

(Note: Professional development outcomes have been defined using an additive model that assumes all outcomes outlined in previous phase)

Organiser	TEACHER DEVELOPMENT CONTINUUM →			
	Foundational	Proficient	Highly Accomplished	Lead
	Knowledge and understanding of content and processes of science			
Ways of working through scientific inquiry	<ul style="list-style-type: none"> • Explain the basic steps of a scientific inquiry • Identify and explain how to correctly use equipment to conduct basic investigations using the principles of a fair test • Identify and explain how to collect and manipulate data to show patterns and trends including using ICTs such as data logging and spreadsheets • Explain and model reflection to generate conclusions to investigations linked to the prediction/hypothesis • Identify and explain the principles of safety, including risk assessment • Explain how to communicate scientifically using an appropriate range of oral, written and multimodal formats • Explain the use of reflection strategies to reconstruct and develop understandings based on new knowledge and experiences. 	<ul style="list-style-type: none"> • Extend students' abilities to use skills and processes to design and conduct routine investigations using appropriate equipment and resources • Incorporate techniques, including the use of appropriate ICTs, to evaluate the validity of collected data and identify anomalies, • Identify, recognise and integrate new knowledge and procedures to refine practice • Explain how to reflect on and evaluate the adequacy of procedures and data • Reconstruct new understandings based on the findings of investigations. 	<ul style="list-style-type: none"> • Extend students' abilities to explain and apply the skills and processes to design and conduct challenging investigations • Explain patterns and trends in data and use these to draw justified conclusions based on this evidence • Explain ways of improving the investigation and/or options for continuing the investigation. • Explain options for applications of new knowledge • Know and apply the legal obligations and conditions for storing and using chemical and other issues involved in science practical work • Synthesise new science knowledge and procedures into curriculum materials • Reflect on investigations, analyse, represent and evaluate data to reconstruct new meanings based on logical and systematic judgements. 	<ul style="list-style-type: none"> • Develop collaborative teaching strategies to explain and model the skills and processes involved in designing and conducting a range of investigations for colleagues • Access science and education research and apply to current curriculum and initiatives • Access, analyse, review and share resources (including human resources e.g. scientists and ICTs), which inform/strengthen the working scientifically aspect of teaching science • Develop strategies to explain, model and lead risk assessment implementation • Develop understanding and support mechanisms to ensure legal obligations and procedures for the operation of school science meet legal obligations • Use a range of strategies to model the value and benefits of reflecting on teaching practices and engaging in professional development.

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	Knowledge and understanding of content and processes of science			
Science as a human endeavour	<ul style="list-style-type: none"> Recognise and describe how science has applications in everyday life Recognise and describe how science can contribute to the sustainability of natural and human environments Recognise and describe how scientific understanding contributes to decisions about real-world issues Recognise and describe how different cultures over time have contributed to scientific understanding Recognise and describe how science has contributed to human health and wellbeing at an individual and population level. 	<ul style="list-style-type: none"> Identify and use scientific understandings to explain everyday events and processes Describe and explain the science underpinning sustainability in natural and human environments including the use of natural resources and climate change Link the study of Science as a human endeavour concepts with careers Apply scientific understandings and processes when making decisions about real-world situations Maintain currency of knowledge by identifying and incorporating new knowledge into the curriculum as it is published Recognise, describe and link the contribution of different cultures over time to scientific understanding and provide relevant examples. 	<ul style="list-style-type: none"> Apply scientific understanding to engage in a future-oriented way with relevant local, national and global issues Explain the moral, ethical and social implications of science and its practices Explain how science has advanced through, and is open to, the contributions of many people from different cultures at different times in history Explain the contributions scientists have made to society Access, critically analyse and incorporate new knowledge and procedures into curriculum materials. 	<ul style="list-style-type: none"> Represent science as an integral part of society and everyday life Evaluate and promote discussion on contemporary moral, social and ethical issues related to science and science education Describe and explain that scientific research often leads to technological advances that can have positive and/or negative impacts upon society and the environment Develop strategies to model how to be discerning and sceptical about new knowledge and discoveries Share new knowledge and understandings of science concepts.

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	Knowledge and understanding of content and processes of science			
Earth and beyond	<ul style="list-style-type: none"> • Identify and describe the scientific implications of natural systems and resources for people and their quality of life • Recognise and describe the basic concepts and terminology that underpin the Earth and beyond organiser, namely: <ul style="list-style-type: none"> – Weather and climate – Water cycle – Structure of the Earth and its atmosphere – Natural resources – Solar system, stars and galaxies – Space travel and exploration • Know and use basic equipment to model, simulate or investigate Earth and beyond concepts • Apply ICT techniques to model, simulate or investigate Earth and beyond concepts • Apply contemporary research to inform teaching practice of Earth and beyond. 	<ul style="list-style-type: none"> • Explain the basic concepts of geology, meteorology and astronomy that are central to teaching the Earth and beyond concepts • Link the study of Earth and beyond concepts with relevant careers in science • Know a wide range of practical strategies, including the use of ICTs, to model, simulate or investigate Earth and beyond concepts • Know and use appropriate and specific equipment including telescopes, barometers, rain gauges and a range of computer software, which simulate and investigate Earth and beyond concepts. 	<ul style="list-style-type: none"> • Explain the natural processes of Earth as interconnected systems • Recognise, describe, explain and apply complex concepts and terminology that underpin the Earth and beyond concepts • Access, use and incorporate new knowledge and understandings of Earth and beyond concepts into the curriculum • Know and use equipment, ICTs and apply procedures to model, simulate or investigate Earth and beyond concepts in challenging situations • Know and effectively use specific equipment including telescopes, barometers, rain gauges and a wide range of computer software, which simulates Earth and beyond concepts. 	<ul style="list-style-type: none"> • Apply in-depth knowledge of the central concepts as well as the experimental and theoretical knowledge in geology, meteorology and astronomy that underpin the Earth and beyond concepts • Recognise and describe links between the study of Earth and beyond concepts at primary school and secondary school level, and to the real world, including work • Access and use science and education research, which enhances the knowledge and understanding of the teaching of the Earth and beyond concepts • Develop strategies to model how to be discerning and sceptical about new knowledge and discoveries • Develop strategies to share new knowledge and understandings of Earth and beyond concepts.

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	Knowledge and understanding of content and processes of science			
Energy and change	<ul style="list-style-type: none"> Identify and describe the relevance of knowledge about Energy and change for people and their quality of life Recognise and describe the basic concepts and terminology that underpin the Energy and change organiser, namely: <ul style="list-style-type: none"> Energy Forces Motion Gravity Electricity and magnetism Waves Know and use basic equipment to model, simulate or investigate Energy and change concepts Apply ICT techniques to model, simulate or investigate Energy and change concepts Apply contemporary research to inform teaching practice of Energy and change. 	<ul style="list-style-type: none"> Explain the basic concepts of physics that are central to teaching the Energy and change concepts Link the study of Energy and change concepts with relevant careers in science Know a wide range of strategies, including ICTs and the use of equipment to model, simulate or investigate Energy and change concepts Know and use appropriate and specific equipment including force meters, components of simple electric circuits and pendulums and a range of computer software, which simulate and investigate Energy and change concepts. 	<ul style="list-style-type: none"> Apply in-depth knowledge of the central concepts of physics that underpin the Energy and change organiser Recognise, describe, explain and apply complex concepts and terminology that underpin the Energy and change organiser Access, use and incorporate new knowledge and understandings of Energy and change concepts into the curriculum Know and use strategies, ICTs and procedures to model, simulate or investigate Energy and change concepts in challenging situations Know and effectively use specific equipment including force meters, components of simple electric circuits and pendulums and a wide range of computer software, which simulates Energy and change concepts. 	<ul style="list-style-type: none"> Apply in-depth knowledge of the central concepts as well as the experimental and theoretical knowledge in physics that underpin the Energy and change organiser Recognise and describe links between the study of Energy and change concepts at primary school and secondary school level and to the real world, including work Access and use science and education research, which enhances the knowledge and understanding of the teaching of the Energy and change concepts Develop strategies to model how to be discerning and sceptical about new knowledge and discoveries Develop strategies to share new knowledge and understandings of Energy and change concepts.

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	Knowledge and understanding of content and processes of science			
Life and living	<ul style="list-style-type: none"> Identify and describe the importance to life of interdependence, function, systems and change Recognise the basic concepts and terminology that underpin the Life and living organiser, namely: <ul style="list-style-type: none"> Cells Structure and physiology Reproduction Natural selection Ecosystems Human impact Know and use basic equipment to model, simulate or investigate Life and living concepts Apply ICT techniques to model, simulate or investigate Life and living concepts Apply contemporary research to inform teaching practice of Life and living. 	<ul style="list-style-type: none"> Explain the basic ideas of biological science that are central to teaching the Life and living organiser Link the study of Life and living concepts with relevant careers in science Know a wide range of strategies and procedures to use basic equipment and ICTs to model, simulate or investigate Life and living concepts Know and use appropriate and specific equipment including microscopes, magnifying glasses, classification keys and a range of computer software, which simulate and investigate Life and living organiser concepts. 	<ul style="list-style-type: none"> Apply in-depth knowledge of the central ideas in biological science that underpin the Life and living organiser Recognise, describe, explain and apply basic and some more complex concepts and terminology that underpin the Life and living organiser Access, use and incorporate new knowledge and understandings of Life and living concepts into the curriculum Know and use equipment, ICTs and apply procedures to model, simulate or investigate Life and living concepts in challenging situations Know and effectively use specific equipment including microscopes, biological sensors and a wide range of computer software, which simulates Life and living organiser concepts. 	<ul style="list-style-type: none"> Apply in-depth knowledge of the central ideas as well as the experimental and theoretical knowledge in biological science that underpin the Life and living organiser Recognise and describe links between the study of Life and living concepts at primary school and secondary school level and to the real world, including work Access and use science and education research, which enhances the knowledge and understanding of the teaching of the Life and living concepts Develop strategies to model how to be discerning and sceptical about new knowledge and discoveries Develop strategies to share new knowledge and understandings of Life and living concepts.

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	Knowledge and understanding of content and processes of science			
Natural and processed materials	<ul style="list-style-type: none"> Identify and describe the relevance of knowledge of materials and their properties Recognise the basic concepts and terminology that underpin the Natural and processed materials organiser, namely: <ul style="list-style-type: none"> Particles States of matter Materials and their uses Changes Know and use basic equipment to model, simulate or investigate Natural and processed materials concepts Apply ICT techniques to model, simulate or investigate Natural and processed materials concepts Apply contemporary research to inform teaching practice of Natural and processed materials. 	<ul style="list-style-type: none"> Explain the basic ideas of chemistry that are central to teaching the Natural and processed materials organiser Link the study of Natural and processed materials concepts with relevant careers in science Know a range of strategies and procedures to use basic equipment and ICTs to model, simulate or investigate Natural and processed materials concepts Know and use appropriate and specific equipment including, thermometers, pH meters, measuring cylinders and range of computer software, which simulates and investigates Natural and processed materials concepts. 	<ul style="list-style-type: none"> Apply in-depth knowledge of the central ideas in chemistry that underpin the Natural and processed materials organiser Recognise, describe, explain and apply basic and some more complex concepts and terminology that underpin the Natural and processed materials organiser Access, use and incorporate new knowledge and understandings of Natural and Processed Materials concepts into the curriculum Know and use equipment, ICTs and apply procedures to model, simulate or investigate Natural and processed materials concepts in challenging situations Know and effectively use specific equipment including pH meters, measuring cylinders equipment and a wide range of computer software, which simulates Natural and processed materials concepts. 	<ul style="list-style-type: none"> Apply in-depth knowledge of the central ideas as well as the experimental and theoretical knowledge in chemistry that underpin the Natural and processed materials concepts Recognise and describe links between the study of Natural and processed materials concepts at primary school and secondary school level and to the real world, including work Access and use science and education research, which enhances the knowledge and understanding of the teaching of the Natural and processed materials Develop strategies to model how to be discerning and sceptical about new knowledge and discoveries Develop strategies to share new knowledge and understandings of Natural and processed materials concepts.

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Foundational	Proficient	Highly Accomplished	Lead
Pedagogical content knowledge — science			
<ul style="list-style-type: none"> Understand and describe the sequences of learning required to develop conceptual understandings for the identified curriculum and assessment Plan and implement learning experiences in contexts, which engage students and provide opportunities for hands-on engagement/investigations and fieldwork Understand and use a range of teaching strategies to develop science understanding and supports students to learn independently and collaboratively Identify and access resources, including ICTs to provide relevant and appropriate learning experiences Conduct risk assessment and implement procedures to ensure lessons are conducted safely Identify and incorporate the literacy numeracy and ICT skills, which underpin the development of science understanding Recognise links for knowledge and conceptual understanding within science disciplines and with other key learning areas Know and apply a range of strategies for developing meta-cognitive behaviours in learners. 	<ul style="list-style-type: none"> Understand, explain and use the sequences of learning required to develop conceptual understandings for the identified curriculum and assessment Conduct risk assessment and ensure lessons are conducted safely. Ensure chemicals /materials are used and stored according to Material Safety Data Sheets (MSDS) Identify and access a wide range of resources and ICTs to provide relevant and appropriate learning experiences Link knowledge and conceptual understanding within science organisers and with other key learning areas. 	<ul style="list-style-type: none"> Use the knowledge of the sequences of learning to plan and effectively implement learning experiences, which clearly align to the required curriculum and assessment for the year level Use knowledge of the learners to effectively implement learning experiences, which cater for and inspire all learners Implement science learning experiences in relevant contexts, which engage students, relate to everyday life experiences and provide opportunities for authentic hands-on engagement/ investigations Identify and access a wide range of resources and ICTs to provide relevant and appropriate learning experiences. Experiment with new ideas/ technologies and regularly implement these into lessons. 	<ul style="list-style-type: none"> Develop strategies to model effective planning and implementation of learning experiences in science at class, year and whole-school levels Develop strategies to model how to conduct risk assessment Identify and access a wide range of resources to provide relevant and appropriate learning experiences across the school Develop strategies to model, identify and explicitly teach the literacy, numeracy and ICT skills, which underpin the development of science understandings Make authentic links to show the relevance of school science to the real world Share new knowledge and understanding of science concepts. Ensure teaching and whole-school curriculum documents are updated to reflect changes Develop strategies to model reflection and incorporate these into teaching practices Access and communicate relevant professional development opportunities to staff.

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Assessment professional development learning outcomes			
<ul style="list-style-type: none"> Understand and describe the nature, purposes, and principles of assessment Assess learners' current understandings, misconceptions and levels of attainment of relevant learning outcomes and use this information as the starting point for teaching Know and apply a range of diagnostic assessment strategies to determine students' understanding Know and apply a range of strategies to continuously monitor and assess learner progress against specified learning standards Maintain student assessment data Provide basic feedback to learners and their families based on assessment evidence Collect and use assessment data to inform the teaching and learning cycle at the individual and class level Understand and participate in assessment moderation processes Prepare students for national/state testing programs. 	<ul style="list-style-type: none"> Use a range of strategies to identify, assess and monitor student progress in science including addressing alternative conceptions and/or misconceptions Describe and select appropriate types of assessment, which clearly align to the curriculum intent Consistently assess learners progress against specified learning standards Accurately maintain and organise student assessment data Provide detailed feedback to learners and their families based on assessment evidence Collect, analyse and use assessment data to inform the teaching and learning cycle at the individual and class level Evaluate appropriate and relevant assessment resources. 	<ul style="list-style-type: none"> Explain and select appropriate forms of assessment, which clearly align to the curriculum intent and generate meaningful reliable evidence Provide a wide range of opportunities for students to show what they know and can do with respect to the required curriculum and relevant life experiences Collect and analyse student assessment data at individual, class and year level Accurately and consistently assess learners progress against specified learning standards Provide extensive feedback to learners and their families on learner performance Develop expertise in assessment moderation processes Analyse outcomes of national testing programs and apply to science program planning Implement class/year level participation in state and national testing programs and explain how the outcomes are used to inform planning Advise on the selection, management and use of assessment resources at the relevant year level. 	<ul style="list-style-type: none"> Develop strategies to model and explain appropriate types of assessment clearly aligned to the curriculum intent and generate meaningful and reliable evidence Mentor colleagues to increase the range and effectiveness of assessment strategies Lead systemic evaluation of science programs Collect and monitor trends in student performance at individual, class, year and whole-school level Collect, analyse and use assessment data to inform science curriculum planning at year and whole-school level Advise on the selection and use of commercial assessment materials at year and whole-school level Contribute to the development of whole-school assessment policy and procedures Facilitate the implementation of assessment moderation processes for science Evaluate outcomes of state and national testing programs and apply to whole-school science program planning.

Curriculum Frameworks and reference and advisory documents

Knowledge and understanding of content area
<p>Queensland Studies Authority (QSA) http://www.qsa.qld.edu.au/learning.html</p> <ul style="list-style-type: none"> • Early Years Curriculum Guidelines • Year 1 Learning Statements • Years 3, 5, 7, 9 Essential Learnings (Science) • Implementing the Essential Learnings and Standards • Planning - Using the Essential Learnings and Standards • Year 10 Guidelines (Science) • P— 9 Literacy and Numeracy Indicators <p>Australian Curriculum Assessment and Reporting Framework (ACARA) http://www.acara.edu.au/publications.html</p> <ul style="list-style-type: none"> • Shape of the Australian Curriculum: Science (May 2009) • Framing Paper Consultation Report: The Science (May 2009)
Pedagogical content knowledge
<p>Queensland Studies Authority (QSA) http://www.qsa.qld.edu.au/learning.html</p> <ul style="list-style-type: none"> • Early Years Curriculum Guidelines • Year 1 Learning Statements • Years 3, 5, 7, 9 Essential Learnings (Science) • Implementing the Essential Learnings and Standards • Planning - Using the Essential Learnings and Standards • Year 10 Guidelines (Science) • P—9 Literacy and Numeracy Indicators <p>Australian Curriculum Assessment and Reporting Framework (ACARA) http://www.acara.edu.au/publications.html</p> <ul style="list-style-type: none"> • Shape of the Australian Curriculum: Science (May 2009) • Framing Paper Consultation Report: The Sciences (May 2009)