated for its impact on maintaining pupils' curiosity. It includes up-to-date training for technical support staff, and a current understanding of health and safety matters relating to science teaching.
- Resources, including teaching time, practical facilities and staff professional development, match the ambition and expectations of staff for high achievement and the future success of pupils in science.

#### Good (2)

- Leaders are well informed by current developments in the subject and are aware of developments in science education, including in other schools and by national agencies and associations.
- Pupil progress in science is tracked during the year with feedback from this used to drive intervention and extension activities.
- Subject reviews, self-evaluation and improvement planning are successfully focused on raising attainment and improving the provision for science. They are carried out systematically and the outcomes communicated effectively to all science staff so that there is a common understanding of priorities.
- There are shared common purposes among those involved in teaching science. Teachers have good opportunities to share practice among themselves and have access to subject training within and beyond the boundaries of the school, where appropriate. Science reflects wider whole-school priorities including consistent application of literacy and numeracy policies.
- Science leaders ensure that health and safety information is up-to-date and understood by

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colleagues.

### Requires improvement (3)

- Leaders are aware of current developments in science and try to incorporate these, with some success.
- Science leaders do not have a clear plan to contribute to literacy and numeracy learning.
- Pupil progress in science is not tracked frequently enough to direct timely intervention and extension activities.
- The understanding by science teachers of current developments may not be consistent.
- Provision for the subject is monitored and reviewed regularly during the year and there is some understanding of the strengths and priorities for improvement.
- Strategies for improvement are not sufficiently focused on securing measurable outcomes and, where necessary, improvements in pupils' achievement.
- Leaders ensure appropriate balance in the teaching of biology, chemistry and physics, with sufficient time allocated.
- Provision for science-specific professional development and opportunities to share good practice across all teaching are limited.

### Inadequate (4)

Leadership and management are likely to be inadequate if any of the following apply.

- Leaders are not well informed about current initiatives in the subject. There is little evidence of a broader vision of science education that draws on the work and expertise of other professionals beyond the confines of the school.
- Key statutory requirements for science are not met, including the programmes of study for 'how science works'.
- Pupil progress in science is not monitored, or is only checked annually.
- Self-evaluation is weak and not informed by good practice in science, or by outcomes for pupils. Insufficient effort is made to coordinate the work of science staff and to improve the quality of the weakest teachers.
- Opportunities for professional development in the subject are limited, and, as a result, some staff lack the confidence and expertise to deliver science effectively.
- The subject is poorly resourced in terms of curriculum time and practical resources, limiting the opportunity for every pupil to develop scientific enquiry skills.
- Health and safety training is not effective, with evidence of unnoticed unsafe practice.