Narrowing the Gap:
The Gender Agenda – making a difference in science
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1. Overview

One of the things we have no control over in life is whether we are born male or female and yet in terms of educational outcomes the differences can be stark. At one end of the education journey more females than males are graduating from top UK universities and with ‘better’ degrees. In fact the trend is the same across developed nations – more females than males are going to university and graduating.

When science outcomes for pupils are considered, there is no single issue relating to either boys’ or girls’ underperformance. Many boys and girls reach their expected outcomes in science but some do not. Progress will depend on their individual context and the other groups these individuals also belong to such as whether they receive Free School Meals or are members of an ethnic group. Teachers should focus on all pupils who are not making the expected amount of progress in science, whether they are girls or boys.

The purpose of this guide is to support science teachers and subject leaders to establish how well both girls and boys are doing in science at all stages of their secondary education and to give ideas as to how any emerging issues can be addressed as part of a development programme. The strategies included are equally applicable to boys and girls.

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1 Higher Education Policy Institute (2009)
2 OECD (2003) Education at a Glance
2. Introduction – How this guide supports gap narrowing

Differences between the genders begin in the mother’s womb. The reasons behind these differences are a cause of much debate. Some believe that gender differences are inherent, that the reasons are both genetic and hormonal, established before a child is even born. As a result girls are generally diligent, well-behaved, calmer and more mature whereas boys are more adventurous, take risks and want to learn by doing.

However others argue that boys and girls are products of the environment in which they are raised. Western society has unwritten rules regarding behaviour expected of boys and girls and these can ultimately manifest themselves in academic achievement. Some even advocate that pregnant women talk differently to the unborn child if they know they are expecting a boy or girl. We are all products of the society we live in.

An Institute of Education study of 15,000 UK children suggests that by the age of five, girls are two months ahead of boys in tests of verbal, non-verbal and visual skills. Key Stage 1 tests show girls outperforming the boys in English, and this continues into Key Stages 2, 3 and at GCSE.

There are many references in the media to the relative performance of girls and boys. Sometimes it is a gap in attainment that is highlighted and in others it is suggestions as to how improvements can be made, for example establishing single sex science classes.

From 1976 to 2006, GCSE English language A*–C pass rate for girls rose four percentage points to 69% compared to a drop of one percentage point to 55% for boys. Ideas that have been developed to increase boys’ attainment also benefited the girls and the gap has widened.

Strategies such as boy-friendly texts or having adult males teach boys’ groups have generally been unsuccessful and some have even widened the gap further. In addition – not only are girls outperforming boys, but if you’re a boy you are more likely to be identified as having special educational needs (SEN).

### 2008 data

Of all pupils with a statement of SEN – 73.5% are boys and 26.5% girls.

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3 Centre for Longitudinal Studies, Millennium Cohort Study Third Survey (2005)
The Evidence Base

The PISA report⁴ (2006) noted that Year 11 boys outperformed girls in England and Wales in their ability to explain scientific phenomena. There was little difference in identifying scientific issues and using scientific evidence. However, the TIMSS⁵ report (2007) states that in England there were no gender differences in mathematics or science at either Year 5 or Year 9.

ROSE⁶ (2006) highlighted that girls and boys as groups have preferences for the types of science they wish to learn about.

*When asked what they wished to learn about, there are marked differences in the responses of boys and girls. For girls, the priorities lie with topics related to the self and, more particularly, to health, mind and well-being. The responses of the boys reflect strong interests in destructive technologies and events. Topics such as ‘Famous scientists and their lives’ and ‘How crude oil is converted into other materials’ are among the least popular with both boys and girls.*

When national data is compared, differences in science GCSE attainment between boys and girls are relatively small:

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Girls</td>
<td>% Boys</td>
</tr>
<tr>
<td>A*-C science</td>
<td>51.3</td>
<td>49.7</td>
</tr>
<tr>
<td>Two good sciences</td>
<td>48.4</td>
<td>45.3</td>
</tr>
<tr>
<td>3+ levels of progress KS2–4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

However, gender differences can be identified when the performance of groups of pupils are considered.

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⁴ PISA report – Programme for International Student Assessment. A triennial assessment of 15 year olds within OECD member countries
### Attainment

<table>
<thead>
<tr>
<th>2008</th>
<th>% two good sciences at GCSE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Girls</td>
<td>Boys</td>
<td>Gap (Girls – Boys)</td>
</tr>
<tr>
<td>All</td>
<td>51.2</td>
<td>49.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Free school meals (FSM)</td>
<td>29.2</td>
<td>26.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Non FSM</td>
<td>54.5</td>
<td>52.4</td>
<td>2.1</td>
</tr>
<tr>
<td>Black African and White/Black African</td>
<td>47.5</td>
<td>42.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>40.4</td>
<td>33.4</td>
<td>7.0</td>
</tr>
<tr>
<td>Pakistani</td>
<td>43.3</td>
<td>38.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Black other</td>
<td>42.0</td>
<td>34.5</td>
<td>7.5</td>
</tr>
<tr>
<td>White/Black Caribbean</td>
<td>41.3</td>
<td>37.9</td>
<td>3.4</td>
</tr>
<tr>
<td>Gypsy Roma Traveller</td>
<td>11.5</td>
<td>8.9</td>
<td>2.6</td>
</tr>
<tr>
<td>White other</td>
<td>47.7</td>
<td>47.1</td>
<td>0.6</td>
</tr>
</tbody>
</table>

All data from National Strategies Integrated Data Set – June 2009

### Progress data

<table>
<thead>
<tr>
<th>2008</th>
<th>% 3+ level progress KS2–4 science</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Girls</td>
<td>Boys</td>
<td>Gap (Girls – Boys)</td>
</tr>
<tr>
<td>All</td>
<td>55.6</td>
<td>54.1</td>
<td>1.5</td>
</tr>
<tr>
<td>FSM</td>
<td>34.8</td>
<td>33.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Non FSM</td>
<td>58.5</td>
<td>56.9</td>
<td>1.6</td>
</tr>
<tr>
<td>Black African and White/Black African</td>
<td>65.7</td>
<td>56.1</td>
<td>9.6</td>
</tr>
</tbody>
</table>
However, when progression to post-16 sciences is considered, then there is a definite issue in terms of girls moving on to study physics post-16.

The following table gives the take up of AS courses for pupils who gained specific GCSE outcomes.

<table>
<thead>
<tr>
<th>2008 GCSE outcomes</th>
<th>% uptake of Biology AS courses</th>
<th>% uptake of Chemistry AS courses</th>
<th>% uptake of Physics AS courses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>2 A*–A grades</td>
<td>39</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>2 B grades</td>
<td>16</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>A*/A and B grades</td>
<td>28</td>
<td>20</td>
<td>18</td>
</tr>
</tbody>
</table>

When the national data is considered, gender differences with reference to attainment and progress in science are relatively small. However, all pupils are also part of other groups, for example FSM and ethnicity. Non-FSM boys generally do better than FSM girls. These factors have a bigger influence on pupil outcomes than gender alone.
3. What does this guide include?

- **An introduction** which includes national attainment and progress data for girls and boys including the relative performance of identified groups. The guide is equally applicable for subject leaders who have well-established and developed self-evaluation processes in place and to those who need to develop those skills, as well as teachers who wish to use self-evaluation to reflect on their own practice.

- **A chart** (guide overview) illustrating how the guide can be used by both teachers and subject leaders as a result of self-evaluation against current outcomes. It allows you to decide where you are within the process and to locate the appropriate part of the guide to work from.

- **Case studies** of how the guide has been used by subject leaders and teachers.

- **Follow-up tasks** to support next steps and reflection.

- **A toolkit of resources** to allow the gathering of evidence. This supports you to: interrogate available data and analyse the performance of groups of pupils; listen to pupil voice; undertake lesson observations to focus on teacher and pupil behaviours; and consider ideas for a departmental development session which will provide stimuli to generate discussion about how classroom practice can support the Every Child Matters agenda.

- **Strategies to try** in order to address identified issues. Also included are tried-and-tested strategies to address issues that have been identified through the self-evaluation process to ensure all boys and girls make good progress in science.

- **Support with action planning.**

- **Appendices** which include further reading, background research and references.
4. Guide overview

**TEACHER**

I think I may have an issue with underperformance in one of my classes.

**SUBJECT LEADER**

How well are we doing?

**Departmental action plan** is in place but monitoring shows limited impact on pupils.

Key areas related to underperforming groups have been prioritised.

It is difficult to prioritise areas for improvement because there is insufficient evidence to base decisions on.

Using parts of the Toolkit to identify what is happening.

**What's happening day to day in lessons?** Check out the lesson-observation tool.

**Pupils' attitudes and perceptions?** Check out the pupil-voice tool.

Identification of underperforming groups. Check out the data tool.

Priorities emerging from data.

What do the pupils think is important?

What do the teachers think is important?

What do the lessons triangulate with teacher and pupil perceptions?

Write an action plan to address the priorities, make it time limited (say six weeks) and include an opportunity to monitor and evaluate the impact on pupils' learning. Buddy up with other members of the department or your line manager to make the process more effective.
5. How to use this guide

This guide offers some practical strategies that science subject leaders and teachers can use to address underperforming groups. The techniques suggested are tried and tested by practising teachers and are supported by academic research (see appendices).

The Guide overview shown on page 8 demonstrates the flexibility of the guide and, dependent upon your starting point, the different routes available. It is important that you include your line manager in the work. The stage that you enlist their support will depend on the route you take. Your science consultant can also offer support.

Narrowing the Gap

The National Strategies approach to narrowing gaps is based on four areas of action. These are:

Know the gap by making gaps visible through effective analysis of data

Narrow the gap by Quality First teaching and specialist pedagogy, effective planning for progression, appropriate intervention and wider work with pupils, parents, families and partnerships

Mind the gap by a relentless focus on underachieving groups, challenging targets and rigorous tracking of pupil progress through APP

Celebrate by giving high profile to improved progress and gap narrowing and the capture and sharing of good practice

This publication focuses particularly on what secondary science departments can do in the first three areas. To find out more, please visit the Narrowing the Gap area at: www.standards.dcsf.co.uk/nationalstrategies

Supporting your continuing professional development (CPD)

Notes and planning that are completed as part of this work can be added to a CPD portfolio. It could provide evidence of meeting professional standards to support career progress at Core, Post-Threshold, Excellent Teacher or Advanced Skills Teacher (AST) levels. In addition, the evidence gathered could be used in your application for CSciTeach (Chartered Science Teacher) or count towards accreditation of an MA.

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7 www.tda.gov.uk/teachers/professionalstandards
8 Contact The Association for Science Education (ASE): www.ase.org.uk
9 Contact your local higher education provider
6. Development

Schools with a gender gap of 10% or more in their ‘two good sciences’ GCSE indicator:
- 2007 – 27%
- 2008 – 25%

Any gaps in science attainment and progress within pupil groups need to:
- be identified at school and departmental level
- have action taken to narrow these gaps through Quality First teaching (QFT) highlighting planning for progression, intervention and working in partnerships with families and communities
- be constantly monitored through regular tracking, and in Key Stage 3 Assessing Pupils’ Progress (APP).

As a result, the gaps between girls’ and boys’ attainment and progress will be narrowed.

Trialling these materials

During the trialling of these materials the greatest impact was seen where:
- the line manager supported the process
- evidence was triangulated (i.e. at least three parts of the Toolkit were used)
- subsequent developmental activities were supported by buddying or peer coaching opportunities within the department.
Case studies

Case study 1: How a subject leader used this guide in the pilot trial

I was interested in using this guide because I wanted to get some ideas of how I could get more girls to A/A*. I used the data section which showed that some girls were underachieving. This prompted me to think about what girls’ experience of science was. My initial ideas were that these girls were not making expected progress because they were bored, thought science was difficult and they were not good at it.

I decided to use pupil voice materials from the Toolkit. I got the views of pupils from every year group. I also carried out some paired lesson observations with my line manager with a gender focus.

My findings were that girls did not know how well they are doing or how to improve. In the lesson observations the majority of questions were answered by the boys (girls didn’t put hands up).

As a result of this I decided to raise staff awareness of gender. For the next half-term we focused on improving oral and written feedback to pupils and our questioning techniques.

We then repeated pupil voice and found that pupils had noticed that their teachers were involving them more in the lessons. Pupils were better informed about how well they were doing and what they needed to do to improve.
I was looking for the guide to help me with ideas to make my lessons more appealing to Year 10 pupils. In particular I wanted more boys to carry on with science post-16. I was concerned that they didn’t seem very interested in the work we were doing for the exam course. They did what I asked them to do but did not really engage with the lessons.

I wanted to make my lessons more interesting and I had an idea that pupils weren’t very aware of what career options could be open to them with chemistry/science.

I used the pupil-voice materials and asked a colleague to observe one of my lessons. The boys said they didn’t see the relevance of chemistry to their future career plans. The observer noticed that boys tended to ask questions that distracted me from the learning and that I expected pupils to listen to me for long periods of time. I tried suggestions from the Toolkit and when I was next observed there were some improvements with most pupils on-task and engaged.
What do you know about your department/class?

Task

Reflect on what you think you already know about learners in your department/class. Consider the teaching, learning, physical environment, staff (including support staff), curriculum, use of resources (including ICT). What does it look, feel and sound like to a learner?

Here are three suggestions to help you do this. You might use any of the following examples:

- a visual representation
- a table
- a Y diagram.

This could be done in a departmental meeting.

Visual representation

Table

<table>
<thead>
<tr>
<th>Teaching</th>
<th>Learning</th>
<th>Etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td>I plan lots of experiments for them.</td>
<td></td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td>Slow at completing experiments.</td>
<td></td>
</tr>
</tbody>
</table>
Y diagram

What does it look like?

What does it sound like?

What does it feel like?
7. Toolkit – Know the gap

In this section you will find guidance and accompanying resources so you can:

1. **Look at the data** – How does the attainment and progress of boys and girls compare in science?
2. **Listen to pupil voice** – What do boys and girls think about their experiences of learning in science?
3. **Observe lessons** – Are there significant differences in teacher interaction or pupils' actions between boys and girls during the course of a lesson?
4. **Discussion scenarios** – How do groups of pupils respond in science lessons?

Note: The red box will show you the current position in the guide overview.

**Know the gap: Interrogating the data**

**How does the attainment and progress of boys and girls compare in science?**

**How do these compare with attainment and progress of boys and girls overall and in other subjects in the school?**

Scrutiny of the data may reveal issues and raise further questions.

There are many sources of data as shown in the list below. Explore with your line manager the options available in your school. Some data for science is only available in the web-based versions; if these are not available you will need to rely on school-level data for your analysis.

The outcomes of your analysis will be more robust if you consult more than one source.

Consider the statistical significance of any differences that emerge before you jump to conclusions.
Teacher task

Ongoing tracking data for your class may not automatically look at differences between boys and girls.

You might wish to extend your analysis to include other underperforming groups. If you do not already know, ask your line manager for a list of pupils who:

- take free school meals
- are gifted and talented
- belong to ethnic minority groups
- have SEN.

Look at the results from internal (or external) assessments including outcomes from periodic assessments using APP.

Calculate the differences between those children who are part of the designated group and those who are not, for example, boys – girls.

Compare these differences with similar classes in your school and, if available, against the performance of these groups locally and nationally.

Does the data support your hypothesis that some boys/girls are not making as much progress as similar pupils in other classes/schools/nationally?

Try another of the tools in the Toolkit to collect more evidence to support your ideas. Once you have developed some reasons look at the strategies available to you.

Subject leader task

If you do not already know, ask your line manager for a list of pupils who:

- take free school meals
- are gifted and talented
- belong to ethnic minority groups
- have SEN.

Look at the school-level results using one or more of the data sources listed below. See the screen shots to help you locate the pertinent data.

You should also include departmental results from internal tracking including outcomes from periodic assessments using APP or external interim assessments.

Adjust the spreadsheet template to help you calculate the differences between those pupils who are part of the designated group and those who are not (e.g. boys – girls) and to compare these differences with other subjects in your school and, if available, against the performance of these groups locally and nationally.

Does the data support your hypothesis that some boys/girls are not making as much progress as similar pupils in other classes/schools/nationally?

Once you have developed some reasons for the differences triangulate this evidence by using another of the tools from the Toolkit.
Data sources

- RAISEonline
- Fischer Family Trust (FFT) Analyses to Support Self-Evaluation booklet will provide progress data for science including comparisons of low-, middle- and high-ability boys and girls.
- SSAT Data Enabler
- Post-16 progression to A Level sciences
- Local authority data
- School internal analysis
- Model Excel spreadsheet: The spreadsheet can be downloaded from the resource section.

Interrogate the data

Rationale

How do the attainment and progress of boys and girls compare in science? How do these compare with attainment and achievement of boys and girls overall and in other subjects in the school? To answer these questions, a range of data needs to be accessed and compared. Scrutiny of the data may reveal issues and raise further questions. This may lead to further enquiry before solutions can be trialled and evaluated.

Trends over time – for all pupils, girls and boys; school and national

5 A*–C
5 A*–C English + mathematics
2 sciences A*–C (%)
1 science A*–C (%)
Progression to A Level sciences
English A*–C (%)
Mathematics A*–C (%)
KS3 – L5/6+
Questions

1. How does the performance of boys and girls compare across English, mathematics and science in school and national data?

The purpose of this analysis is to determine if there are trends across all core subjects. For example, if girls' attainment is lower than national across all subjects, not just science, it may be that the mean ability of girls is lower than boys or that girls are underachieving across all three subjects.

<table>
<thead>
<tr>
<th>Look at trends in boy/girl/both science attainment…</th>
<th>and compare to whole-school boy/girl/both attainment…</th>
</tr>
</thead>
<tbody>
<tr>
<td>% 1 A*–C GCSE science</td>
<td>5 A*–C</td>
</tr>
<tr>
<td>% 2 A*–C GCSE sciences</td>
<td>5 A*–C English + mathematics</td>
</tr>
<tr>
<td>Triple sciences % A*–C</td>
<td>5 A*–C</td>
</tr>
<tr>
<td>BTEC science</td>
<td>A*–C English</td>
</tr>
<tr>
<td>Any other sciences</td>
<td>A*–C mathematics</td>
</tr>
</tbody>
</table>

2. What does value added data tell us?

Do girls or boys appear to have significantly lower achievement across English, mathematics and science? If so, what are the Contextual Value Added (CVA) values for boys and girls?

(Boys may appear to be underperforming compared to girls but value added data suggests boys make good progress. Boys mean ability is lower than girls.)

What does the FFT Analyses to Support Self-Evaluation booklet tell you about the achievement of boys and girls over time? Look at the following sections first:
- KS2 to KS4: Value Added (Significant Areas)
- KS2 to KS4: Value Added (Significant Areas Summary)
- KS2 to KS3: Value Added (Significant Areas)
- KS2 to KS3: Value Added (Significant Areas Summary)
- KS3 to KS4: Value Added (Significant Areas)

3. How does science compare with other subjects in the school?

What does RAISEonline tell you about the relative performance of boys and girls in science over time? (Relative performance indicators (RPI) tells you how the pupils performed in science relative to the other subjects they took.)

Look at the following which can be found in Home > Reports & Analysis > View All Analyses > Key Stage 4 > Attainment > Thresholds > KS4 Relative Performance Indicators in full GCSE subjects by subject:
- RPI Sig+/Sig–/no Sig All
- RPI Sig+/Sig–/no Sig BOYS
- RPI Sig+/Sig–/no Sig GIRLS

4. Additional data sources (e.g. school, progression to post-16) – do these give you any additional information?

Use your most recent RAISEonline Full Report, Fischer Family Trust Analyses to Support Self-Evaluation documents and any LA/internal data to determine if there are significant differences between boys' and girls' performance in general and/or in science. The table below shows some of the analyses available. Access to RAISEonline and FFTlive (www.fftlive.org) will provide further analyses.
### Analysis

#### Examples from an anonymous RAISEonline report 2009

**(Production date: 9 February 2009)** and notes

<table>
<thead>
<tr>
<th>RAISEonline</th>
<th>Contextual Value Added Key Stage 2 to 4: Overall by pupil groups</th>
<th>&gt;10% of boys or girls above or below the 75th and 25th percentile line is significant.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
<td><img src="image3.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

**Contextual Value Added Key Stage 2 to 4: Overall, predicted versus actual for pupils**

**Contextual Value Added Key Stage 2 to 4: Overall, 3-year average**

**Contextual Value Added Key Stage 3 to 4: Overall by pupil groups**

**Contextual Value Added Key Stage 3 to 4: Overall, predicted versus actual for pupils**

>10% of boys or girls above or below the 75th and 25th percentile line is significant.
<table>
<thead>
<tr>
<th>Analysis</th>
<th>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contextual Value Added</td>
<td>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</td>
</tr>
<tr>
<td>Key Stage 3 to 4: 3-year average</td>
<td>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</td>
</tr>
<tr>
<td>Attainment, percentage achieving 2 or more A*-C in science at GCSE</td>
<td>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</td>
</tr>
<tr>
<td>Attainment, Relative Performance Indicators for full GCSEs, all pupils</td>
<td>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</td>
</tr>
<tr>
<td>Key Stage 2 to Key Stage 4: Value Added (Significant Areas)</td>
<td>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</td>
</tr>
<tr>
<td>Key Stage 2 to Key Stage 3: Value Added (Significant Areas)</td>
<td>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</td>
</tr>
<tr>
<td>Key Stage 3 to Key Stage 4: Value Added (Significant Areas)</td>
<td>Examples from an anonymous RAISEonline report 2009 (Production date: 9 February 2009) and notes</td>
</tr>
</tbody>
</table>

Note: Tables for girls and boys available in RAISEonline
Know the gap: exploring pupil voice

What do boys and girls think about their experiences of learning in science?

**Organisation**

- Select a small group, for example, five to eight pupils. These should be the same year group and of similar ability. (Some pupils' responses can be influenced by older pupils or those they perceive to be more able.) You may wish to speak to boys and girls separately.
- Decide how many groups you will be able to see allowing at least 40 minutes per interview.
- If two people can be present, one could record pupil responses while the other asks the questions, (teacher, consultant, subject leader, senior leadership team, higher-level teacher assistant, etc.)
- Swapping over the roles during the interviews may also help. If you are alone consider using a recording device.
- Arrange the seating so that equal eye contact can be maintained with all the pupils. Two possible arrangements are shown below:
Introduction

Some of the questions will not be applicable if you are a teacher finding out about your own classes. In this case choose the ones that are suitable to your enquiry.

Explain to the pupils that you are going to ask them a series of questions which they can answer openly; they should say if they agree, disagree or have anything to add to what another person in the group has said. Recommend that they do not refer to teachers by name.

Interview questions

A Word version of this table is available to customise to your needs.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Possible questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Putting at ease</td>
<td>What are your three favourite subjects? Why? Follow up if needed. What number (approximately) would you say science is in your list? Why do you like science/not like science?</td>
</tr>
<tr>
<td>2. Reflection on ability (Does it match teachers’ perception?)</td>
<td>How well are you doing in science? How do you know?</td>
</tr>
<tr>
<td>3. Perception of organisation of a science lesson</td>
<td>What are science lessons like? Describe a typical lesson. Do the rest of you agree? What’s the difference in science lessons since you: • were at primary school (Y7)? • were lower down the school (Y8 and Y9)? • started GCSE courses (Y10 and Y11)? What makes you feel included in science lessons?</td>
</tr>
<tr>
<td>4. Exploring opportunities to choose a learning style or context</td>
<td>In a typical lesson how often do you get a choice of what to do? (Prompt with: all the time/frequently/sometimes/never.)</td>
</tr>
</tbody>
</table>
| 5. Awareness of structural arrangements | Which class/set/group are you in?  
Does anyone move up/down groups?  
Why does this happen?  
How many different teachers have you had for science this year?  
Since joining the school? |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Effect of gender of the teacher(s)</td>
<td>Does it make a difference to your learning if the teacher is male or female? How? Why?</td>
</tr>
</tbody>
</table>
| 7. Opportunity for engagement | Use the Word version of this section of the Toolkit to prepare sets of cards or photocopy the cards on the next page.  
First ask pupils to rank the activities to show a list that describes their experience of science lessons. (Those they do most to those they do least). They can use the blank cards to add anything else.  
Take a photograph.  
Secondly they should choose the nine activities that enable them to learn best. Ask them to use the cards to carry out a diamond nine exercise. There are 16 cards but pupils are asked to choose 9 cards that describe the ways they learn best in science. You will have to model what you mean by this. Ask them to work in twos or threes to rank the activities. There should be no mixed-gender groups.  
Listen in and if possible write down relevant statements they make while sorting.  
Take a photograph of their diamonds. In the photograph include an indication of which group is which. (See examples on page 24.) |
| 8. Confidence and how the teacher encourages this. | When would you answer a question in class?  
Who does the teacher expect to answer questions in class? |
| 9. Perceptions of enrichment/enhancement opportunities | Are there any science clubs running in school?  
Do you go?  
Have you ever been?  
How many times have you been involved in learning outside the classroom for science, for example, fieldwork, science-related trips?  
How enjoyable was this? |
| 10. Perception of science in the real world | Is science important to:  
• you in your life? How?  
• your family? How?  
• your country? How?  
• the world? How? |
| 11. To elicit contexts that might be overlooked | What aspects of science are you interested in? |
| 12. Aspirations | Once you have done your GCSEs will you consider a career or further study that includes aspects of science?  
Why? |

Thank all participants for their time and engagement with the process.
Ranking exercise and diamond nine – How do I learn best in science?

Instructions to teacher – prepare the card-sort cards; have enough sets for one set between two to three pupils. Using a digital camera to make a record of the responses helps with analysis after the interviews.

1. Working in silence
2. Discussing in pairs to agree answers
3. Pupils using the interactive whiteboard (IWB)
4. Teacher explaining to the whole class

5. Discussing in small groups to share ideas
6. Using data-logging equipment
7. Hands-on experiments
8. Answering questions from a sheet or book

9. Drawing graphs
10. Watching the teacher doing an experiment
11. Reading a text book
12. Using models to help you explain a scientific idea

13. Deciding how to carry out an investigation
14. Teacher using digital technology to help with explanations (e.g. IWB, podcast, etc.)
15. Pupils using digital technology to explain their ideas. (e.g. IWB, podcast, etc.)
16. Going through homework

Example of pupil responses when asked to order the cards to reflect what happens most in lessons to what happens least (picture shows only part of the continuum).
This picture shows an example of a pupil response when asked to select the nine activities that enabled them to learn best. These were then diamond ranked (most to least useful).

**Subject leader task**

Identify two significant differences between the responses of boys and girls. Reflect on the reasons for these. You could use this as part of the evidence to support the need for change in current practice in your department.

**Teacher task**

Identify two significant differences between the responses of boys and girls. Reflect on the reasons for these. You could use this evidence to guide decisions about how you improve teaching and learning in your classroom.

Try out some strategies; monitor the impact by repeating the pupil voice process after about six weeks of trialling a strategy.
Know the gap: lesson observation

Are there significant differences in teacher interaction or pupils’ actions between boys and girls during the course of a lesson?

Organisation

Ask a colleague, e.g. another teacher, subject leader or senior leadership team member to use the Toolkit observation form to help you identify your strengths and areas for development when looking at underachieving groups in lessons.

Notes for observer

Be clear with the teacher that the purpose of the observation(s) is to collect evidence to formulate ideas about strengths and areas for development about teaching and learning across the department. The outcomes will be in the form of a general report which will provide evidence for future actions.
### Year group | Set/mixed ability
--- | ---
**Number of boys**
**Number of girls**
**Teacher gender** | Male/female
**Lesson focus**

<table>
<thead>
<tr>
<th>Context</th>
<th>Area</th>
<th>Detail</th>
<th>Observation</th>
<th>Possible implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson planning</td>
<td>Objectives and/or outcomes. Include HSW and encourage pupils to think scientifically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starter</td>
<td>Proportion of pupils engaged. Any particular group more engaged?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisation</td>
<td>How are groups seated: generally, for group work, for practical work?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active engagement</td>
<td>How actively involved are the boys and girls in the lesson?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plenaries</td>
<td>At the end of the lesson. Mini plenaries during the lesson</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questioning</td>
<td>What was the proportion of questions answered by boys and girls during the lesson?</td>
<td>Girls</td>
<td>Boys</td>
<td></td>
</tr>
<tr>
<td>Questioning</td>
<td>Were open and closed questions equally answered by girls and boys? Did the teacher respond to pupil responses that were ‘incorrect’/correct in the same way for girls and boys?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupil questions</td>
<td>Was there opportunity for pupils to question the teacher or other adult or each other?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planning of use of time</td>
<td>What proportions of time during the lesson were given to: teacher talk, discussion, writing, practical, other?</td>
<td>TT</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>W</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing thinking</td>
<td>Examples of how the teacher challenged pupils’ thinking during the lesson</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessments</td>
<td>Evidence of assessments where context for gender has been considered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any other observations of note</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Know the gap: department discussion scenarios**

**How do groups of pupils respond in science lessons?**

**SUBJECT LEADER**
How well are we doing? How do groups of pupils respond in science lessons?

**TEACHERS**
I think I may have an issue with underperformance in one of my classes.

Key areas related to underperforming groups have been prioritised. It is difficult to prioritise areas for improvement because there is insufficient evidence to base decisions on.

Departmental action plan is in place but monitoring shows limited impact on pupils.

**Organisation**

As a subject leader you could use one or more of the cards on page 29 to promote discussion in a departmental meeting. You may select particular cards in the light of initial observations or use various cards to explore ideas and raise awareness about classroom practice.

For individual teachers, the cards may prompt you to identify areas that you may choose to look at in greater depth.

**Task**

Reflect on how close the picture is to reality in your classes or across your department.

Is this, for example, because:

- boys call out?
- teacher only takes answers from those who put hands up?

List other reasons:

- 
- 

---
“Why haven’t you girls started yet?”
OUTCOME:
You will have completed your coursework.

As usual, Mr Jones’ engaging lesson was enthusing the pupils.

“Now you can collect your equipment.”

You can’t hit a target you can’t see!
8. Next steps – strategies and action planning

Narrowing the Gap: agreeing department actions

The table has some possible findings that may have become apparent from using the various sections of the Toolkit. It offers suggestions about possible strategies.

<table>
<thead>
<tr>
<th>Is it because…</th>
<th>You might try…</th>
<th>Look in…</th>
</tr>
</thead>
<tbody>
<tr>
<td>boys call out</td>
<td>no hands up</td>
<td>Strengthening teaching and learning in science through using different pedagogies – Unit 2: Active questioning</td>
</tr>
<tr>
<td>limited questioning techniques</td>
<td>think, pair, share</td>
<td>See planning effective questioning (pages 6–7), classification of question types (page 10), classroom tactics (pages 11–12)</td>
</tr>
<tr>
<td>teacher only asked pupils who put hands up (mainly boys)</td>
<td>departmental CPD on questioning</td>
<td>Creating a progress culture</td>
</tr>
<tr>
<td></td>
<td>direct questions to named individuals</td>
<td>See transforming questioning (pages 5–6)</td>
</tr>
<tr>
<td>teachers are asking boys directly as a method of controlling behaviour</td>
<td>planning strategies to actively involve all pupils in activities, e.g. in demonstration structure follow-up such as: ‘You have to write three questions about what you have seen’</td>
<td></td>
</tr>
<tr>
<td>classroom management</td>
<td>having protocols for movement/seating?</td>
<td>Assessment for Learning (Afl)</td>
</tr>
<tr>
<td>pupils are choosing where to sit</td>
<td>considering appropriate groupings to allow girls to increase engagement/contribution to lessons</td>
<td>Whole-school training materials: Unit 4, Module 1: oral feedback (see pages 23–24)</td>
</tr>
<tr>
<td>girls are intimidated by boys</td>
<td>varying the contexts</td>
<td>Pedagogy and Practice: Teaching and Learning in Secondary Schools: Unit 18</td>
</tr>
<tr>
<td>boys are more interested</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Action planning

After having collected information from different sources – data, pupil voice and lesson observations – it is important that you address any identified issues so that all your pupils make good progress.

Your line manager or another teacher can help you to think through your findings – what the information has told you and how you might tackle the identified issues.

Decide on between one to three actions to address the area(s) for development.

Writing a clear action plan will then help you to focus on what needs to change and identify from the outset what success will look like.

There are a variety of templates available. Investigate what is currently used in your school or department.
For example:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Action</th>
<th>Lead person/people involved</th>
<th>Timescale (to–from)</th>
<th>Resources</th>
<th>Monitoring evaluation and review (who, when and how)</th>
<th>Success criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys rush to get apparatus before the girls have a chance</td>
<td>Organise practical work so that groups are called to get apparatus by the teacher</td>
<td>Mr Newton Mrs Bell</td>
<td>October half-term to Christmas</td>
<td>Mrs Bell freed to complete Pupil voice</td>
<td>Mrs Bell Week before Christmas Pupil voice with separate girl and boy groups</td>
<td>Girls more engaged in practical work</td>
</tr>
</tbody>
</table>

As a result of using this approach to improvement planning teachers will be able to return to the improvement cycle and use the evidence gained to reassess their current position. The narrowing of the gap in both attainment and progress in science should be celebrated.
Appendices

National Strategies materials
The following resources are available to download from: www.standards.dcsf.gov.uk/nationalstrategies Search using the reference numbers provided.

Assessment for Learning (AfL): Whole-school training materials
A suite of guidance and support materials on a variety of topics.
Ref:0043-2004

Creating a progress culture
This booklet focuses on building challenge into lessons.
Ref:00905-2007PDF-EN-01

Intervention in Science
A web-based resource to support intervention in science. There is a link from the site to the resource finder which will help to target the resources needed.

Pedagogy and Practice: Teaching and Learning in Secondary Schools Unit 18: Improving the climate for learning
A study guide offering some practical strategies that teachers can use to improve the climate for learning.
Ref:0441-2004G

Progressing to Level 6 and beyond in science (now with added HSW)
The resource is based on a Steps and Layers approach where a simple ‘steps’ table is used to identify ‘where the pupils are’, a second table identifies some strategies to help move pupils to the next step and detailed teacher guidance forms the final layer.
Ref:00013-2009EPD-EN-01

Strengthening teaching and learning in science through using different pedagogies – Unit 1: Using group talk and argument
Practical suggestions to use in classroom when using group talk and argument to stimulate discussion. Contains case studies and tasks for teachers to undertake.
Ref:0697-2004G

Strengthening teaching and learning in science through using different pedagogies – Unit 2: Active questioning
Practical suggestions to use in the classroom when using active questioning techniques. Contains case studies and tasks for teachers to undertake.
Ref:0698-2004G
(See also: Pedagogy and Practice: Teaching and Learning in Secondary Schools Unit 7: Questioning Ref:0430-2004G)

Strengthening teaching and learning in science through using different pedagogies – Unit 3: Improving the learning climate
Study unit offers practical suggestions for science subject leaders, Key Stage 3 science coordinators and science teachers to use in the classroom.
Ref:0699-2004G
Other references and resources

Addressing gender and achievement: myths and realities (2009) DCSF
Blair, Holland and Sheldon (Eds), (1995) Debates and issues in feminist research and pedagogy, OUP
Blair, Holland and Sheldon (Eds), (1995) Equality and inequality in education policy, OUP
Blair, Holland and Sheldon (Eds), (1995) Identity and diversity: gender and the experience of education, OUP

Gender and student achievement in English schools (February 2006) Centre for the Economics of Education (CEE)

Gender issues in school – what works to improve achievement for boys and girls (2009) DCSF


Higher Education Policy Institute report (2009)

Improving the performance and outcomes of under-performing groups of boys and girls: Outcomes for the gender agenda (2009) DCSF


Millennium Cohort Study Third Survey 2005, Institute of Education, Centre for Longitudinal Studies
