Suggested teaching program

**Chapter 1: Science Toolkit**

Time allocation: 5 weeks

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| **Context and overview** |
| In year 7, students explore the nature of science, investigating the work of scientists and the various forms of inquiry. Students make accurate measurements and control variables to analyse relationships between system components and explore and explain these relationships through increasingly complex representations. |
| **Syllabus outcomes addressed** |
| • Scientific knowledge has changed peoples’ understanding of the world and is refined as new evidence becomes available ACSHE119  • Science knowledge can develop through collaboration across the disciplines of science and the contributions of people from a range of cultures ACSHE223  • Solutions to contemporary issues that are found using science and technology, may impact on other areas of society and may involve ethical considerations ACSHE120  • People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity ACSHE121  • Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge ACSIS124  • Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed ACSIS125  • Measure and control variables, select equipment appropriate to the task and collect data with accuracy ACSIS126  • Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate ACSIS129  • Summarise data, from students’ own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence ACSIS130  • Reflect on scientific investigations including evaluating the quality of the data collected, and identifying improvements ACSIS131  • Use scientific knowledge and findings from investigations to evaluate claims based on evidence ACSIS132  • Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate ACSIS133 |
| **Achievement standards** |
| Students describe situations where scientific knowledge from different science disciplines has been used to solve a real–world problem. They explain how the solution was viewed by, and impacted on, different groups in society. Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations. |

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| **Student book section** | **WA Syllabus links** | **Suggested indicators of learning and understanding** | **Suggested teaching and learning activities** | **Resources** |
| **1.1 Science is the study of the natural and physical world**  **(pages 2–3)** | *Science as a Human Endeavour*  ACSHE119  ACSHE223  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:   * understand the nature of science * explain what constitutes a scientist * suggest scientific questions to explore * describe where and how scientific investigations can occur. | **Questioning our world**  Before commencing the unit, conduct a class discussion about the big questions they might have about their world. Ask students to consider the big questions ancient civilisations might have asked in order to live with adequate food, shelter and water. Ask students to consider what questions might be essential to investigate and which might simply be interesting to investigate.  As an extension, students could explore the issue of government funding for some scientific investigations but not all. They could also consider which groups within our society might have different priorities. | **Oxford Science 7 WA resources**  – Check your learning page 3  – Challenge 1.1 page 170 |
| **Additional resources**  BBC Science, a fantastic resource framed by questions <http://www.bbc.co.uk/science>  Videos to answer some common questions in science <http://science.howstuffworks.com>  Australian Government priorities in Science (some advanced language)  <http://www.science.gov.au/scienceGov/ScienceAndResearchPriorities/Pages/default.aspx> |
| **1.2 Scientists use specialised equipment**  **(pages 4–5)** | *Science Inquiry Skills*  ACSIS133 | By the end of this unit, students should be able to:   * explain how an experiment is different to other types of investigations * describe a variety of different pieces of specialised science equipment. | **The right ingredients**  Ask students to consider the photos of scientific equipment pictured in Figure 1.9. Are they made of certain types of materials more than others? Are there reasons why these materials might be used? Why might it be important to have the same types of equipment being used across the world? In what other industries do the equipment and the materials from which they’re made matter? | **Oxford Science 7 WA resources**   * Check your learning page 5 * Skills lab 1.2 page 171 |
| **Additional resources**  Company that supplies scientific equipment as an interesting site for students to investigate  <http://www.westlab.com.au/index.php> |

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| **1.3 Scientists take safety precautions**  **(pages 6–7)** | *Science as a Human Endeavour*  ACSHE121  *Science Inquiry Skills*  ACSIS130 | By the end of this unit, students should be able to:   * describe safe practices within the laboratory * describe safety equipment and attire * describe the safety risks unique to different types of scientists * identify common safety symbols. | **Symbols**  Ask the students to consider why words are not often used in safety symbols. If they have ever travelled to a country where English was not the dominant language, did they encounter difficulties finding their way around or remaining safe? Did symbols help? Were the symbols universally used?  As an extension, students could investigate who is liable when an accident occurs because a symbol was either not understood or ignored. As a starting point they could consider the case of the Australian who chose to swim in the Mary River in the Northern Territory where there was clearly a sign indicating the presence of crocodiles. | **Oxford Science 7 WA resources**  – Check your learning page 7 |
| **Additional resources**  ABC report on Australian taken by crocodile <http://www.abc.net.au/news/2013-08-26/police-find-body-of-darwin-man-taken-by-croc/4911268> |
| **1.4 Scientists use observation and inference to answer questions**  **(pages 8–9)** | *Science as a Human Endeavour*  ACSHE121  *Science Inquiry Skills*  ACSIS129  ACSIS130  ACSIS131  ACSIS133 | By the end of this unit, students should be able to:   * define observation and inference as scientific terms * explain the difference between qualitative and quantitative data. | **Getting creative**  Have students refer back to the pictures in figure 1.18 on page 8. Ask them to make statements referring to the pictures that demonstrate their understanding of the terms qualitative and quantitative, as well as observation and inference. A couple of examples could be given before students first write their own examples in their books then share them with the class. Examples may include:  Observation – 3 of the 5 cows in each picture are definitely female  Inference – all of the cows are likely to be female  Qualitative – there are cows in the pictures  Quantitative – there are 5 cows in each picture  Students could then be challenged to draw their own set of pictures that contain similarities and differences to be spotted. | **Oxford Science 7 WA resources**  – Check your learning page 9  – Skills Lab 1.4 page 172 |
| **1.5 Science relies on measuring with accuracy**  **(pages 10–13)** | *Science as a Human Endeavour*  ACSHE119  ACSHE223  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:   * describe how units of measurement have changed over time * list a range of units of measurement from the metric system and the symbols used to communicate them * describe some common instruments that are used to measure accurately * understand and explain how to accurately measure data using a variety of different pieces of equipment. | **Learning by doing**  Unit 1.5 could be taught by students actively measuring different amounts using a range of different tools and equipment. Challenge students to measure a certain number of amounts, carefully selecting the tools and equipment they require. They should be required to justify their choices and evaluate the successes and otherwise that they encounter.  **Shape matters**  Provide students with a range of measuring vessels of different shapes and sizes and let them explore how different the same amount of water can look in different containers. Ask students to suggest reasons for choosing certain shapes and sizes when communicating something about the substance it contains. For example, when selling a substance you might want it to look plentiful. | **Oxford Science 7 WA resources**  – Check your learning page 13  – What if? page 10  – Skills Lab 1.5 page 172 |
| **Additional resources**  Short video of examples of confusion caused by different systems of measurement <http://splash.abc.net.au/home#!/media/1566108/monumental-measurement-mess-ups>  National Measurement Institute website. Includes a unit conversion applet.  <http://www.measurement.gov.au/Pages/default.aspx> |
| **1.6 A Bunsen burner is an essential piece of laboratory equipment**  **(pages 14–15)** | *Science Inquiry Skills*  ACSIS125  ACSIS130 | By the end of this unit, students should be able to:   * use a Bunsen burner safely and accurately * explain the difference between the two flames that can be created by the Bunsen burner. | **Certified user**  Students often enjoy receiving a certificate or licence to demonstrate that they are capable of using a Bunsen burner correctly. This could be demonstrated through formal or informal circumstances in the laboratory. | **Oxford Science 7 WA resources**  – Check your learning page 15  – Skills Lab 1.6A page 15  – Skills Lab 1.6B page 15 |

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| **1.7 A fair test is a controlled experiment**  **(pages 16–17)** | *Science as a Human Endeavour*  ACSHE119  ACSHE223  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:   * explain the difference between science and pseudoscience * describe how to make a test ‘fair’ * explain the term ‘variable’ and understand the difference between dependent and independent variables * explain why all variables need to be controlled except one * describe how repetition increases the reliability of results. | **Science at home**  Challenge students to plan, conduct and report on an investigation of their choice to be conducted at home. Materials and methods should be presented to the teacher for approval prior to commencing the experiments.  Students should identify independent and dependent variables, and inform the teacher which variables are to be controlled to make it a fair test.  Examples might include:   * Does milk, dark or white chocolate melt faster? * Does ice melt faster in the fridge, on the bench or on the windowsill? * Does the colour of light effect the growth of plants? * Do girls have faster reflexes than boys? * Does cola produce a bigger explosion when shaken than sparkling mineral water? | **Oxford Science 7 WA resources**  – Check your learning page 17  – What if? page 16 |
| **Additional resources**  Interactive experiment highlighting fair testing <http://splash.abc.net.au/home#!/media/1390357/fair-test>  Examples of experiments appropriate for year 7 students <http://www.sciencekids.co.nz/experiments.html> |

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| **1.8 Graphs and tables are used to show results**  **(pages 18–21)** | *Science as a Human Endeavour*  ACSHE119  ACSHE223  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:   * identify and define discrete and continuous data * use graphs and tables appropriately to communicate the data from investigations * accurately construct graphs and tables according to scientific conventions * interpret data from graphs and tables * appreciate how the choices of graph type and scale can influence the initial impression of data. | **Constructing graphs**  Students should practice constructing graphs on paper and by digital means. Careful attention should be given to the allocation of axes according to whether the data relates to the dependent or independent variable.  Units and scale are also of great importance. Students could intentionally change the units and/or scale of a graph to examine the impact this has on the presentation of the data.  **Manipulating data**  Data can be presented in different ways. Advertising agencies particularly are very aware of how the initial impression of data can sell an idea or product.  Challenge students to find examples of data in graphs and tables that advertises an idea or product, evaluating the choice of graph/table type, units and scale. | **Oxford Science 7 WA resources**  – Check your understanding page 21  – Skills lab 1.8 page 173 |
| **Additional resources**  A variety of examples of misleading graphs <http://mathslinks.net/browse/category/misleading-graphs> |
| **1.9 Scientific reports communicate findings**  **(pages 22–23)** | *Science as a Human Endeavour*  ACSHE119  ACSHE223  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:   * describe the importance of scientific reports for communicating with other scientists * describe the purpose of the different sections of a scientific report * construct a scientific report using the sections appropriately and writing in the third person. | **Prepare a template**  Many teachers use a template to introduce the correct format, structure and language for writing scientific reports.  Challenge students to prepare their own template, complete with headings, sentence stems and a brief description of what should be in each section. This template could be included at the beginning of their workbooks for future reference.  **Peer assessment**  After completing scientific report, students can learn about correct language and structure by assessing each others work prior to teacher assessment. | **Oxford Science 7 WA resources**   * Check your learning page 23 * Experiment page 23 |
| **Additional resources**  A non–competitive awards program run by CSIRO supporting students in designing and conducting investigations <http://www.csiro.au/en/Education/Programs/CREST> |

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| **1.10 Science skills are used to solve important problems**  **(pages 24–25)** | *Science as a Human Endeavour*  ACSHE119  ACSHE223  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:   * describe the impact of the cane toad in Australia as an example of a current issue being investigated by scientists * consider how the scientists plan, conduct and communicate their investigative strategies and conclusions * plan and communicate their own hypothetical experiment. | **Student input**  Conduct a class discussion to find out how much students already know about the issues surrounding cane toads in Australia. Read the content of the unit to clarify their understanding.  Students could also be asked to suggest other examples of problems in Australia that are important for scientists to address. Examples could include other introduced species such as rabbits, foxes, camels, Crown of Thorns starfish, Prickly Pear cactus, and blackberries. Examples could also include human impact on the environment, vaccines and medication for diseases, and cleaner technologies. | **Oxford Science 7 WA resources**  – Extend your understanding page 25 |
| **Additional resources**  Global issues <http://www.globalissues.org>  Environmental issues in Australia <http://wwf.panda.org/who_we_are/wwf_offices/australia/environmental_problems_in_australia/> |
| **Review**  **(pages 26–28)** | *Science as a Human Endeavour*  ACSHE119  ACSHE223  ACSHE120  ACSHE121  *Science Inquiry Skills*  ACSIS124  ACSIS125  ACSIS126  ACSIS129  ACSIS130  ACSIS131  ACSIS132  ACSIS133 | By the end of this unit, students should be able to:   * identify areas of strengths and weakness in their knowledge and comprehension of the topic. | **Teach your peers**  Consider having the students work in groups to reteach the content of the unit to the class for the purpose of revision. Each group could be allocated a double-page spread to cover. | **Oxford Science 7 WA resources**  – Review questions 1–17 pages 26–27  – Research tasks page 27  – Key words page 28 |