Introducing the Victorian Curriculum: Science 7-10

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Acknowledgment of Country

I would like to acknowledge the traditional custodians of the many lands across Victoria on which each of you are living, learning and working from today.

For myself and those of us in the Melbourne metropolitan area, we acknowledge the traditional custodians of the Kulin Nations.

When acknowledging country, we recognise Aboriginal and Torres Strait Islander peoples' spiritual and cultural connection to country and acknowledge their continued care of the lands and waterways over generations, while celebrating the continuation of a living culture that has a unique role in this region.

I would like to pay my respects to Elders past, present and emerging, for they hold the memories, traditions, culture and hopes of all Aboriginal and Torres Strait Islander peoples across the nation, and hope they will walk with us on our journey.

Objectives

- Provide an overview:
  - Victorian Curriculum 7-10: Science

- Enhance understanding:
  - Strands, sub-strands, content descriptions, achievement standards
  - Planning opportunities
  - Assessment
  - Resources available

Structure

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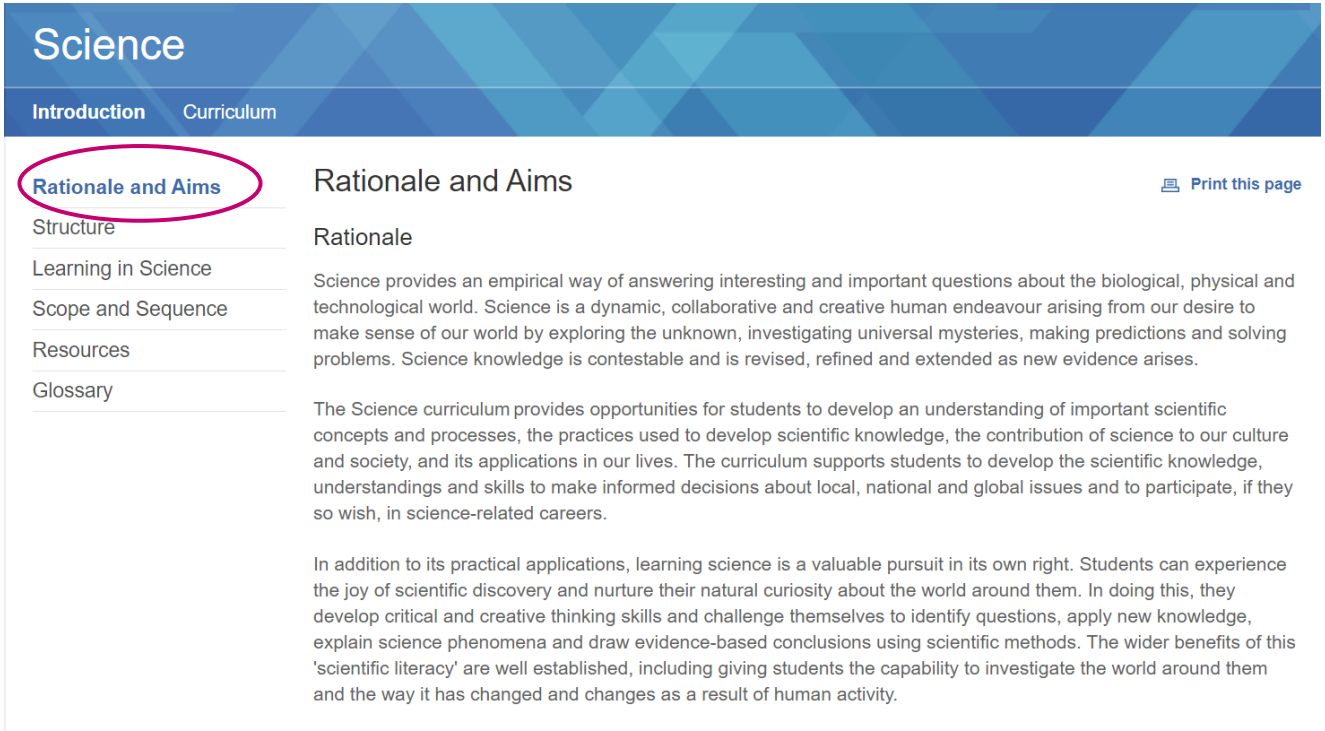
Victorian Curriculum F-10

Introduction	Curriculum
• Rationale and aims • Structure • Learning in Science • Scope and sequence • Resources • Glossary	The curriculum sets out the learning continuum and offers a range of viewing options. This is done by selecting a 'view mode' or a level/band within the curriculum area. It includes: • Level/band descriptions • Content descriptions organised by strands • Achievement standards

Victorian Curriculum vocabulary

Term	Definition
Achievement standards	Statements that describe what students typically are able to understand and do, and are the basis for reporting student achievement
Content descriptions	Specific and discrete information identifying what teachers are expected to teach and what students are expected to learn
Elaborations	Non-mandated, advisory examples that provide guidance on how the curriculum may be transformed into a classroom activity or learning opportunity
Level/Band description	Statements that provide an overview to the content descriptions and achievement standard within the Level or Band
Strands	Key organising elements within each curriculum area
Sub-strands	Supplementary organising elements within some curriculum areas

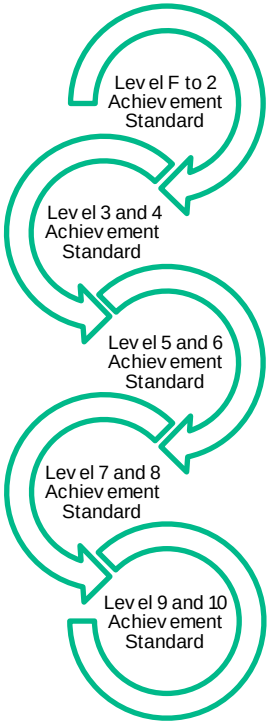
Victorian Curriculum F–10: Science

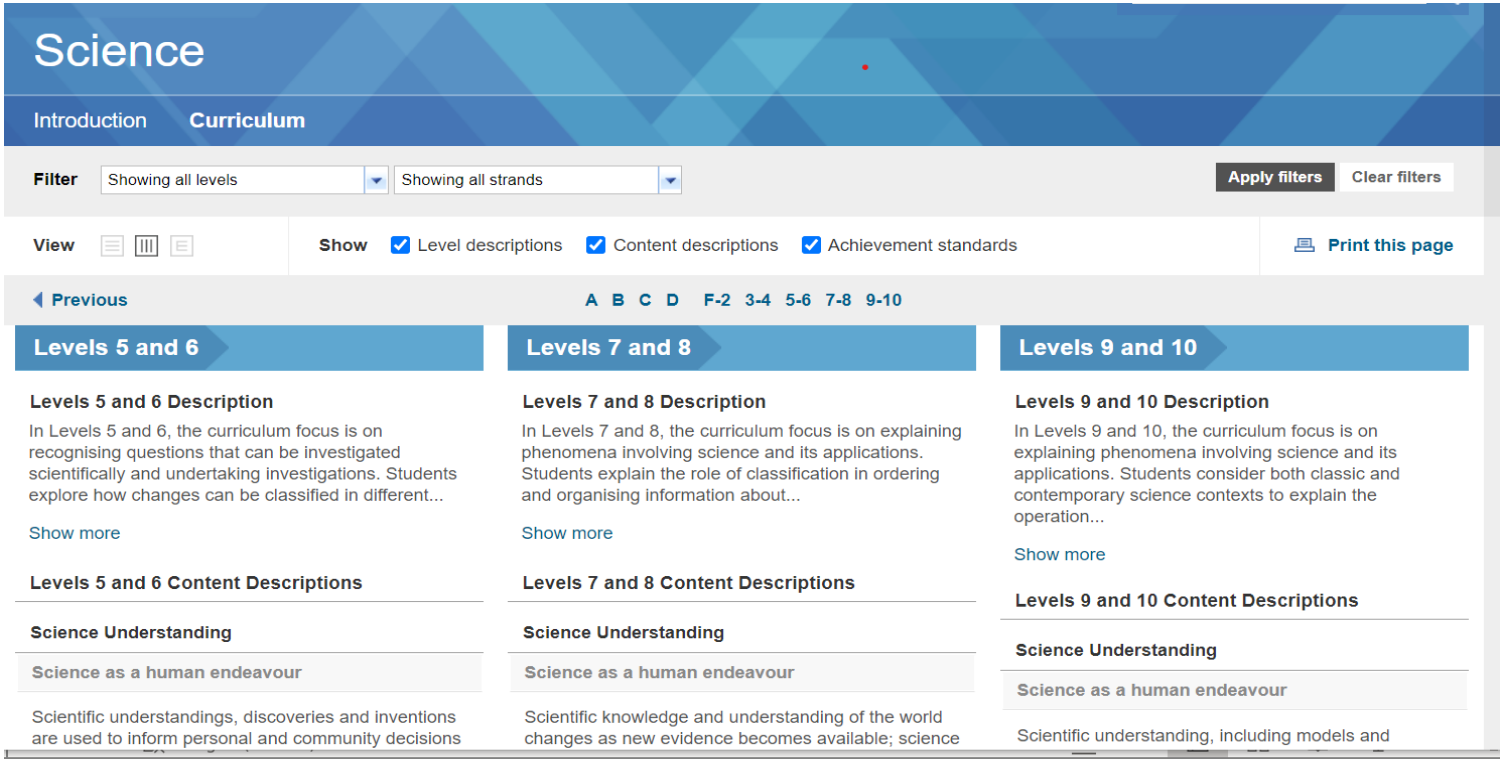


Victorian Curriculum F–10: Science

Strands	Science Understanding	Science Inquiry Skills
Sub-strands	Science as a Human Endeavour	Questioning and predicting
	Biological Sciences	Planning and conducting
	Chemical Sciences	Recording and processing
	Earth and Space Sciences	Analysing and processing
	Physical Sciences	Communicating

Curriculum Continuum F-10





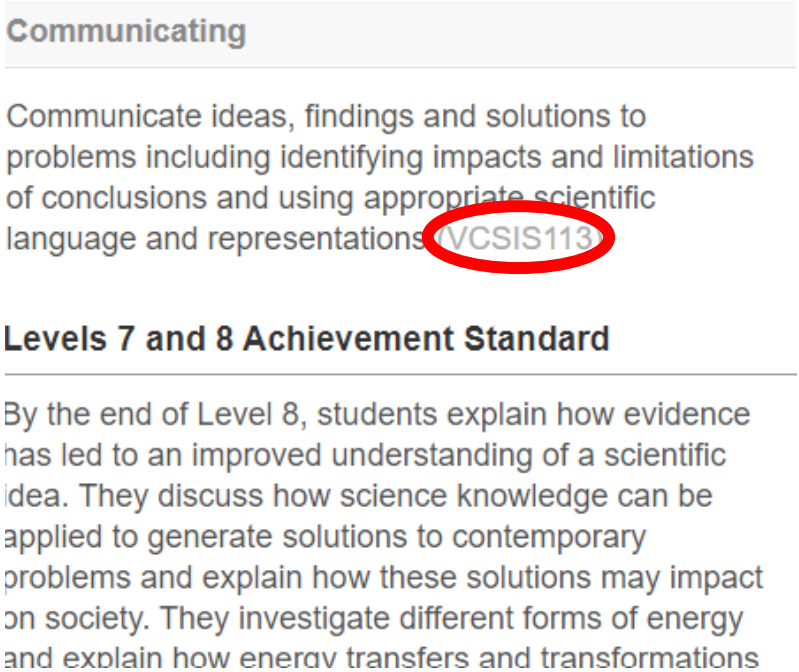
Victorian Curriculum F–10: Science

[Science - Curriculum - Victorian Curriculum (vcaa.vic.edu.au)]

Content descriptions

- Elaborations (not mandatory)

Achievement standard



Communicating

Communicate ideas, findings and solutions to problems including identifying impacts and limitations of conclusions and using appropriate scientific language and representations (VCSIS113)

Levels 7 and 8 Achievement Standard

By the end of Level 8, students explain how evidence has led to an improved understanding of a scientific idea. They discuss how science knowledge can be applied to generate solutions to contemporary problems and explain how these solutions may impact on society. They investigate different forms of energy and explain how energy transfers and transformations

Key concepts

The key concepts underpinning the ***F-10 Victorian Curriculum: Science*** are:

- Patterns, order and organisation
- Form and function
- Stability and change
- Scale and measurement
- Matter and energy
- Systems

Planning opportunities

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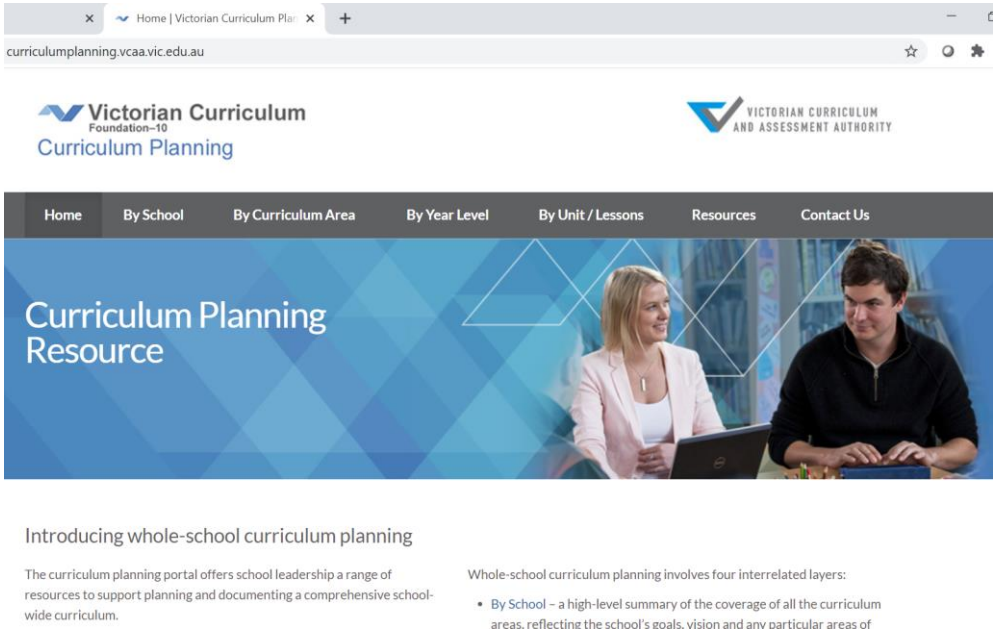
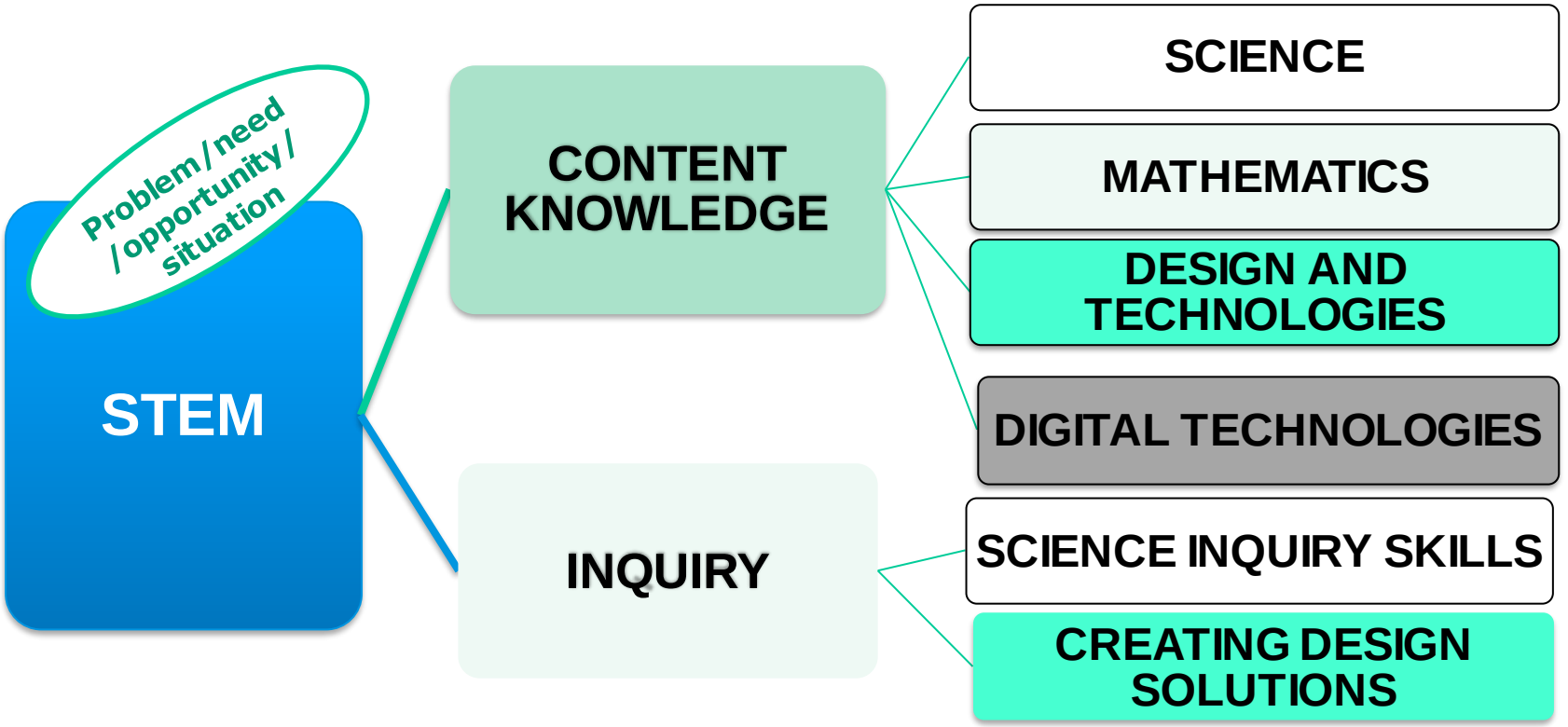
Victorian Curriculum Planning Resource



STEM in the Victorian Curriculum F–10

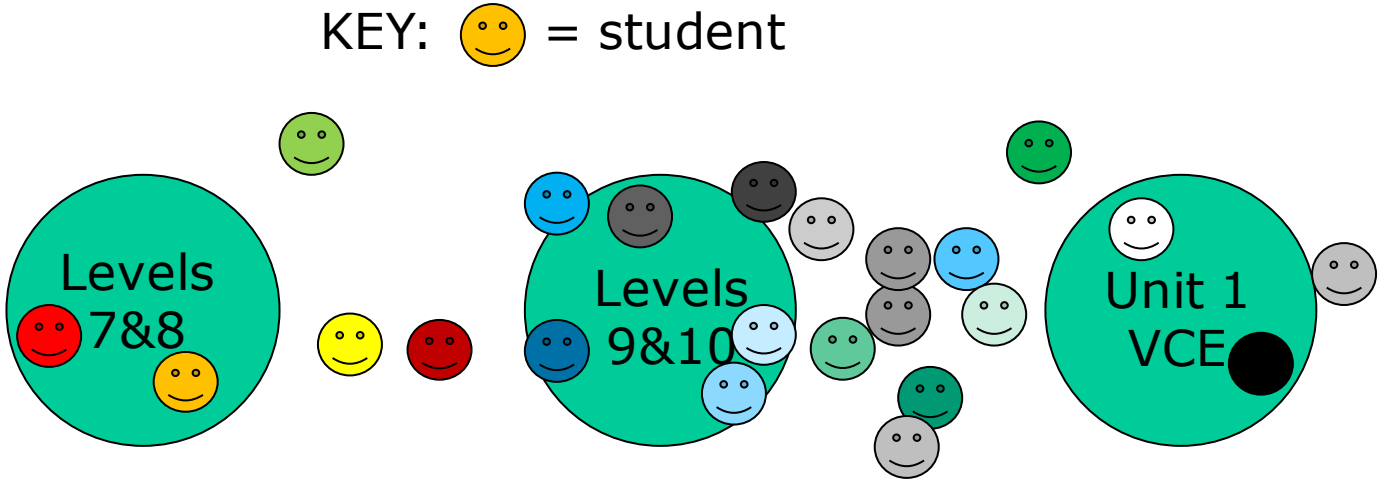


What do your students already know?

Where are your students on a 'learning continuum'?

How do I know where my class of 23 students are on a learning continuum for analysing trends/patterns/relationships in data?

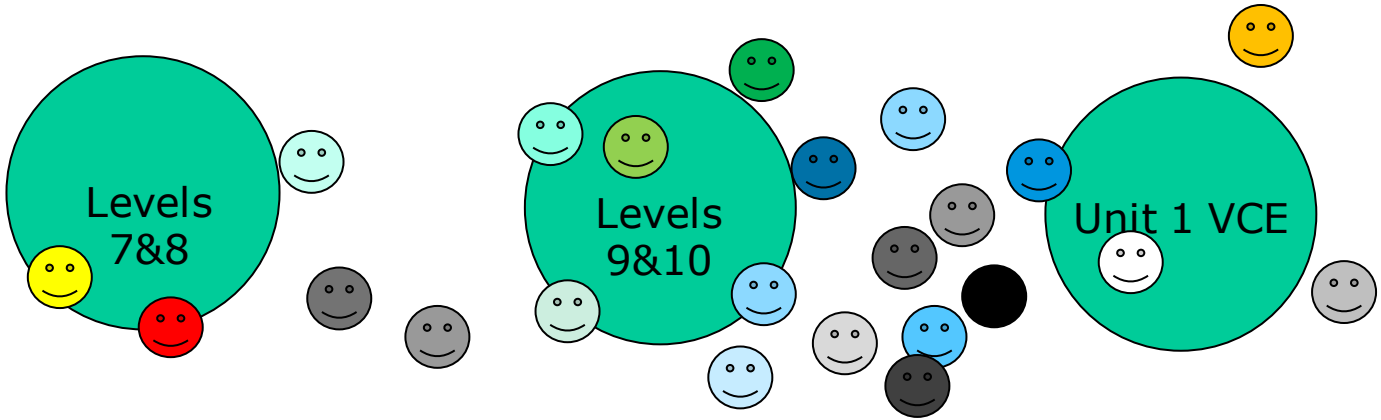
…and are they in the same place in the continuum for content other than analysing data trends/patterns/relationships?



Where are my class of 23 students on a learning continuum for communicating scientific ideas?

…and how will I make a summative judgment about their level of achievement?

KEY: = student



Note: reporting is a sectoral decision

What is the experiment?

Distance (mm)	Temperature (ºC)
0	120
50	78
100	55
130	42
145	40
255	20
365	17
480	10
510	9

Sketch a graph of results:
what are the common difficulties students demonstrate when sketching graphs?

Follow up activity:
Insert an outlier. What would you expect to see when students draw the graph?

Zone of proximal development

- **concept developed by Lev Vygotsky**
- **“the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers”** (Vygotsky, Mind in society: the development of higher psychological processes, 1978, p.86)
- **when a student is in the zone of proximal development for a particular task, providing the appropriate assistance will give the student enough of a ‘boost’ to achieve the task**

Supporting students to move through their zones of proximal development

Strategies include:

- Presence of someone with knowledge and skills beyond that of the learner
- Social interactions with a skilful educator, or peers, that allow the learner to observe and practise their skills
- Scaffolding, or supportive activities provided by an educator, or more competent peer, to support the student's learning

Continuum of Science Inquiry Skills F-10

Sub-strand: Analysing and evaluating

Levels	Content description
F-2	Compare observations and predictions with those of others
3-4	Compare results with predictions, suggesting possible reasons for findings
5-6	Compare data with predictions and use as evidence in developing explanations
7-8	Use scientific knowledge and findings from investigations to identify relationships, evaluate claims and draw conclusions
9-10	Analyse patterns and trends in data, including describing relationships between variables, identifying inconsistencies in data and sources of uncertainty, and drawing conclusions that are consistent with evidence

Progression of Science Inquiry Skills 7-10

Sub-strand: Analysing and evaluating

Level	Content description	Achievement standard
7-8	Use scientific knowledge and findings from investigations to identify relationships, evaluate claims and draw conclusions	Students summarise data from different sources and construct representations of their data to reveal and analyse patterns and relationships, and use these when justifying their conclusions
9-10	Analyse patterns and trends in data, including describing relationships between variables, identifying inconsistencies in data and sources of uncertainty, and drawing conclusions that are consistent with evidence	They analyse trends in data, explain relationships between variables and identify sources of uncertainty. When selecting evidence and developing and justifying conclusions, they account for inconsistencies in results and identify alternative explanations for findings …They construct evidence-based arguments

Assessment

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Assessment

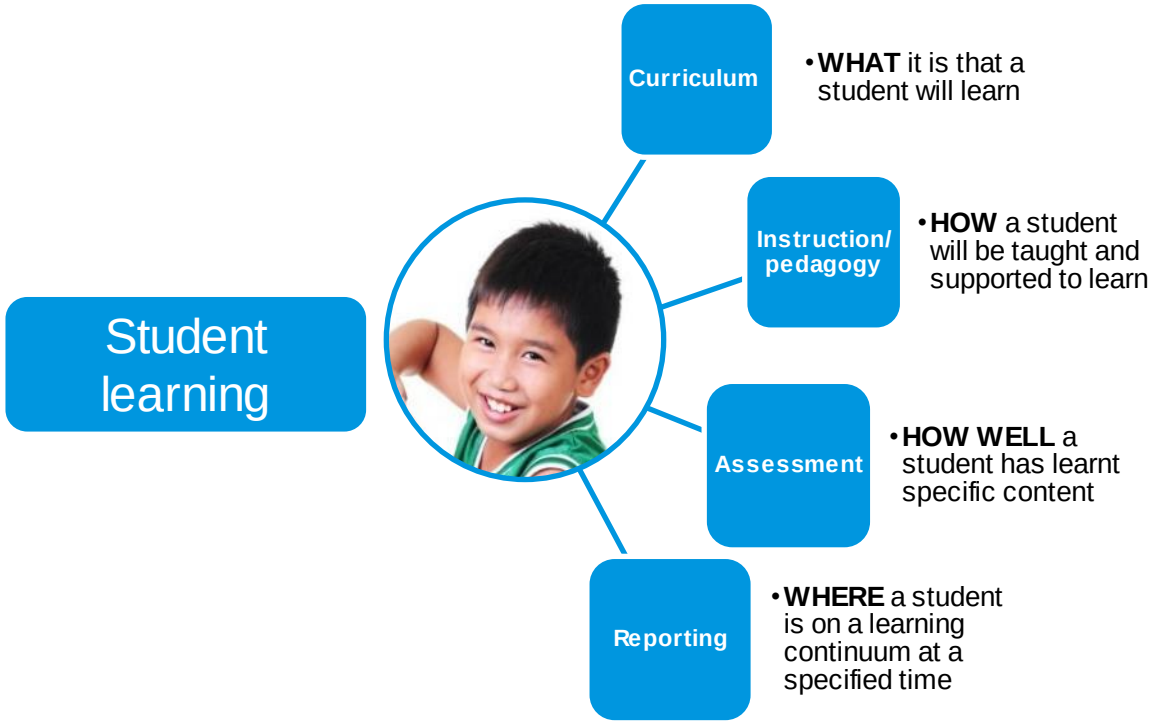
- Students are assessed against the achievement standards:
  - describe what students are typically able to understand and do, and are the basis for reporting student achievement

- Assessment is the measurement of how well a student has demonstrated the application of knowledge, skills and understandings set out in the achievement standards of a curriculum area.

Assessment

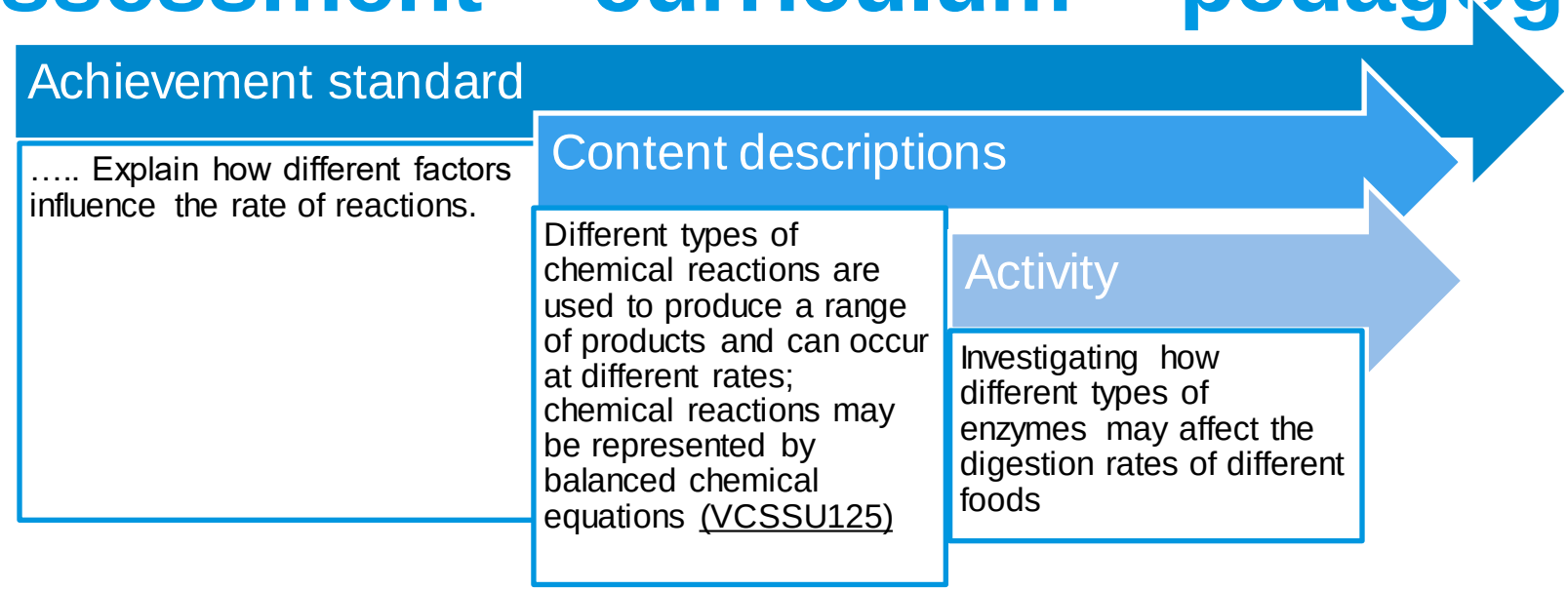
- is part of teaching and learning
- can improve student learning
- uses a range of methods
- aligns to curriculum outcomes and the teaching and learning
- is authentic (real world challenges)
- provides feedback to students

Assessment as part of the teaching and learning program



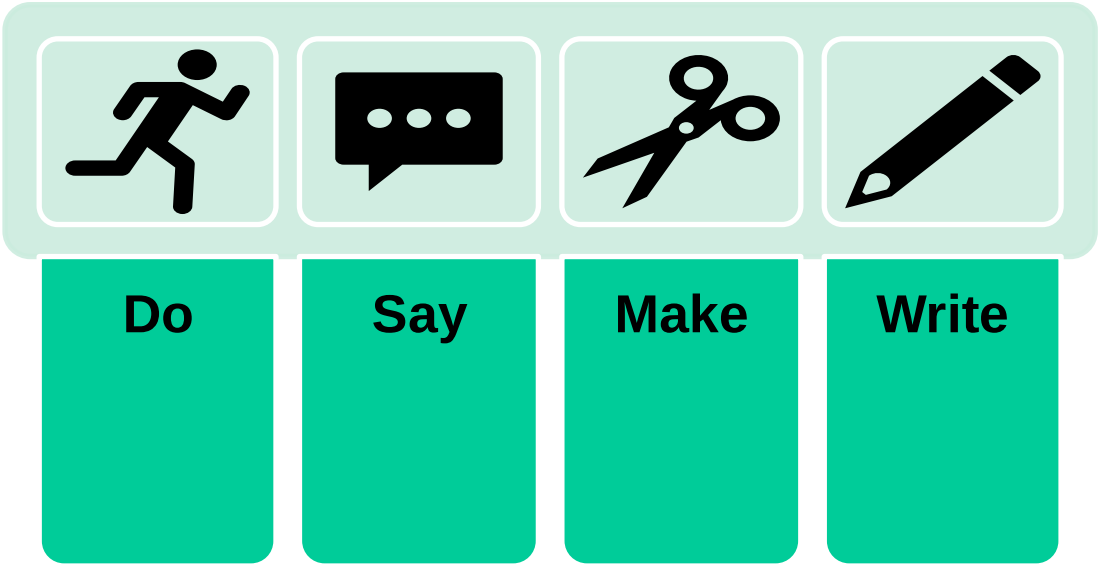
VCAA (2019), *Guide to Formative Assessment Rubrics*

Assessment – curriculum – pedagogy



Demonstrating achievement

- What can the student…

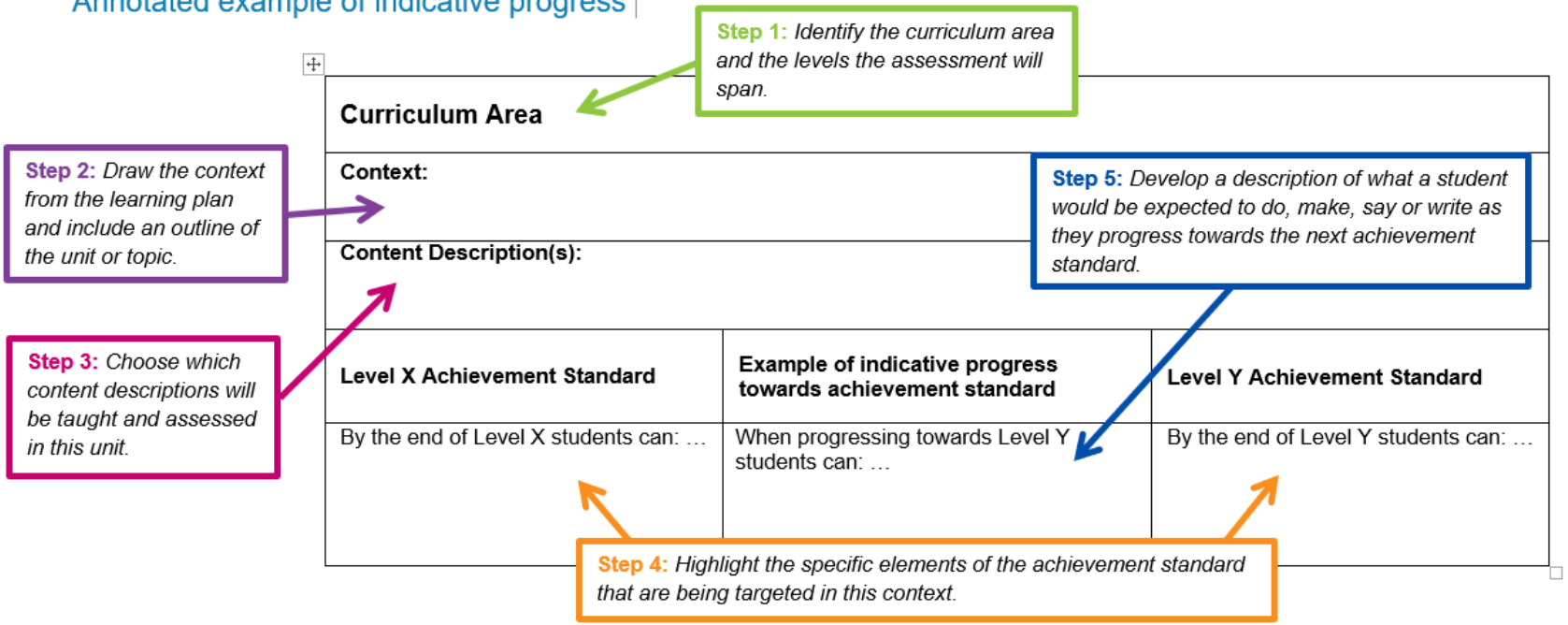


Indicative progress

- articulates what student progress looks like *between* achievement standards
- assess and report the student's learning progress *when they are only partially through teaching the level* and e the student is still working towards the level achievement standard.

Indicative progress template

Annotated example of indicative progress



Indicative progress 9 and 10 SU example

https://www.vcaa.vic.edu.au/curriculum/foundation-10/resources/science/help-me-assess/Pages/Indicative-progress.aspx

Science Level 8 Achievement Standard	Example of Indicative Progress toward Level 10 Achievement Standard	Science Level 10 Achievement Standard
predict, represent and analyse the effects of unbalanced forces, including Earth's gravity, on motion	• provide qualitative explanations of the relationship between distance and speed and distinguish between distance and displacement, and speed and velocity, but are not yet able to apply provided physics formulas to evaluate and explain their predictions related to speed	give both qualitative and quantitative explanations of the relationships between distance, speed, acceleration, mass and force to predict and explain motion

Indicative progress SIS example

https://www.vcaa.vic.edu.au/curriculum/foundation-10/resources/science/help-me-assess/Pages/Indicative-progress.aspx

Science Level 8 Achievement Standard	Example of Indicative Progress toward Level 10 Achievement Standard	Science Level 10 Achievement Standard
Students summarise data from different sources and construct representations of their data to reveal and analyse patterns and relationships, and use these when justifying their conclusions	• collate class data related to reaction times and identify discrepant or conflicting results, but are not yet able to offer plausible reasons for differences in data or to suggest alternative explanations of differing results • represent investigation findings in graphical form, but may not yet be able to distinguish between the representations of continuous and discrete variables in a graph	They analyse trends in data, explain relationships between variables and identify sources of uncertainty. When selecting evidence and developing and justifying conclusions, they account for inconsistencies in results and identify alternative explanations for findings.

How effective is your ‘separating machine’?

Context:

Students are provided with a mixture containing specific amounts of sand, salt, iron filings, polystyrene beads, water and oil. They work in pairs to design, test and evaluate a ‘separating machine’ prior to using it to separate the provided mixture. Their challenge is to separate and determine the quantities of each pure substance component within the provided mixture. Students may be encouraged to construct flowcharts to stage their thinking and planning and to annotate them as a record of the new knowledge acquired as they solve the problems that arise during the design and construction processes.

Stimulus questions may be used to prompt student inquiry: **What are the strengths and limitations of different separating techniques? Do all mixture components dissolve in water? What are the physical properties of each component of the mixture? In what order should the components of the mixture be separated? The teaching and learning plan focuses primarily on the application of an understanding of the chemical principles associated with separation techniques and critical and creative thinking strategies to design and construct a functioning ‘separating machine’.**

Completing the template…

By the end of Level 6…	Example of Indicative Progress toward Level 8 Achievement Standard	By the end of Level 8…
They compare the properties and behaviours of solids, liquids and gases	identify and describe different types of separating techniques (for example, filtration, sieving, evaporation, crystallisation, decanting, chromatography, magnetic separation, precipitation, distillation and centrifuging), but are not yet able to sequence multiple separations within a mixture to obtain pure substances	They describe and apply techniques to separate pure substances from mixtures

Resources

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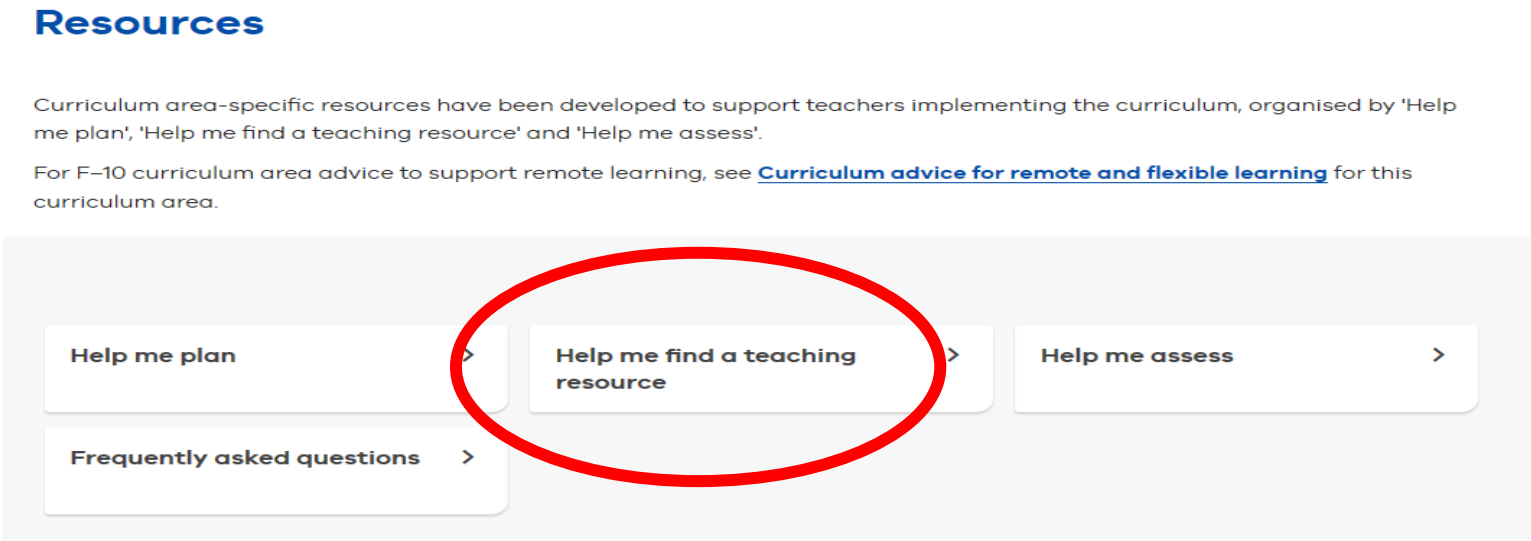
F-10 Sciences Resources

- **NEW 7-10 Science resources** will be available **from Term 3, 2021**

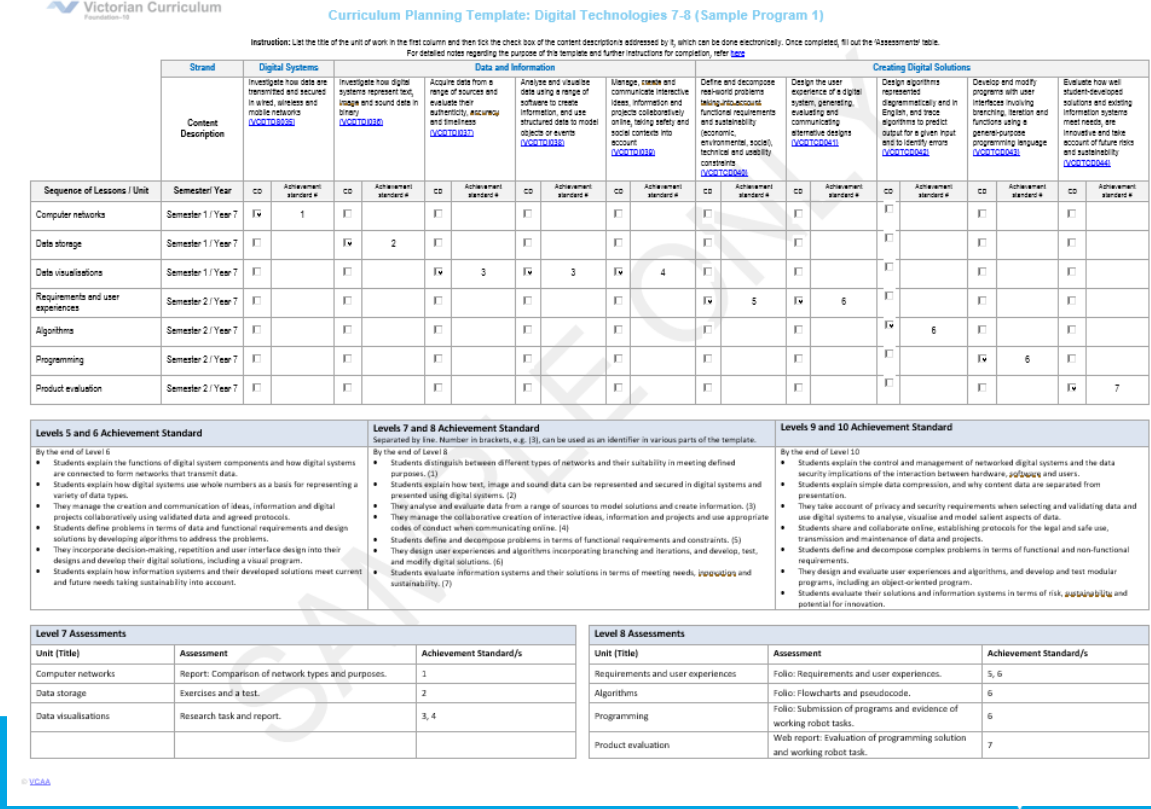


https://vcaa.vic.edu.au/curriculum/foundation-10/resources/science/Pages/default.aspx

https://www.vcaa.vic.edu.au/curriculum/foundation-10/resources/digital-technologies/Pages/Help-me-find-a-teaching-resource.aspx

Curriculum planning templates

- These resources demonstrate the coverage of the content descriptions in a number of units taught across a two-year planning cycle.
- Each unit is linked to extracts from the achievement standard and outlines assessment strategies.
- There are three samples for each band.



Victorian Curriculum

Curriculum Planning Template: Digital Technologies 7-8 (Sample Program 1)

Instruction: List the title of the unit of work in the first column and then tick the check box of the content description/s addressed by it, which can be done electronically. Once completed, fill out the 'Assessments' table.
For detailed notes regarding the purpose of this template and further instructions for completion, refer here

Strand	Digital Systems		Data and Information								Creating Digital Solutions									
Content Description	Investigate how data are transmitted and secured in wired, wireless and mobile networks (VCDTDI029)		Investigate how digital systems represent text, image and sound data in binary (VCDTDI030)		Acquire data from a range of sources and evaluate their authenticity, accuracy and timeliness (VCDTDI031)		Analyse and visualise data using a range of software to create information, and use structured data to model objects or events (VCDTDI032)		Manage, create and communicate interactive ideas, information and projects collaboratively online, taking safety and social contexts into account (VCDTDI033)		Define and decompose real-world problems taking into account functional requirements and sustainability (economic, environmental, social), technical and usability constraints (VCDTDI034)		Design the user experience of a digital system, generating, evaluating and communicating alternative designs (VCDTDI041)		Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (VCDTDI042)		Develop and modify programs with user interfaces involving branching, iteration and functions using a general-purpose programming language (VCDTDI043)		Evaluate how well student-developed solutions and existing information systems meet needs, are innovative and take account of future risks and sustainability (VCDTDI044)	
Sequence of Lessons / Unit	Semester/ Year	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #	CD	Achievement standard #
Computer networks	Semester 1 / Year 7	☑	1	☐		☐		☐		☐		☐		☐		☐		☐		☐	
Data storage	Semester 1 / Year 7	☐		☑	2	☐		☐		☐		☐		☐		☐		☐		☐	
Data visualisations	Semester 1 / Year 7	☐		☐		☑	3	☑	3	☑	4	☐		☐		☐		☐		☐	
Requirements and user experiences	Semester 2 / Year 7	☐		☐		☐		☐		☐		☑	5	☑	6	☐		☐		☐	
Algorithms	Semester 2 / Year 7	☐		☐		☐		☐		☐		☐		☐		☑	6	☐		☐	
Programming	Semester 2 / Year 7	☐		☐		☐		☐		☐		☐		☐		☐		☑	6	☐	
Product evaluation	Semester 2 / Year 7	☐		☐		☐		☐		☐		☐		☐		☐		☐		☑	7

Levels 5 and 6 Achievement Standard	Levels 7 and 8 Achievement Standard Separated by line. Number in brackets, e.g. (3), can be used as an identifier in various parts of the template.	Levels 9 and 10 Achievement Standard
By the end of Level 6 • Students explain the functions of digital system components and how digital systems are connected to form networks that transmit data. • Students explain how digital systems use whole numbers as a basis for representing a variety of data types. • They manage the creation and communication of ideas, information and digital projects collaboratively using validated data and agreed protocols. • Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. • They incorporate decision-making, repetition and user interface design into their designs and develop their digital solutions, including a visual program. • Students explain how information systems and their developed solutions meet current and future needs taking sustainability into account.	By the end of Level 8 • Students distinguish between different types of networks and their suitability in meeting defined purposes. (3) • Students explain how text, image and sound data can be represented and secured in digital systems and presented using digital systems. (2) • They analyse and evaluate data from a range of sources to model solutions and create information. (3) • They manage the collaborative creation of interactive ideas, information and projects and use appropriate codes of conduct when communicating online. (4) • Students define and decompose problems in terms of functional requirements and constraints. (5) • They design user experiences and algorithms incorporating branching and iterations, and develop, test, and modify digital solutions. (6) • Students evaluate information systems and their solutions in terms of meeting needs, opportunities and sustainability. (7)	By the end of Level 10 • Students explain the control and management of networked digital systems and the data security implications of the interaction between hardware, software and users. • Students explain simple data compression, and why content data are separated from presentation. • They take account of privacy and security requirements when selecting and validating data and use digital systems to analyse, visualise and model salient aspects of data. • Students share and collaborate online, establishing protocols for the legal and safe use, transmission and maintenance of data and projects. • Students define and decompose complex problems in terms of functional and non-functional requirements. • They design and evaluate user experiences and algorithms, and develop and test modular programs, including an object-oriented program. • Students evaluate their solutions and information systems in terms of risk, sustainability and potential for innovation.

Level 7 Assessments		
Unit (Title)	Assessment	Achievement Standard/s
Computer networks	Report: Comparison of network types and purposes.	1
Data storage	Exercises and a test.	2
Data visualisations	Research task and report.	3, 4

Level 8 Assessments		
Unit (Title)	Assessment	Achievement Standard/s
Requirements and user experiences	Folio: Requirements and user experiences.	5, 6
Algorithms	Folio: Flowcharts and pseudocode.	6
Programming	Folio: Submission of programs and evidence of working robot tasks.	6
Product evaluation	Web report: Evaluation of programming solution and working robot task.	7

Numeracy continuum: Science levels 7 and 8

https://www.vcaa.vic.edu.au/curriculum/foundation-10/crosscurriculumresources/Pages/Numeracy.aspx

Some examples…

Quantifying numbers

- **Students read, write and apply knowledge of place value of numbers including numbers beyond millions. They order large numbers when comparing features, resources and processes in Earth and space sciences so that predictions can be made and patterns investigated.**

Operating with percentages

- **Students recognise that 100% is a complete whole and use percentages to describe and compare relative size, composition and area. Students may use percentages in making comparisons, such as looking at the abundance of different elements in Earth's crust in investigating possible renewable resources.**

Numeracy continuum 9 and 10

https://www.vcaa.vic.edu.au/curriculum/foundation-10/crosscurriculumresources/Pages/Numeracy.aspx

Some examples:

Understanding units of measurement

- In Earth and space sciences, understanding units of measurement provides an important foundation for generating accurate measurements and for developing a sense of scale, particularly when dealing with very small and very large numbers, such as large distances in space, the small size of atoms and long time periods for geological processes. Students are able to measure, compare and estimate length, area, mass, volume and capacity, using and converting between different units of measurement. Students use the SI units of the kilogram (kg) to measure mass, the metre (m) to measure length and the second (s) to measure time. SI derived units, including millimetres (mm), centimetres (cm) and kilometres (km) to measure length, grams (g) to measure mass, millilitres (mL) to measure volume, and °C to measure temperature, may be more practical units for students to deal with in generating their own experimental data.

Career Education Framework and resources

https://www.vcaa.vic.edu.au/curriculum/CareerEducation/Pages/CareerEducationCurriculum.aspx

- 6 learning resources
- Shows how existing activities can be adapted to include a career focus

Levels 7 and 8

- Science Levels 7 and 8 - VCSSU093-VCSIS113-VCSSU090 (docx - 77.83kb)
- Science Levels 7 and 8 - VCSSU102 (docx - 80.76kb)
- Science Levels 7 and 8 - VCSSU095 (docx - 73.76kb)

Levels 9 and 10

- Science Levels 9 and 10 - VCSSU116-VCSSU128 (docx - 75.06kb)
- Science Levels 9 and 10 - VCSSU119-VCSSU115-VCSIS140 (docx - 74.38kb)
- Science Levels 9 and 10 - VCSSU125 (docx - 72.83kb)

Formative assessment resource

https://www.vcaa.vic.edu.au/assessment/f-10assessment/Pages/FormativeAssessment.aspx

- **Guide to Formative Assessment Rubrics**
- **Develop your own formative assessment rubrics:**
  - **plan**
  - **assess**
  - **review**
- **Put formative assessment rubrics into practice**

Bushfire Education Resource

https://www.vcaa.vic.edu.au/curriculum/foundation-10/crosscurriculumresources/Pages/Bushfire-education.aspx

Four units at Levels 7-10:

- **Learning about bushfires**
- **Preparing for bushfires**
- **Responding to bushfires**
- **Recovering from bushfires**

Making visible: Aboriginal perspectives

https://www.vcaa.vic.edu.au/news-and-events/professional-learning/F-10-program/Pages/AboriginalPerspectives.aspx

- Partnering with key stakeholders, the VCAA ran in 2020 a series of webinars related to Aboriginal perspectives in the Victorian Curriculum, including secondary STEM
- PowerPoints and recordings of webinars are available on the VCAA website, accessed through the past professional learning materials pages

Questions

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For further advice about the implementation of the F–10 curriculum in Victorian schools, including developments, resources and professional learning opportunities, please subscribe to the F–10 Curriculum Update:
https://www.vision6.com.au/em/forms/subscribe.php?db=399327&s=112201&a=18689&k=799b5d6