Year 8 standard elaborations — Australian Curriculum: Science

Purpose

The standard elaborations (SEs) provide additional clarity when using the Australian Curriculum achievement standard to make judgments on a five-point scale. They can be used as a tool for:

- making consistent and comparable judgments about the evidence of learning in a folio of student work
- developing task-specific standards for individual assessment tasks.

Structure

The SEs are developed using the **Australian Curriculum achievement standard**. The achievement standard for Science describes the learning expected of students at each year level. Teachers use the achievement standard during and at the end of a period of teaching to make on-balance judgments about the quality of learning students demonstrate.

In Queensland the achievement standard represents the **C standard** — a sound level of knowledge and understanding of the content, and application of skills. The SEs are presented in a matrix. The discernible differences or degrees of quality associated with the five-point scale are highlighted to identify the characteristics of student work on which teacher judgments are made. Terms are described in the Notes section following the matrix.

Year 8 Australian Curriculum: Science achievement standard
By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the timescales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems. They reflect on implications of these solutions for different groups in society. Students identify and construct questions and problems that they can investigate scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They identify variables to be changed, measured and controlled. Students construct representations of their data to reveal and analyse patterns and trends, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their own scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types.
Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), *Australian Curriculum Version 8 Science for Foundation–10*, www.australiancurriculum.edu.au/Science/Curriculum/F-10

Year 8 Science standard elaborations

		A	B	C	D	E
		The folio of student work has the following characteristics: work has the following characteristics:				
Science understanding	**Chemical sciences**	• thorough comparison and explanation of physical and chemical changes • justified explanation and justified prediction of the properties and behaviours of substances using the particle model	• informed comparison and description of physical and chemical changes • informed explanation and plausible prediction of the properties and behaviours of substances using the particle model	• comparison of physical and chemical changes • explanation and prediction of the properties and behaviours of substances using the particle model	• description of physical and chemical changes • description of the properties and behaviours of substances with reference to the particle model	statements about properties and behaviours of substances
	Physical sciences	• identification of different forms of energy in simple and complex systems • explanation of how energy transfers and transformations cause change in simple systems, with progress towards some that are complex	• identification of different forms of energy in simple systems • informed description of how energy transfers and transformations cause change in simple systems	• identification of different forms of energy • description of how energy transfers and transformations cause change in simple systems	• recall of different forms of energy • identification of energy transfers and transformations in simple systems	statements about energy transfers and transformations
	Earth and space sciences	comparison and explanation of the processes of rock formation, including the timescales involved	comparison and description of the processes of rock formation, including the timescales involved	comparison of the processes of rock formation, including the timescales involved	description of the processes of rock formation	statements about the processes of rock formation
	Biological sciences	critical analysis of the relationship between structure and function at cell, organ and body system levels	informed analysis of the relationship between structure and function at cell, organ and body system levels	analysis of the relationship between structure and function at cell, organ and body system levels	description of how cells, organs and body systems function	statements about cells, organs and body systems

		A	B	C	D	E
		The folio of student work has the following characteristics: work has the following characteristics:				
Science as a human endeavour	**Nature and development of science**	• examination and justified explanation of how different science knowledge is used in occupations • justified explanation of how evidence has led to an improved understanding of a scientific idea	• examination and explanation of how different science knowledge is used in occupations • informed explanation of how evidence has led to an improved understanding of a scientific idea	• examination of the different science knowledge used in occupations • explanation of how evidence has led to an improved understanding of a scientific idea	• description of science knowledge used in science occupations • description of how understanding of a scientific idea has changed	statements about: • science used in occupations • scientific ideas
	Use and influence of science	• thorough description of situations in which scientists collaborated to generate solutions to contemporary problems • thorough reflection on the implications of these solutions for different groups in society	• informed description of situations in which scientists collaborated to generate solutions to contemporary problems • informed reflection on the implications of these solutions for different groups in society	• description of situations in which scientists collaborated to generate solutions to contemporary problems • reflection on the implications of these solutions for different groups in society	• identification of situations where scientists generate solutions to contemporary problems • identification of implications of these solutions	statements about: • solutions to contemporary problems • implications of solutions
Science inquiry skills	**Questioning and predicting**	identification and construction of questions and problems that can be investigated scientifically and the making of justified predictions	identification and construction of questions and problems that can be investigated scientifically and the making of plausible predictions	identification and construction of questions and problems that can be investigated scientifically	guided identification and guided construction of questions and problems for investigation	directed identification and directed construction of questions and problems for investigation

	A	B	C	D	E
	The folio of student work has the following characteristics: work has the following characteristics:				
Planning and conducting (including field or experimental methods)	• planning of investigations that: – describe how to manage safety and ethical considerations – identify and describe how variables are changed, measured and controlled • accurate collection of reliable data	• planning of investigations that: – describe the implications of safety and ethics considerations – identify and describe how variables are changed, measured and controlled • accurate collection of data	planning of investigations that: • consider safety and ethics • identify variables to be changed, measured and controlled	partial planning of investigations that: • consider safety and ethics • identify variables to be changed, measured and controlled	• use of provided investigations methods • identification of safety considerations
Processing and analysing data and information	• following of conventions to construct accurate representations of data to reveal and analyse patterns and trends • use of these patterns and trends when explaining relationships to justify conclusions	• following of conventions to construct representations of data to reveal and analyse patterns and trends • use of these patterns and trends when describing relationships when justifying conclusions	• construction of representations of data to reveal and analyse patterns and trends • use of these patterns and trends when justifying conclusions	• partial construction of representations of data to partially reveal patterns and trends • drawing of conclusions	• partial construction of representations of data • statements about data

		A	B	C	D	E
		The folio of student work has the following characteristics: work has the following characteristics:				
Science inquiry skills	**Evaluating**	• evaluation of the quality of data to justify the explanation of how effective modifications to methods could improve the quality of their data • application of scientific knowledge and investigation findings to critically evaluate claims made by others	• explanation of how effective modifications to methods could improve the quality of their data • application of scientific knowledge and investigation findings to make informed evaluations of claims made by others	• explanation of how modifications to methods could improve the quality of their data • application of scientific knowledge and investigation findings to evaluate claims made by others	• description of modifications to methods • description of claims made by others	statements about: • modifications • claims
	Communicating	concise and coherent use of appropriate language and accurate representations to communicate science ideas, methods and findings in a range of text types	coherent use of appropriate language and accurate representations to communicate science ideas, methods and findings in a range of text types	use of appropriate language and representations to communicate science ideas, methods and findings in a range of text types	use of everyday language and representations to communicate science ideas, methods and findings	fragmented use of language and representations to communicate science ideas, methods and findings

Key	shading emphasises the qualities that discriminate between the A–E descriptors

Notes

Australian Curriculum common dimensions

The SEs describe the qualities of achievement in the two dimensions common to all Australian Curriculum learning area achievement standards:

- understanding
- skills.

Dimension	Description
understanding	The concepts underpinning and connecting knowledge in a learning area, related to a student's ability to appropriately select and apply knowledge to solve problems in that learning area
skills	The specific techniques, strategies and processes in a learning area

Terms used in Year 8 Science SEs

These terms clarify the descriptors in the Year 8 Science SEs. They help to clarify the descriptors and should be used in conjunction with the ACARA Australian Curriculum Science glossary: www.australiancurriculum.edu.au/f-10-curriculum/science/glossary.

Term	Description
accuracy; accurate	consistent with a standard, rule, convention or known fact; in the context of Science: • *accurate* measurements are close to the accepted value • *accurate* representations are a true representation of observations or collected data
analysis; analyse	consider in detail for the purpose of finding meaning or relationships, and identifying patterns, similarities and differences; in order to explain and interpret it
coherent	rational; well-structured and makes sense
communicating (sub-strand)	conveying information or ideas to others through appropriate representations, text types and modes
comparison; compare	estimate, measure or note how things are similar or dissimilar
complexity; complex	involving a number of elements, components or steps
concise	brief and to the point; without repetition of information, loss of clarity or loss of argument, logic or solution

Term	Description
conventions (tables and graphs)	agreed methods of representing concepts, information and behaviours; in the context of constructing tables and graphs in science, the following conventions apply: **tables** — any table used in an investigation should include: • the independent variable goes in the left hand column, the dependent variables in the column/s to the right • column headings that have all the information needed to define the table's meaning and should identify units (if applicable) • a title that summarises what the table is showing **graphs** — any graph used to report findings should include: • labelling the dependent variable on the horizontal (x) axis and the independent on the vertical (y) axis, accompanied by the units of measurement • an appropriate scale in ascending amounts with equal intervals (if applicable) • a title that summarises what the graph is showing
critical	analysis or evaluation of an issue or information in order to form a critical judgment, especially in a detailed way, and involving skilful judgment as to truth or merit and is informed by evidence
description; descriptive; describe	give an account of characteristics or features
direction; directed	following the instructions of the facilitator
effectively; effective	meeting the assigned purpose; in a way that produces a desired or intended result
evaluating (sub-strand); evaluation; evaluate	examining and judging the merit or significance of something; considering the quality of available evidence and the merit or significance of a claim, proposition or conclusion with reference to that evidence; in Year 8, *evaluating* includes: • reflecting on scientific investigations • evaluating the quality of the data collected • identifying improvements to the method • evaluating claims
examination; examine	to determine the nature or condition of something
explanation; explanatory; explain	provide additional information that demonstrates understanding of reasoning and/or application
fragmented	disjointed, incomplete or isolated
guided	visual and/or verbal prompts to facilitate or support independent action
identification; identify	establish or indicate who or what someone or something is
informed	having relevant knowledge; being conversant with the topic; in the context of Science, *informed* means referring to scientific background knowledge and/or empirical observations

Term	Description
justification; justify	show how an argument or conclusion is right or reasonable; provide sound reasons or evidence; in the context of Science, *justified* also means that the evidence is provided through reference to scientific background knowledge and/or empirical observations as part of the justification
partial	incomplete, half-done, unfinished
planning and conducting (sub-strand)	making decisions regarding how to investigate or solve a problem and carrying out an investigation, including the collection of data; in Year 8, this includes: • planning and conducting a range of investigation types • ensuring safety and ethical guidelines are followed • measuring and controlling variables • selecting equipment to collect data with accuracy
plausibility; plausible	credible and possible; in the context of Science, a *plausible* prediction is based on scientific knowledge
processing and analysing data and information (sub-strand)	representing data in meaningful and useful ways; identifying trends, patterns and relationships in data, and using this evidence to justify conclusions; in Year 8, this includes: • constructing and using a range of representations • analysing patterns or relationships in data • summarising data • identifying relationships • drawing conclusions based on evidence
questioning and predicting (sub-strand)	identifying and constructing questions, proposing hypotheses and suggesting possible outcomes; in Year 8, this includes: • identifying questions and problems to be investigated scientifically • making predictions based on scientific knowledge
questions (that can be investigated scientifically)	a question that is connected to scientific concepts and methods and is able to be investigated through the systematic observation and interpretation of data; there are three types of investigable questions: 1. **descriptive questions**: produce a qualitative or quantitative description of an object, material, organism or event 2. **relational questions**: identify associations between the characteristics of different phenomena 3. **cause–effect questions**: determine whether one or more variables cause or affect one or more outcome variables Sharkawy, A 2010, 'A Quest to Improve: Helping students learn how to pose investigable questions', *Science and Children*, vol. 48, no. 4, pp. 32–35
reflection; reflect	think carefully about, such as past experiences, activities or events

Term	Description
reliability; reliable	constant and dependable or consistent and repeatable; in Science, in the context of collecting data from: • first-hand investigations, *reliability* refers to the consistency of the data collected, i.e. a consistent pattern of results is established through repetition • secondary sources, *reliability* refers to information and data from secondary sources that is consistent with information and data from a number of reputable sources; Note: *reliability* and *validity* are terms that can easily be confused by students; in the context of collecting data from: • first-hand investigations, *validity* refers to whether the measurements collected are caused by the phenomena being tested, i.e. if the procedure is testing the hypothesis • secondary sources, *validity* refers to the degree to which evidence supports the assertion or claim being evaluated; McCloughan, G 2001, 'Reliability and validity — what do they mean?', *Curriculum Support for Teaching in Science in 7–12*, vol. 6, no. 3, pp. 14–15
representation	use words, images, symbols or signs to convey meaning; in the context of Science, *representation* is an important learning and presentation tool that contributes strongly to science literacy development; scientists represent ideas in a variety of ways, including models, graphs, charts, drawings, diagrams and written texts; the use of these models and other representations is to help understand or present meaning about an idea, an object, a process or a system, or even something that cannot be directly observed, e.g. an atom or inside our body
science knowledge	*science knowledge* refers to facts, concepts, principles, laws, theories and models that have been established by scientists over time; in the context of Years 7 to 10, students develop their understanding of microscopic and atomic structures, how systems at a range of scales are shaped by flows of energy and matter and interactions due to forces, and develop the ability to quantify changes and relative amounts
selection; select	choose in preference to another or others
simple	involving few elements, components or steps; obvious data or outcomes
statement; state	a sentence or assertion
thorough	demonstrating depth and breadth, inclusive of relevant detail