

# Focus on success: GCSE science

A03

Build on your students' assessment performance using our self-guided, modular training pack

Pre-reading  
booklet





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# Using this resource

This pack is designed to enable you to deliver a CPD session on Assessment Objective 3 (AO3) for your teaching colleagues.

Using the completed pre-session health checks and the provided route map, you'll be able to design a bespoke session to focus on the areas your colleagues are less confident teaching.

This resource pack is intended to help you:

- deliver a CPD session for teaching colleagues around AO3
- understand what AO3 is
- identify the question types that assess AO3
- understand how AO3 is assessed at different levels of demand
- discuss how you might use the legacy coursework assessments (ISAs) in your teaching and learning.

## Before the session

- Ask your colleagues to each complete the pre-session health check (page 13 in this booklet).
- Use the responses to the health check to tailor the training session to the needs of your colleagues. The route map on page 10 will help you plan which activities to use in the session.
- Each colleague should have a copy of the activities booklet and access to the [data source booklets](#) electronically.
- The post-session health check (page 14 in this booklet) should be printed for each colleague.

## Running the session

- Download the guidance presentation from [aqa.org.uk/focus-on-success-science](https://aqa.org.uk/focus-on-success-science).
- The presentation will provide guidance and discussion questions to move you through your bespoke session.

## After the session

- Ask your colleagues to each complete the post-session health check (page 14 in this booklet) to ensure the training has been successful.
- As a group, discuss how you can support each other to embed what you have learned into your teaching. Use the prompt questions in the guidance presentation to guide your discussion.
- Complete the individual and group action plan templates (pages 33–35 in the activities booklet).
- A certificate of attendance can be created and printed for each person from [aqa.org.uk/focus-on-success-science](https://aqa.org.uk/focus-on-success-science).

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# Summary of activities

## Activity 1: What is Assessment Objective 3

Most teachers are aware that Assessment Objective 3 covers analysis and evaluation, but may not be clear as to what that looks like in the final assessments or how the skills may be developed in class. This initial activity is designed to develop a deeper understanding of what AO3 covers and to start the process of formulating ideas about how this understanding can be used in lesson design.

Slide 3 acts as an introduction to AO3, to set the scene about what it is (basically looking critically at information presented in different ways) and what the strands of AO3 are.

### Activity 1a

- Using the Ofqual strand document covering AO3 on page 4 of your activities booklet, teachers should read the different strands and elements and identify the skills they need to be developing in lessons
- The key points are summarised on slide 5 and 6 along with pertinent assessment points
- One particular point to emphasise is that in many teaching and learning taxonomies, the ability to evaluate data and ideas appears as a high-order skill, but in the GCSE sciences, evaluation has to be assessed at all levels of demand.

### Activity 1b

- Using this knowledge of what AO3 is, identify which strand a question is targeting and what level of demand they are written for. It may be worth pointing out that items within a question may be set at different levels of demand. The demand generally ramps through the paper so, for instance, question 2 on the Foundation paper will consist mainly of low-demand items but also possibly one or two standard-demand items.
- The answers for your reference are in the table below
- Conduct a group discussion using the prompt questions on slide 8 of the guidance presentation. The discussion on the level of demand is expanded on in the next activity.

### Answers

Example	Strand	Level of demand
Example 1	1a	low
Example 2	2	standard
Example 3	3	low
Example 4	3	high
Example 5	2	low
Example 6	3	standard
Example 7	1	standard
Example 8	1	high
Example 9	2	high
Example 10	3	standard

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## Activity 2: Assessing AO3 at different levels of demand

It is important that teachers understand how examiners may assess the different strands of AO3 at different levels of demand. This will help teachers to use the same kind of language in class and plan appropriate activities that challenge and stretch their students.

This activity builds on the previous discussion on levels of demand. Recap the answers teachers gave to the last two questions on slide 8.

- Using the questions starting on page 17 of the activities booklet, which assess the same strand of AO3 but at different levels of demand, the group consider what the examiner has done to make the question work at the different demands.
- Each set covers a different strand of AO3 so one way to organise the activity would be to assign a different strand to each group:
  - interpret and evaluate starts on page 17
  - make judgements and draw conclusions starting on page 20
  - develop and improve experimental procedures starting on page 23.
- Commentaries on these questions are in the appendices of the activity booklet. It would be useful to familiarise yourself with these before the training so that you can lead the discussion on what examiners do to change the level of demand of a question. You may want to ask teachers not to look at these until the end of the activity.
- Use the prompt questions on slide 9 of the guidance presentation to discuss how you might adapt your questions in class and homework tasks to ensure there is the appropriate level of challenge for different students.

## Activity 3: AO3 teaching and learning

Having an understanding of what students might have to do in questions addressing the different elements of AO3 will help teachers to design activities to bring out the different aspects of the Assessment Objective. It will also help in structuring discussion with students about strategies they could use to successfully access these types of questions.

- Slides 11-13 of the guidance presentation lists the types of assessment tasks students might be required to do for each strand of AO3.
- In groups look at one of the strands and list any:
  - actions/reminders of things to do in lessons to help students develop these skills
  - strategies students could use to access the questions more successfully.
- Slide 14 of the guidance presentation lists a number of ideas to exemplify actions or strategies.

These ideas and strategies might be different depending on the level of demand you are focusing on.

In the table below are a few suggestions and there is an example on slide 14 to support the discussion.

Interpret and evaluate	Make judgements and draw conclusions	Develop and improve experimental procedures
Annotate the data in tables with arrows to show whether it is increasing, decreasing or staying the same.	Use data from unfamiliar context.	Read the question carefully, critically thinking about the equipment and chemicals being used – will these give the correct outcomes?
Quote figures from the table to illustrate the <b>change</b> .	Highlight data in the stem of the question.	Don't use the phrase 'same amount' or 'fair test' these are too vague. Don't use the phrase 'reliable' as it's not on the vocab list and is also too vague.
Use the data provided in answers.	Use the data to support your explanation of the conclusion (what you have found out).	When doing practicals think 'big picture' of all the variables that might need to be controlled. Students often think that there is one factor (eg temperature ) that always needs to be controlled and so can never be the variable you are investigating.
Command word 'Compare' needs similarities and differences.	Understand what valid means in terms of peer reviews.	You are changing = independent You are measuring = dependent
Command word 'Evaluate' needs comparisons and a judgement.	Prediction = 'I think this will happen...'	Understand what the difference is between a control and control variables.

Check understanding of the word 'hypothese'.		<p>When asked about improving the methods:</p> <ul style="list-style-type: none"> <li>• relate your answer to how this makes the results /readings/data <b>valid</b>. Make sure you use the actual word.</li> <li>• consider which apparatus would be a better choice and why. Link answers to resolution of apparatus and uncertainty within the raw data.</li> <li>• consider the size of the interval used to take a reading to make it more accurately. Eg take a reading every 5 mins then every minute between 15-20 mins take a reading every minute. Say why you are doing this.</li> </ul>
Use a table to help organise your answer if asked for advantages and disadvantages. Don't forget to make a comment about what your table shows and the conclusion you have drawn from the information.		<p>The teacher introduces some errors if demonstrating the practicals before students do it. Then ask students to identify them, eg measuring a distance but the ruler isn't straight or lined up properly at zero for the start of the measuring .</p> <p>Discuss one or two common errors in each practical.</p> <p>'Human error' is too vague to gain any credit.</p>
Use the information in the <a href="#">subject specific vocabulary</a> document to calculate uncertainty at GCSE standard.		Link anomalous results to errors.
Check understanding of the word 'anomalous'. Don't include anomalous results when calculating the mean or when drawing a line of best fit.		<p>Realistic risks that are relevant to the practical and linked to the materials /chemicals used in the experiment.</p> <p>Not writing 'wear lead clothing' for all physics practicals.</p> <p>Using common hazard terms like corrosive, irritant, poison (CLEAPSS).</p>



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## Activity 4: Data resources to support teaching

Finding sources of information, particularly data sets, for critical study can be difficult and time consuming. The legacy coursework assessments (ISAs) are a free source of such data schools can use. Using any search engine looking for stories or articles on 'Bad science' is another good source of materials, particularly if you want to practice evaluation skills. Dr Ben Goldacre is one well known author of such materials.

It is important to familiarise yourself with the layout of the data source booklets [available on our website](#) before the training session. Due to the length of these booklets it would be advisable to view these electronically. We have reproduced the relevant information from the legacy ISAs which can be used in class with students. Not all of the legacy ISAs are relevant to use with the new specification, so we have listed only those that have links either to the Required practicals or to areas of the subject content where the information could be useful in teaching.

The full range of legacy ISA materials are available on [e-AQA](#).

The information we have given for each ISA depends on whether it has a link to the current Required practicals.

There is no expectation that centres will do all these extra practicals in addition to the RPs, although teachers may find them useful in enhancing the practicals undertaken. The materials in the booklets is intended to be used as stimulus material to further develop AO3 skills. They are also really useful in developing AO2 skills, as they provide case studies of practicals in unfamiliar contexts.

### Activity 4

For the training session it would be advisable to **access these booklets electronically**.

- As a group look at page 4 of the electronic version of the booklet and familiarise your colleagues with the information and how we have laid out the ISA materials.
- Using slides 15 and 16 in the presentation discuss in groups how you could make use of these resources in class with your students.



## Area for development

Does the team need to know what A03 assesses?

Does the team know how examiners write questions at different levels of demand?

Can the team identify useful learning and assessment points for students based on A03 assessment tasks?

Does the team know how the legacy coursework tasks (ISAs) can be used as a learning resource?

**Activity 1a:** Understand the Ofqual guidance and strands of A03  
Page 4 of the activities booklet  
Slide 4-6 of guidance presentation

**Activity 1b:** Identifying strands and level of demand of A03 exam items  
Page 5 of activities booklet  
Slide 7 of guidance presentation

**Activity 2:** Identify features of questions written at different levels of demand  
Page 18 of activities booklet  
Slide 9 of guidance presentation

**Activity 3:** Considering the type of assessment tasks list strategies, prompts or actions to share with students  
Page 30 of activities booklet  
Slide 10 of guidance presentation

**Activity 4:** Using the online data source booklets discuss how ISA materials can be used with students

**Group discussion:**  
Discuss your students' progress in A03 and ideas on level of demand

**Group discussion:**  
By understanding better these exam features, how might they be incorporated into lessons to support progression?

**Group discussion:**  
Feedback from each group to share teaching and learning ideas

**Handout:** Data source booklets available online

**Group discussion:**  
Discuss any sources of stimulus materials to use with A03 activities

# Introduction to AO3

AO3 covers the skill of looking critically at information given in tables, graphs, diagrams or written prose. It involves analysing and interpreting information and ideas to:

- identify and explain patterns and trends
- make judgements based on the data
- draw conclusions based on the data
- identify experimental errors, adapt and improve practical procedures.

20 % of the marks on an award are for AO3. This is a significant amount of marks but perhaps because of the nature of the activities involved it does not receive as much teaching and learning time as it needs. Students need to be aware that the revision guides they often use will rarely cover the skills needed to address AO3 as they mainly cover just the content set out in the specification.

AO3: Analyse information and ideas to:			20%
<ul style="list-style-type: none"> <li>■ interpret and evaluate</li> <li>■ make judgements and draw conclusions</li> <li>■ develop and improve experimental procedures.</li> </ul>			
Strands	Elements	Coverage	Interpretations and definitions
<b>1 – Analyse information and ideas to interpret and evaluate.</b>	1a – Analyse information and ideas to interpret.	<ul style="list-style-type: none"> <li>■ Full coverage in each set of assessments (but not in every assessment).</li> <li>■ A reasonable balance between the strands within this assessment objective, and between the elements within each strand.</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Develop and improve</b> covers a range of approaches to assessment, including questions related to adapting, modifying and enhancing experimental procedures. Learners should not be expected to develop their own procedures.</li> <li>■ <b>Experimental procedures</b> encompasses, but is broader than, the core practical activities. In the context of this assessment objective, questions/tasks should take an analytical form such as suggesting the limitations of a particular method.</li> <li>■ The emphasis here is on the outcome that Learners produce through the analysis of information – for instance, the interpreting, evaluating, judgement, conclusion or modification/improvement of procedures that stems from their reasoning and synthesis of skills. The abilities to interpret and evaluate in this context are both linked and complementary.</li> <li>■ Questions/tasks should address a range of sources here – for example, written, numerical, theoretical, practical, ethical, social, economic and environmental.</li> </ul>
	1b – Analyse information and ideas to evaluate.		
<b>2 – Analyse information and ideas to make judgements and draw conclusions.</b>	2a – Analyse information and ideas to make judgements.		
	2b – Analyse information and ideas to draw conclusions.		
<b>3 – Analyse information and ideas to develop and improve experimental procedures.</b>	3a – Analyse information and ideas to develop experimental procedures.		
	3b – Analyse information and ideas to improve experimental procedures.		

Source: *Ofqual GCSE Subject Level Guidance for Single Science (Biology, Chemistry, Physics)*, July 2015

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# Assessing AO3 in GCSE science

There are three broad categories of tasks used to assess AO3:

- interpret and evaluate
- make judgements and draw conclusions
- develop and improve experimental procedures.

AQA use a wide range of command words, and assess using closed, short answer and extended response questions. The full range of marks are also used from 1 markers to the 6 mark extended responses. What is particularly important is that AO3 is assessed at **all levels of demand**.

Critical thinking is a high-level skill but that doesn't mean to say activities cannot be written to engage all our students' minds in this kind of activity. Many students like to know the 'right answer' and can get very frustrated if they feel their teacher isn't giving them the answers. It is very important that teachers do provide opportunities for students to question data and statements and to have to think critically and question ideas and evidence for themselves.

## Working scientifically

The working scientifically (WS) criteria can be found in section 3 of all GCSE science specifications. The four key areas encompass many AO3 skills. It is essential that teachers are aware of this section of the specification and are addressing these skills in class.

- WS1: Development of scientific thinking
- WS2: Experimental skills and strategies
- WS3: Analysis and evaluation
- WS4: Scientific vocabulary, quantities, units, symbols and nomenclature

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# Pre-session health check

Grade the area of development statements according to your confidence where 0 is not confident at all and 5 is very confident.

Hand back to your Head of Department.

Area of development	Grading 0-5	Reasons/notes/previous training
Understand what the strands and elements of Assessment Objective 3 are and what these look like in questions		
I know how examiners change the level of demand for AO3 questions		
I have a good understanding of the learning points I should draw out with my students when covering the different elements of AO3		
I have a bank of resources to use in class, for revision and intervention lessons that focus on using and interpreting data and data presented in unfamiliar context		

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# Post-session health check

Grade the area of development statements according to your confidence where 0 is not confident at all and 5 is very confident.

Area of development	Grading 0-5	Reasons/notes
Understand what the strands and elements of Assessment Objective 3 are and what these look like in questions		
I know how examiners change the level of demand within each grade range for AO3 assessments		
I have a good understanding of the learning points I should draw out with my students when covering the different elements of AO3		
I have a bank of resources to use in class, for revision and intervention lessons that focus on using and interpreting data and data generated in unfamiliar context		



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## Contact us

**T:** 01483 477756

**E:** [gcsescience@aqa.org.uk](mailto:gcsescience@aqa.org.uk)

[aqa.org.uk](https://www.aqa.org.uk)