Science 21
Advice for teachers

Developing effective instrument-specific standards matrixes
April 2011
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Compiled by the Queensland Studies Authority

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About this advice

The Science 21 syllabus requires each assessment instrument to be accompanied by an instrument-specific criteria and standards sheet (criteria sheet) that is derived from, and consistent with, the standards descriptors, as defined in the Science 21 syllabus (section 5.8.1: pp. 34–35).

Instrument-specific criteria sheets are usually presented as a matrix that sets out the requirements of the task in terms of the objectives to be assessed, and also defines the qualities of the five standards that guide judgments. Instrument-specific criteria sheets must be given to students before they start an assessment task.

Criteria sheets:
- clearly specify each of the five standards (A–E)
- inform teaching and learning practice
- are annotated to show student achievement
- give the basis for teacher judgment about student achievement
- give students with the opportunity to develop self-evaluative expertise.

An analysis of the syllabus standards quickly reveals that the discrimination between each standard is based on quality, not quantity. (See highlighted standards on the QSA website — Home > Years 10-12 > Years 11-12 subjects > Sciences > Science21 (2010) > subject-specific advice.) For example, the B standard in the second element of Knowledge and conceptual understanding (KCU) requires comparison and explanation of interrelationships between scientific ideas, concepts, theories, processes and phenomena, whereas at the C standard students are required to demonstrate description. This means that B-standard evidence is different from (not just more than) C-standard evidence.

Instrument-specific criteria sheets provide students with powerful feedback. They preserve the relationship between syllabus standards and teacher judgment. Students can be taught to question criteria sheets in order to make informed judgments about their areas of weakness with respect to the dimensions of the syllabus. Teaching students this skill allows the formative potential of standards-based assessment to be more fully realised. The syllabus requires that criteria sheets be annotated to support teacher decisions about the quality of student work. The more specific and extensive this annotation is, the more useful it is to students.

Further information about using standards to make judgments can be found in the A-Z Senior moderation Home > Years 10-12 > Moderation & quality assurance > Authority subjects > Moderation handbook, procedures and forms (section 1.3) Using standards to make judgments about student achievement in Authority and Authority-registered subjects.
What are instrument-specific standards matrixes?

Science syllabuses require that each assessment instrument be accompanied by a criteria sheet specific to that instrument. These instrument-specific criteria sheets are usually presented as standards matrixes or tables, and are drawn from, and consistent with, syllabus exit standards descriptors.

The extent to which the syllabus standards are evident in an instrument-specific standards matrix will vary according to the dimensions assessed by the task and the stage of the course at which the assessment is started. Instrument-specific standards matrixes must be given to students before they undertake an assessment instrument and should:

- clearly specify each of the five standards (A–E)
- inform teaching and learning practice
- be annotated to show student achievement
- be consistent with the qualities of the standards statements in the relevant syllabus for the particular objective being assessed
- use the discriminating words of the syllabus standards statements
- give students:
  - specific information about what the instrument requires
  - clear, written descriptions of how to meet standards
  - the opportunity to develop self-evaluation skills
- give teachers clear statements that help when making judgments.
Writing instrument-specific descriptors

The flow-chart below describes one way of developing an instrument-specific standards matrix.

The key points to remember when developing the standards matrix are:
- do not change the qualitative descriptors of the standard
- retain the demonstrable qualities of the standards descriptors
- content descriptors can be changed to match the context of the task

Examples of instrument-specific standards descriptors are on the next page.
Example 1: Instrument-specific standards for Life in space SW (excerpt)

<table>
<thead>
<tr>
<th>Syllabus exit standard</th>
<th>A</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syllabus exit standard</strong></td>
<td>description and explanation of complex scientific information</td>
<td>Demonstrable quality statements of Qualitative difference Content</td>
</tr>
<tr>
<td><strong>Instrument-specific descriptor</strong></td>
<td>description and explanation of complex information about circular and elliptical motion</td>
<td>Unchanged Unchanged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>statements of isolated scientific facts</td>
</tr>
</tbody>
</table>

Sample 2: Instrument-specific standards for Energy alternatives ERT (excerpt)

<table>
<thead>
<tr>
<th>Syllabus exit standard</th>
<th>B</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syllabus exit standard</strong></td>
<td>analysis and interpretation of data and information using appropriate quantitative and qualitative techniques to identify trends and anomalies</td>
<td>Qualitative description partial analysis of data and information</td>
</tr>
<tr>
<td><strong>Instrument specific descriptor</strong></td>
<td>analysis and interpretation of energy conversion data using appropriate mathematical techniques to identify conversion efficiencies, potential supply, cost comparisons and other trends for alternative energy sources</td>
<td>Unchanged Unchanged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>partial analysis of energy conversion data</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrument-specific descriptor</th>
<th>B</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instrument-specific descriptor</strong></td>
<td>analysis and interpretation of energy conversion data using appropriate mathematical techniques to identify conversion efficiencies, potential supply, cost comparisons and other trends for alternative energy sources</td>
<td>Unchanged Unchanged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>partial analysis of energy conversion data</td>
</tr>
</tbody>
</table>

No opportunities to identify anomalies in this task